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Kenneth M.C. Cheung

The University of Hong Kong, Hong Kong SAR, China

Biao Wang

Honghui Hospital Affiliated to Xi'an Jiaotong University, China

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Bone and Arthrosurgery Science

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Clinical Research on the Treatment of Extremity Fractures with Bushen Jiegu Decoction

Dongfeng Yu*

Huishan Yu Weijin Clinic, Wuxi 214181, Jiangsu Province, China

***Corresponding author:** Dongfeng Yu, ywjzs@126.com

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Abstract: *Objective:* To study the therapeutic effect of Bushen Jiegu Decoction on patients with limb fractures. *Methods:* 59 patients with limb fractures were selected for this study from May 2021 to December 2022. They were divided into two groups by the random number table method. The research group received conventional treatment + Bushen Jiegu Decoction, while the control group received conventional treatment. The therapeutic effect, rehabilitation indicators, inflammatory factors, and callus growth of the two groups were compared. *Results:* The therapeutic effect of the treatment received in the research group was higher than that of the control group ($P < 0.05$); the visual analogue scale (VAS), tenderness score, and swelling of the research group were lower than those of the control group ($P < 0.05$); the interleukin-8 (IL-8), interleukin-1β (IL-1β), tumor necrosis factor-α (TNF-α), and other inflammatory indicators were lower than those of the control group ($P < 0.05$); the callus volume score and density score in the study group were higher than those of the control group ($P < 0.05$). *Conclusion:* Treating patients with limb fractures with Bushen Jiegu Decoction can reduce swelling, relieve pain, inhibit inflammation, and stimulate the growth of callus, which makes it a highly effective and feasible treatment method.

Keywords: Limb fractures; Bushen Jiegu Decoction; Therapeutic effect

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1. Introduction

Under the background of the rapid development of the transportation system, the risk of traffic accident has increased, and the incidence of limb fractures has increased year by year. When a limb fractures the patients will experience swelling and pain, combined with a variety of physiological and biochemical changes, such as the rapid decomposition of protein, causing the body to enter a negative oxygen state, which can aggravate pain and swelling and prolong the healing of the wound [1]. In addition, early diagnosis and treatment is required for limb fractures, otherwise the patient will be left with a limb dysfunction, which will reduce their quality of life. Conventional closed reduction methods can correct displaced fracture fragments, but it does not relieve the local pain of the fracture, which is not conducive to the rehabilitation of patients. Traditional Chinese medicine scholars believe that patients with limb fractures have stagnation of qi and blood after surgery, which can cause pain and swelling, and they need to be treated with blood stasis dispelling and blood activating prescriptions. In

this paper, 59 patients with limb fractures treated from May 2021 to December 2022 were selected to explore the efficacy of the Bushen Jiegu Decoction.

2. Materials and methods

2.1. Information

Fifty-nine patients with limb fractures were selected as study subjects from May 2021 to December 2022, and they were grouped by the random number table method. In the research group, there were 20 males and 10 females, aged 20–68 years, with an average age of 43.11 ± 2.84 years; in the control group, there were 18 males and 11 females, aged 20–69 years, with an average age of 43.19 ± 2.79 years. There was no difference in the data of patients with limb fractures in the study group and the control group ($P > 0.05$).

2.2. Inclusion and exclusion criteria

Inclusion criteria: (i) Diagnosed with limb fractures according to the "Integrated Chinese and Western Medicine Orthopedics and Traumatology" standards [2], (ii) X-ray confirmed limb fractures with bone fricatives, (iii) no damage to nerves and blood vessels, (iv) signed an informed consent, (v) closed fractures with partial swelling.

Exclusion criteria: (i) severe blood vessel and nerve damage, (ii) organ damage, (iii) drug allergy, (iv) pregnant women.

2.3. Treatment methods

The research group received routine treatment + Bushen Jiegu Decoction treatment, and the routine medication was the same as that of the control group. The prescription of Bushen Jiegu Decoction was as follows: Astragalus 30 g; *Rhizoma Drynariae*, Dipsacus, and Psoralen, each 15 g; myrrh, frankincense, *Salvia miltiorrhiza*, and natural copper 10 g each; Licorice 6 g. The following ingredients are added and removed according to the patient's condition: for severe swelling, add 10g of coix seed and 15 g of fried herbs; for severe blood stasis, add 10g of peach kernel and safflower each; for severe pain, add 15 g of lindera root and 20 g of corydalis. Decoct 300 mL of the above-mentioned medicines and take 1 dose warm every morning and evening for 3 weeks.

The control group was treated with splint external fixation after closed reduction, and was given Jiegu Qili Tablets (Hunan Jinsha Pharmaceutical Co., Ltd.), 3 tablets orally, twice a day for 3 weeks

2.4. Observation indicators

2.4.1. Efficacy

Very effective: X-rays showed fracture healing, complete detumescence, no pain, recovery of limb function. Effective: X-rays showed fracture healing, reduced swelling, pain relief, improved function of affected limbs. Not effective: X-rays showed non-union of fractures, severe pain.

2.4.2. Rehabilitation index

The Visual Analogue Scale (VAS) scale evaluates the degree of pain of the affected limb from 0–10 points; the VAS score is directly proportional to the pain of the fracture. The circumference of the affected limb and the circumference of the healthy limb were measured, and the degree of swelling = (circumference of the affected limb – circumference of the healthy limb) / circumference of the healthy limb. The degree of tenderness was evaluated based on the patient's response, and score 0, 2, 4, and 6 points, respectively, such as no response when pressing, tolerable pain, frowning from pain, and severe pain when lightly touched.

2.4.3. Inflammatory factors

The changes of the interleukin-8 (IL-8) the interleukin-1β, IL-1β, tumor necrosis factor-α (TNF-α), and other indicators were detected.

2.4.4. Bone callus growth

The bone callus growth was scored as follows: 0, 1, 2, 3, and 4, which represent no bone callus growth, a small amount of callus, slightly more callus, a large amount of callus, and callus growth that covers the fractured site completely, respectively. The bone density was measured using an instrument where the lighter the color of the bone appears, the lower the bone density, which is scored from 0–4, with 0 being the closest to the healthy bone.

2.5. Statistical analysis

Data of patients with limb fractures were processed with SPSS 21.0 the count data of limb fractures were represented by percentages, and a x^2 test was performed; $\overline{x} \pm s$ recorded measurement indicators of limb fractures, t test. There is a statistical difference, $P<0.05$.

3. Results

3.1. Therapeutic effect

The therapeutic effect of the treatment received in the research group was higher than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of curative effects in patients with limb fractures (n, %)

Group	Very effective	Effective	Not effective	Total efficacy
Research group ($n = 30$)	21 (70.00)	8 (26.67)	1 (3.33)	96.67
Control group ($n = 29$)	16 (55.17)	7 (24.14)	6 (20.69)	79.31
x^2	-	-	-	4.2480
P	-	-	-	0.0393

3.2. Rehabilitation indicators

Before treatment, the VAS, tenderness score, and swelling degree of the research group were no different from those of the control group ($P > 0.05$); after treatment, the VAS, tenderness score, and swelling degree of the study group were lower than those of the control group ($P < 0.05$), as shown **Table 2**.

Table 2. Rehabilitation index analysis (mean ± standard deviation)

Group	VAS score (points)		Tenderness score (points)		Degree of swelling (%)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Research group ($n = 30$)	8.81 ± 1.25	3.19 ± 0.42	5.53 ± 1.21	2.29 ± 0.51	38.74 ± 2.35	25.99 ± 1.84
Control group ($n = 29$)	8.83 ± 1.27	4.68 ± 0.59	5.57 ± 1.19	3.18 ± 0.84	38.79 ± 2.39	31.25 ± 1.96
t	0.0610	11.2050	0.1280	4.9384	0.0810	10.6314
P	0.9516	0.0000	0.8986	0.0000	0.9357	0.0000

3.3. Levels of inflammatory factors

After medication, the indexes of IL-8, IL-1β, TNF-α, and other inflammatory factors in the study group were lower than those of the control group ($P < 0.05$); there was no difference between groups ($P > 0.05$), as shown in **Table 3**.

Table 3. Analysis table of inflammatory factor levels (mean ± standard deviation)

Group	IL-8 (pg/ml)		IL-1β (pg/ml)		TNF-α (ng/L)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Research group (n = 30)	26.11 ± 2.84	15.11 ± 1.75	16.18 ± 3.25	5.91 ± 1.35	138.41 ± 6.25	29.11 ± 2.15
Control group (n = 29)	26.16 ± 2.83	20.09 ± 1.96	16.21 ± 3.29	9.58 ± 1.96	138.38 ± 6.72	54.19 ± 3.61
t	0.0677	10.3028	0.0352	8.4006	0.0178	32.5514
P	0.9462	0.0000	0.9720	0.0000	0.9859	0.0000

3.4. Growth of callus

Before treatment, there was no difference in the amount of callus and density scores between the study group and the control group ($P > 0.05$); after treatment, the amount of callus and bone density scores of the study group were higher than those in the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Analysis table of callus growth ([mean ± standard deviation], points)

Group	Callus score		Bone density scores	
	Before treatment	After treatment	Before treatment	After treatment
Research group (n = 30)	0.35 ± 0.11	3.49 ± 0.51	0.27 ± 0.08	3.61 ± 0.15
Control group (n = 29)	0.37 ± 0.13	2.79 ± 0.43	0.29 ± 0.09	2.98 ± 0.21
t	0.0677	10.3028	0.0352	8.4006
P	0.9462	0.0000	0.9720	0.0000

4. Discussion

Fractures of extremities are injuries that can affect local microcirculation and cause ischemia at the fractured site, which affects the healing of fracture fragments [3]. In addition, patients with limb fractures often experience severe pain and muscle reflex spasm, which can further affect venous return, and the abnormal expansion of blood vessels at the fractured site leads to increased vascular permeability, which can aggravate the swelling of the affected limb. In the theory of traditional Chinese medicine, fractures of extremities are under the categories of "muscle injuries" and "fractures" [4]. Limb fractures has been recorded in literature as early as "Su Wen · Yin Yang Ying Xiang Da Lun when a patient experience limb fractures, the patient's qi and shape are injured, which can cause pain and swelling at the fractured site [5]. Studies have shown that the treatment of extremity fractures with traditional Chinese medicine can correct local microcirculation, reduce the problem of insufficient blood oxygen supply at the fracture site, stimulate the body's metabolism, and promote the absorption of inflammation [6]. In addition, Chinese medicine treatment of extremity fractures can also increase the accumulation of calcium ions and phosphorus ions in the human body, as well the production of chondroitin, causing calcification at the fracture end, stimulating the differentiation of mesenchymal cells and the proliferation of bone cells.

Chinese medicine scholars believe that the pathogenesis of pain and swelling after limb fractures is stagnation of qi and blood, so it should be treated with prescriptions for relieving pain, reducing swelling,

removing blood stasis, and promoting blood circulation. In addition, extremity fractures can damage the vitality of the patient, stagnation of blood in the body can block the circulation of qi and blood, and long-term stasis of qi and blood can aggravate pain and swelling symptoms [7]. In this paper, Bushen Jiegu Decoction is selected for treatment. *Rhizoma Drynariae*, Radix Dipsaci and Fructus Psoraleae, etc. belong to the monarch drug, which can restore tendons, bind bones, tonify the kidney, and strengthen the bones; *Salvia miltiorrhiza* is an adjuvant medicine, which can soothe the nerves, nourish blood, remove blood stasis, and promote blood circulation; natural copper can restore tendons, set bones, relieve pain, and remove blood stasis; It can reconcile various medicines and also serves as an envoy. In the dialectical formula, adding coix seed and fried herbs to can reduce swelling and remove water; adding peach kernel and safflower to treat blood stasis can dispel blood stasis and activate blood circulation; adding lindera root and corydalis can relieve pain and promote qi [8,9]. The combination of all the aforementioned helps in relieving pain, reducing swelling, dispelling blood stasis, and promoting blood circulation. Combined with modern pharmacological analysis, the active ingredients of Radix Astragali and Danshen can resist platelet accumulation and regulate the microcirculation of the body; the active ingredients like *Rhizoma Drynariae*, Dipsaci Radix and Fructus Psoraleae can inhibit the release of inflammatory mediators in the body and restore vascular permeability, which prevents vascular bleeding [10].

Based on the results of this paper, the therapeutic effect of the treatment received in the research group was higher than that of the control group ($P < 0.05$); the VAS, tenderness score, and degree of swelling of the research group were lower than those of the control group ($P < 0.05$). These results suggest that Bushen Jiegu Decoction is more effective in treating extremity fractures. Swelling of the fractured site is related to the displacement of the fracture block and damage to the veins, causing blood to leave the meridian, accumulate, and linger, when then causes swelling. The common type is stagnation of qi and blood. Traditional Chinese medicine scholars believe that damage to tendons and veins leads to stagnation of blood and qi, and poor blood circulation, stasis without pain, and swelling. In Bushen Jiegu Decoction, Fructus Psoraleae contains psoralen B and other ingredients, Dipsaci Radix contains loganin and other ingredients, *Rhizoma Drynariae* contains flavonoids, which can optimize the body's metabolism and stimulate the calcification of proteoglycans. Furthermore, it promotes the formation of new bone in the affected limb, has analgesic and anti-inflammatory effects, and can also improve osteoporosis; Astragalus contains astragalus polysaccharides and astragalus saponins, which can promote bone marrow hematopoiesis and enhance the immune function of the body; myrrh and frankincense contain resin Corydalis contains tetrahydropalmatine, which can block the activity of the cerebral cortex, thereby enhancing the analgesic effect [11,12]. Another set of data showed that the indexes of inflammatory factors such as IL-8, IL-1β, and TNF-α in the study group were lower than those in the control group ($P < 0.05$); the callus volume and bone density in the study group were higher than those in the control group ($P < 0.05$). It is suggested that Bushen Jiegu Decoction can inhibit the progression of inflammation and promote bone growth in the treatment of patients with limb fractures. This is because the combination of various medicines in Bushen Jiegu Decoction can remove free radicals and inhibit the release of inflammatory mediators. In addition, natural copper contains a variety of trace elements, such as copper, nickel, antimony, etc., which can promote the metabolism of proteases and stimulate the growth of fractured bones [13].

5. Conclusion

In short, Bushen Jiegu Decoction treatment for patients with limb fractures can inhibit the progression of inflammation, relieve pain and swelling at the fracture end, and promote bone growth, which has promotional value.

Disclosure statement

The author declares no conflict of interest.

References

[1] Yang G, Zhang Y, Yin J, 2021, Study on the Clinical Effect of Modified Bushen Jiegu Decoction in the Treatment of Acute Pain and Swelling After Extremity Fractures. Chinese Science and Technology Journal Database (Full Version) Medicine and Health, 7(12): 368–369.

[2] Sun Z, 2001, Integrative Traditional Chinese and Western Medicine Orthopedics and Traumatology, 2001, China Press of Traditional Chinese Medicine, Beijing, 202–204.

[3] Ren L, Qiu W, Xiang Z, et al., 2021, Effects of Bushen Jiegu Decoction Combined with External Application of Drugs on Pain, Inflammatory Factors and Microcirculation in Patients with Acute Swelling After Limb Fractures. Clinical Medicine Research and Practice, 6(27): 116–118 + 125.

[4] Dong R, 2021, Clinical Efficacy of Bushen Jiegu Decoction in the Treatment of Extremity Fractures and Its Impact on Pain. Reflexology and Rehabilitation Medicine, 7(15): 50–52.

[5] Ding X, 2022, Effect of Bushen Jiegu Decoction Combined with Fumigation on Fracture Healing and Wrist Joint Function After Distal Radius Fracture Operation. Modern Distance Education of Chinese Medicine, 20(5): 108–110.

[6] Wang B, Huang J, Zheng M, 2022, Clinical efficacy of Bushen Jiegu Decoction Combined with Fumigation and Washing Therapy in the Treatment of Postoperative Distal Radius Fractures. Shenzhen Journal of Integrated Traditional Chinese and Western Medicine, 2(11): 49–51.

[7] Ren L, Qiu W, Xiang Z, et al., 2021, Effects of Bushen Jiegu Decoction combined with External Application of Drugs on Pain, Inflammatory Factors and Microcirculation in Patients with Acute Swelling after Limb Fractures. Clinical Medicine Research and Practice, 6(27): 116–118 + 125.

[8] Yang S, 2020, Effect of Bushen Jiegu Decoction on Pain, Swelling and Fracture Healing after Limb Fracture. Chinese Folk Therapy, 28(4): 34–36.

[9] Jiao Y, 2020, Effect of Bushen Zhuanggu Decoction Combined with Double-Reverse Traction Reduction and Percutaneous Minimally Invasive Locking Plate Internal Fixation on Postoperative Knee Joint Function in Patients with Distal Femoral Fractures. Capital Food and Medicine, 27(7): 196.

[10] Gong T, He S, Xu R, 2021, Clinical Research on Floating Acupuncture Combined with Bushen Jiegu Decoction in the Treatment of Fractures Around the Knee Joint. New Chinese Medicine, 53(13): 140–143.

[11] Lu B, Xie D, 2022, Efficacy and Effective Rate Evaluation of Traditional Chinese Medicine Sticking Combined with Modified Taohong Siwu Decoction in the Treatment of Early Limb Pain and Swelling of Limb Fractures. North Pharmacy, 19(11): 88–90.

[12] Feng H, Zeng Q, 2022, The Effect of Traditional Chinese Medicine Xuxuan Jiegu Decoction Combined with Compound Bone Peptide Injection in the Treatment of Limb Fractures and the Impact on the Improvement of Patient Prognosis. North Pharmacy, 19(8): 51–53 + 57.

[13] Dong X, 2020, Clinical Research on the Treatment of Acute Pain and Swelling After Limb Fracture with Modified Bushen Jiegu Decoction. Clinical Research of Traditional Chinese Medicine, 12(29): 85–87.

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Observation on Curative Effect of Minimally Invasive Osteotomy Combined with Ilizarov Technique in the Treatment of Knee Osteoarthritis with Varus Deformity

Yong Di*, Guohua Wu, Guangpu Zhang, Xiaoyu Guo, Liqing Li

Langfang Aidebao Hospital, Langfang 065800, Hebei Province, China

Corresponding author: Yong Di, 13731616432@189.cn

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Abstract: This paper aims to analyze the clinical efficacy of minimally invasive osteotomy combined with Ilizarov technique in the treatment of knee osteoarthritis with varus deformity. 80 patients with knee osteoarthritis and varus deformity who were treated in our hospital from January 2022 to May 2023 were selected, all of whom were affected by one knee. They were randomly divided into groups, including the study group and the control group, each with 40 patients. Patients in the control group were treated with fibula-tibial osteotomy and internal fixation, and patients in the study group were treated with minimally invasive osteotomy combined with Ilizarov technique. The operation time of the patients in the study group was significantly longer than that of the control group ($P < 0.05$). The intraoperative blood loss of the patients in the study group was significantly more than that of the control group ($P < 0.05$). The hospitalization expenses of the patients in the study group were significantly more than those of the control group ($P < 0.05$). The postoperative femorotibial angle and mechanical axis offset distance in the study group were significantly smaller than those in the control group ($P < 0.05$). The postoperative New York Hospital for Special Surgery (HSS) scores of the study group were significantly higher than those of the control group ($P < 0.05$). The postoperative visual analogue scale (VAS) score of the study group was significantly lower than that of the control group ($P < 0.05$). The range of motion of the knee joint in the study group was significantly greater than that in the control group ($P < 0.05$). The incidence of tendon injury, infection, and nerve injury in the study group (2.50%) was significantly lower than that in the control group (30.00%) ($P < 0.05$). Minimally invasive osteotomy combined with Ilizarov technique can be applied in the treatment of knee osteoarthritis with varus deformity, although the operation time is longer, with more intraoperative blood loss and higher treatment cost, but it has no effect on the femorotibial angle and mechanical axis deviation of the patient. It can significantly improve the movement distance, knee joint function, and knee joint range of motion, and significantly reduce the postoperative pain of patients, reduce the incidence of complications, and thus has high clinical application value.

Keywords: Minimally invasive osteotomy; Ilizarov technique; Knee osteoarthritis; Varus deformity

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1. Introduction

Knee osteoarthritis is a common orthopedic disease, and its main incidence group is middle-aged and elderly people [1]. The disease can cause joint pain, swelling, limited mobility, and lower limb dysfunction in patients, which is an important factor affecting patients' quality of life [2]. Clinical studies have shown that the incidence of knee osteoarthritis is related to many factors and resulted from the joint action of multiple factors [3]. The inner side of the knee joint is the main weight-bearing part, hence the incidence of knee osteoarthritis is more common in the inner compartment of the knee joint [3]. This characteristic of knee osteoarthritis makes patients prone to shortening of the tibial distance during the disease progression, resulting in a higher risk of genu varum [4]. For patients with knee osteoarthritis, once combined with varus deformity, it will lead to aggravation of the condition, affecting the function of the knee joint, and causing great harm [5]. Therefore, it is necessary to promptly treat knee osteoarthritis and varus deformity. Our hospital (Langfang Aidebao Hospital) has actively developed Ilizarov technology since 2021. Shaftov Vladimir Ivano, former president of the Russian Ilizarov Center, academician of the Russian Academy of Medical Sciences, and meritorious worker of the Russian Federation, and Professor Wei Qi came to our hospital regularly to carry out teaching rounds, outpatient guidance, and other work (**Figures 1** and **2**). At the same time, in April this year, the China-Russia Langfang Ilizarov Center for Trauma Repair and Orthopedic Reconstruction officially landed in Aidebao Hospital, as shown in **Figures 3** and **4**. The application of Ilizarov in orthopedics in our hospital has been greatly improved through extensive technical cooperation. This article analyzes the clinical efficacy of minimally invasive osteotomy combined with Ilizarov technique in the treatment of knee osteoarthritis with varus deformity, in order to provide a guideline for improving the treatment of such patients.

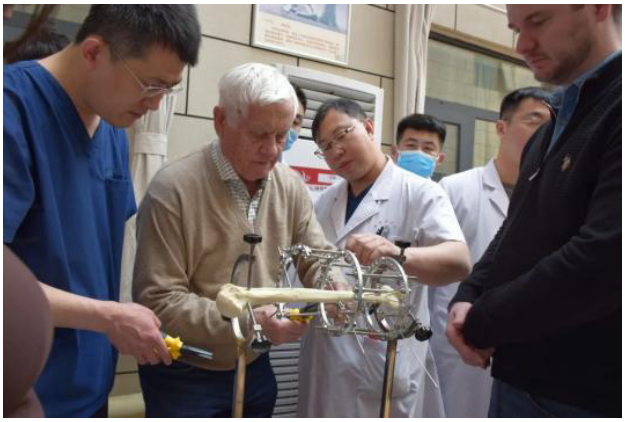


Figure 1. Shaftov Vladimir Ivanovich technical teaching training



Figure 2. Shaftov Vladimir Ivanovich technical teaching rounds



Figure 3. China-Russia Langfang Ilizarov Trauma Repair and Orthopedic Reconstruction Center signed a contract



Figure 4. Unveiling of China-Russia Langfang Ilizarov Trauma Repair and Orthopedic Reconstruction Center

2. Materials and methods

2.1. Demographic of study population

A total of 80 patients with knee osteoarthritis and varus deformity who were treated in our hospital from January 2022 to May 2023 were selected, all of whom were affected by one knee. They were randomly divided into groups, including the study group and the control group, each with 40 patients. There were 24 males and 16 females in the study group, aged 44–76 years, with an average of 55.52±2.06 years old. Among them, there were 22 cases of left knee joint disease and 18 cases of right knee joint disease. There were 23 males and 17 females in the control group, aged 46–77 years, with an average age of 56.74±2.13, the course of disease was 3–14 years, with an average duration of 6.13±3.46 years, and there are 25 cases of left knee lesions and 15 cases of right knee lesions. There was no statistically significant difference in the data of the two groups of patients $P > 0.05$.

Inclusion criteria included patients who meet the diagnostic criteria for knee osteoarthritis and varus deformity, patients suitable for surgical treatment, patients who can communicate in normal language, and patients who have signed the "Informed Consent Form."

Exclusion criteria were patients with surgical treatment contraindications, blood coagulation disorders, and anesthesia contraindications, patients with gouty arthritis, systemic lupus erythematosus, Sjogren's syndrome, and other diseases that can cause joint lesions, patients with other knee diseases such as acute joint injury, patients with knee osteophytes, patients with severe infection, liver, and kidney dysfunction, patients with severe diseases such as hypertension and stroke, and patients who quit the study halfway.

2.2. Treatment methods

The patients in the control group were treated with tibial osteotomy and internal fixation. They were given spinal anesthesia or general anesthesia, placed in the supine position, and put on a tourniquet. An incision was made from the posteromedial tibial plateau below the joint line to the medial tibial tuberosity, about 5cm in length. The goosefoot was separated to expose the superficial medial collateral ligament, the distal part of the superficial medial collateral ligament was peeled off, and a blunt retractor was inserted along the gap between the tibia and the superficial medial collateral ligament to the rear of the tibial osteotomy to protect the neurovascular. After the medial border of the patellar ligament has been identified, a subperiosteal dissection is performed from the tibial tuberosity to the posteromedial tibia. Two guide pins were inserted at 3.5–4.0cm below the medial joint line. The direction of the guide pins is adjusted obliquely upward until 1cm below the lateral tibial joint edge, towards the top of the fibular head. After the C-arm fluoroscopy showed that the position of the guide pins was appropriate, the osteotomy was performed along the two guide pins with a pendulum. During the osteotomy, it was necessary to confirm that the osteotomy line was parallel to the tibial posterior tilt in the coronal position, and a 1cm lateral hinge was reserved. After the osteotomy, a spreader is used to spread the knee to correct the varus of the knee joint. During the operation, a long metal rod was used to position the line of force of the lower limbs to ensure that the metal rod passed 62.5% of the lateral platform of the tibia. After the correction is satisfactory, a locking plate is placed for fixation. When the opening distance of the osteotomy is greater than 10mm, bone grafting is recommended.

Patients in the study group were treated with minimally invasive osteotomy combined with Ilizarov technique. They were treated with general anesthesia, placed in a supine position, and the entire length of the lower limbs were sterilized and draped. Before the operation, the qualified Ilizarov annular external fixator and accessories were assembled in advance. The external fixator consisted of a set of semi-rings and a set of full rings. It is a group with a distance of about 5cm, of which the proximal knee joint ring group is a 3/4 C ring, the anteromedial, anterolateral, posterior medial, and posterior lateral directions of the rings are connected by 4 adjustable screw rods. The articulator was installed at the proximal end of the screw rod, and it was connected

and fixed with the proximal knee joint ring group. The external fixator is placed over the patient's limb and adjusted to match the varus deformity. Under the fluoroscopy of the C-arm X-ray machine, the position is determined, and then the needle is threaded. The first 2.0mm diameter full needle was inserted at the level of the tibial plateau near the knee joint and fixed on the ring. During the placement process, care should be taken to avoid the common peroneal nerve and the upper tibiofibular joint. A second full needle was inserted at the superior ring of the ankle and the inferior tibiofibular joint was stabilized. The position of the external fixator and the operative limb was adjusted to a suitable position. All the needles were inserted and fixed on the remaining rings in the same way. One and a half needles were inserted respectively at the rings of the two groups and fixed on the rings to ensure the stability of the rings. After the external fixator is installed in place, a 1cm incision was made on the anterolateral side of the calf about 2cm below the tibial tuberosity. The subcutaneous tissue and periosteum were separated with hemostatic forceps, and the multi-hole osteotomer was placed against the pre-osteotomy plane of the tibia, and an electric drill was used to minimally invasively arrange the drill holes and cut the osteotomy, the external fixation ring was tightened to connect the screw rod, and the success of the osteotomy was confirmed through fluoroscopy. The bone needle was bent, the excess part of the tail end was cut off, the protective cap was installed, and regular bandaging was performed.

Both the control group and the study group were routinely performed osteotomy of the fibula proximal to the ankle joint greater than 10cm.

2.3. Evaluation indicators

Surgical treatment was evaluated through the operation time, intraoperative blood loss, and hospitalization expenses of the patients. Before operation and 3 months after operation, 64-slice 128-slice spiral CT was used to measure the femorotibial angle and mechanical axis offset distance of patients. Before operation and 3 months after operation, the knee joint function of the patients was evaluated by using the New York Hospital for Special Surgery (HSS) knee score, which mainly included 30 points for pain, 18 points for joint range of motion, and 18 points for walking, 22 points for function, 10 points for flexion deformity, 10 points for joint muscle strength, and 10 points for instability. The higher the score, the better the recovery effect of the knee joint function of the patient [5]. The visual analogue scale (VAS) was used to evaluate the patient's pain severity, with a score ranging from 0 to 10 points. The higher the score is, the more severe the pain is [6]. The range of motion of the knee joint was measured before and after 3 months. The incidence rates of complications, such as tendon injury, infection, and nerve injury were counted.

2.4. Statistical methods

The research data were analyzed using the SPSS software version 21.0, in which the measurement data and count data were represented by (n, %) and ($\bar{x}$±s) respectively, and the t test and x^2 test were given correspondingly. $P < 0.05$ indicates that the comparison results are statistically significant.

3. Results

3.1. Comparison of surgical treatment

Based on **Table 1**, the operation time of the study group was significantly longer than that of the control group, and the difference was statistically significant at $P < 0.05$. The intraoperative blood loss of the study group was significantly longer than that of the control group, and the difference was statistically significant at $P < 0.05$. The hospitalization expenses of the patients in the study group were significantly more than those of the control group, and the difference was statistically significant at $P < 0.05$.

Table 1. Comparison of surgical treatment of two groups of patients

Group	Operation time (min)	Intraoperative blood loss (ml)	Hospital expenses (10,000 yuan)
Study group (n = 40)	68.06 **±7.38**	23.18 **±5.39**	3.48 ± 0.25
Control group (n = 40)	37.13 **±3.16**	9.25 **±2.08**	2.53 ± 0.18
t value	17.562	12.625	17.857
P value	>0.05	<0.05	<0.05

3.2. Comparison of the femorotibial angle and the offset distance of the mechanical axis

As shown in **Table 2**, the preoperative femorotibial angle and mechanical axis offset distance of the two groups of patients were similar, and there was no statistically significant difference in $P > 0.05$. The postoperative femorotibial angle and mechanical axis offset distance of the study group were significantly smaller than those of the control group, $P < 0.05$ indicated that the difference was statistically significant.

Table 2. Comparison of femorotibial angle and mechanical axis offset distance between the two groups of patients

Group	Femorotibial angle (°)		Mechanical axis offset distance (mm)	
	Preoperative	postoperative	Preoperative	Postoperative
Study group (n = 40)	184.42±7.06	154.86±4.05	31.56±4.12	0.95±0.12
Control group (n = 40)	184.62±7.15	172.63±5.13	31.68±3.89	9.15±0.35
t value	0.443	12.748	0.325	17.923
P value	>0.05	<0.05	>0.05	<0.05

3.3. Comparison of knee joint function

Table 3 shows that the preoperative pain, joint range of motion, walking function, flexion deformity, joint muscle strength, instability, and other HSS scores of the two groups of patients were similar, and there was no significant difference between the two groups with $P > 0.05$. The HSS scores of each item in the study group after operation were significantly higher than those of the control group, and the difference was statistically significant at $P < 0.05$.

Table 3. Comparison of knee joint function (points)

Group/ Treatment	Pain		Range of motion		Walking function		Buckling deformity		Joint muscle strength		Instability	
	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Study group (n = 40)	10.28±1.75	25.16±2.15	9.25±1.12	16.15±1.25	8.43±1.75	12.38±1.17	4.38±1.06	8.73±0.17	6.07±1.15	8.33±0.27	6.16 ±1.09	8.12 ±0.21
Control group (n = 40)	10.26±1.74	20.49±2.08	9.15±1.27	13.54±1.22	8.58±1.83	10.24±1.68	4.59±1.15	7.25±0.28	6.48±1.29	7.43±0.12	6.23 ±1.13	7.79 ±0.17
t value	0.342	10.543	0.136	10.793	0.495	5.953	0.226	30.162	0.637	20.054	0.125	6.273
P value	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05	>0.05	<0.05

3.4. Comparison of the degree of pain and range of motion of the knee joint

The preoperative VAS score and the range of motion of the knee joint in the two groups were similar, and there was no statistically significant difference between the two groups when compared ($P > 0.05$). The postoperative range of motion of the knee joint in the study group was significantly greater than that in the control group, and the difference was statistically significant at $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of pain degree and knee joint range of motion between the two groups of patients

Group	VAS score (points)		Knee range of motion (°)	
	Preoperative	postoperative	Preoperative	postoperative
Study group (n = 40)	6.58 ±1.13	2.01 ±0.36	56.54 ±5.07	84.48 ±5.15
Control group (n = 40)	6.43 ±1.17	3.47 ±0.54	55.83 ±5.24	71.06 ±4.65
t value	0.094	11.463	0.876	8.727
P value	> 0.05	< 0.05	> 0.05	< 0.05

3.5. Comparison of the incidence of complications

According to **Table 5**, the incidence of tendon injury, infection, and nerve injury in the study group (2.50%) was significantly lower than that in the control group (30.00%), and the difference was statistically significant at $P < 0.05$.

Table 5. Comparison of the incidence of complications between the two groups of patients

Group	Tendon injury	Infection	Nerve damage	Total incidence
Study group (n = 40)	1	0	0	1 (2.50)
Control group (n = 40)	4	5	3	12 (30.00)
x^2 value	-	-	-	4.863
P value	-	-	-	<0.05

4. Discussion

At present, for the clinical treatment of knee osteoarthritis with varus deformity, the conventional therapy is tibial osteotomy and internal fixation [7]. This operation method is currently considered to be a relatively effective treatment method clinically, and it is also a “knee-preserving” operation therapy [8]. After tibial osteotomy and internal fixation in patients with knee osteoarthritis and varus deformity, the proximal tibial bone can be remodeled, the tension of the soft tissue on the outside of the knee joint can be improved, and the line of force of the lower limbs can be corrected, so as to achieve the therapeutic effect [9,10].

Internal fixation of tibial osteotomy has the advantages of simple operation, less trauma, shorter operation time and relatively lower treatment cost [11-13]. This may be related to the skill of the surgeon in osteotomy and internal fixation. However, in the long-term research and observation, it was found that the long-term curative effect of patients treated with tibial osteotomy and internal fixation was not satisfactory. Due to the lack of internal fixation or external fixation support during the surgical treatment, patients had more complications in the later stage of the treatment, and the improvement effect of joint function has limitations [14,15]. Therefore, it is very important to explore a more effective treatment method.

In this study, in order to achieve this goal, the author adopted minimally invasive osteotomy combined with Ilizarov technique to treat patients with knee osteoarthritis and varus deformity. Compared with tibial osteotomy and internal fixation, the long-term efficacy of minimally invasive osteotomy combined with Ilizarov technique has significant advantages. The author believes that it is mainly due to the fact that the minimally invasive osteotomy combined with Ilizarov technique will not affect the subsidence of the patella or the structure of the patellar ligament. This surgical method improves the safety of osteotomy and will not cause major damage and impact on the ligament structure around the knee joint [16-18]. It is convenient for the firm fixation and accurate

correction of the patient by external fixation, and the damage to the soft tissue can be reduced during the operation, which is conducive to the promotion of postoperative rehabilitation [19,20]. Therefore, with minimally invasive osteotomy combined with Ilizarov technique for treatment, the postoperative pain degree of the patient and the complications are significantly less, and the recovery of knee joint function is better.

To sum up, minimally invasive osteotomy combined with Ilizarov technique in the treatment of knee osteoarthritis with varus deformity can be applied, although the operation time is longer, with more intraoperative bleeding and higher treatment cost, but its effect on the femorotibial angle, the mechanical axis offset distance, knee joint function, and knee joint range of motion can be significantly improved, and it also can significantly reduce postoperative pain and the incidence of complications, which has high clinical application value.

Disclosure statement

The authors declare no conflicts of interest.

References

[1] Zheng H, Ning R, Yin H, et al., 2022, Application of Selective Pie-Crusting Technique in Primary Total Knee Arthroplasty for Severe Genu Varus. Chinese Journal of Bone and Joint Injuries, 37(06): 622–625.

[2] Hu W, 2022, Clinical Effect of Artificial Total Knee Replacement in the Treatment of Knee Osteoarthritis with Severe Genu Varus Deformity. Clinical Medicine Research and Practice, 7(03): 78–80.

[3] Mu W, Xu B, Guo W, et al., 2022, Early Curative Effect of Total Knee Arthroplasty Assisted by MAKO Robot in the Treatment of Knee Osteoarthritis with Severe Varus Deformity. Chinese Journal of Bone and Joint Surgery, 15(08): 612–618.

[4] Li Q, Zhai X, Qin L, et al., 2019, Observation on the Short-Term Curative Effect of High Tibial Osteotomy Combined with Arthroscopic Debridement in the Treatment of Medial Unicompartmental Osteoarthritis of the Knee Joint. Journal of Clinical Medicine Literature, 6(11): 17–19 + 22.

[5] Dong Y, Song Q, Xu X, et al., 2022, Clinical Research on Pie-Crusting Technique in the Treatment of Varus Deformity of Knee Osteoarthritis in Total Knee Arthroplasty. Chinese Medicine Herald, 19(06): 85–88.

[6] Zhang G, Zhang G, 2022, Clinical Comparative Study of Knee Arthroscopic Debridement Combined with Upper Fibula Osteotomy and Upper Fibula Osteotomy for Varus Knee Osteoarthritis. Henan Surgical Journal, 28(01): 140–142.

[7] Hu H, Gao Y, Liu Z, et al., 2019, Clinical Research on the Relationship Between Knee Varus Deformity and Tibial Rotation Angle in Patients with Knee Osteoarthritis. Chinese Journal of Geriatric Orthopedics and Rehabilitation, 5(02): 99–104.

[8] Diao N, Dai Y, Yu F, et al., 2023, The Application of Tibial Plateau Reduction Technology Combined with Limited Medial Soft Tissue Release in Total Knee Arthroplasty. Chinese Journal of Bone and Joint Surgery, 16(03): 226–231.

[9] Liu N, Wei H, Tian X, et al., 2023, Clinical Observation of Arthroscopic Debridement Combined with High Tibial Osteotomy in the Treatment of Early Varus Knee Osteoarthritis. Clinical Misdiagnosis and Mistreatment, 36(02): 85–89.

[10] Li G, Zhao H, Zhang J, et al., 2023, Efficacy of Medial Open Wedge High Tibial Osteotomy in the Treatment of Knee Varus Deformity and its Influence on Postoperative Lower Limb Alignment and Traumatic Stress. Advances in Modern Biomedicine, 23(02): 345–349.

[11] Zhou J, Ge Z, He L, et al., 2022, Comparison of the Effects of Different Surgical Methods in Treating Patients with Medial Compartment Cartilage Injury of the Knee Joint with Genu Varus and Their Influence on the Level of Force Line of the Lower Limbs. Medical Theory and Practice, 35(24): 4204–4206.

[12] Hu Z, Xia L, Hao F, et al., 2022, Comparison of the Application Effect of Gap Balance Technique and Measuring Osteotomy Technique in Total Knee Arthroplasty in Patients with Varus Knee Osteoarthritis. Journal of Xinxiang Medical College, 39(12): 1145–1149 + 1154.

[13] Jin P, 2021, Effect Analysis of Arthroscopy Combined with Fibula Osteotomy and Microfracture Technique in the Treatment of Varus Knee Osteoarthritis. China Health and Nutrition, 31(8): 223.

[14] Xie W, Shang H, Sun W, 2021, Analysis of the Effect of High Tibial Osteotomy in the Treatment of Knee Osteoarthritis with Genu Varus. Chinese Journal of Disability Medicine, 29(8): 31–32.

[15] Pan H, Liu G, Li L, et al., 2022, Effect of High Tibial Biplane Ascending Osteotomy and Descending Osteotomy on Varus Knee Osteoarthritis and Gait Analysis. Bio-Orthopedic Materials and Clinical Research, 19(1): 25–30.

[16] Zeng L, Liao H, Yang F, et al., 2022, Effect of Improved llizarov Minimally Invasive Proximal Tibial Osteotomy Plate Internal Fixation on Knee Joint Function in Patients with Knee Osteoarthritis Complicated with Genu Varus. Clinical and Experimental Journal of Medicine, 21(11): 1174–1178.

[17] Xia K, Ruan W, Liu D, et al., 2022, Arthroscopy Combined with Open Wedge High Tibial Osteotomy for Varus Knee Osteoarthritis. Journal of Practical Orthopedics, 28(8): 750–754.

[18] Wang L, Yang P, Wang K, 2020, Effect of Ilizarov Surgery Combined with Minimally Invasive Osteotomy on Knee Joint Function in Patients with Knee Osteoarthritis Complicated with Genu Varus. Shaanxi Medical Journal, 49(1): 37 –39.

[19] Ma K, Gou L, Guo H, et al., 2020, Comparison of the Curative Effects of Three Minimally Invasive Procedures in the Treatment of Medial Knee Osteoarthritis. Chinese Journal of Orthopedics and Traumatology, 28(6): 10–15.

[20] Zhao X, Xu B, Xiao T, et al., 2021, The Effect of Proximal Fibular Osteotomy on Knee Joint Mobility and Complications in Patients with Varus Knee Osteoarthritis. Practical Hospital Clinical Journal, 18(2): 22–26.

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Analysis of the Influence of Knee Joint Balancing Manipulation on the Rehabilitation of Patients after Total Knee Arthroplasty

Tian Zhang*, Hua Li, Xiaohua Dong, Dakuan Zhang

BeiJing JiShuiTan Hospital GuiZhou Hospital, Guiyang 550021, Guizhou Province, China

Corresponding author: Tian Zhang, gzkfk2011@foxmail.com

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Abstract: This paper aims to explore the clinical effect of knee-balancing manipulation after total knee arthroplasty. A total of 84 patients with total knee arthroplasty in our hospital were selected. The time of admission and treatment was from March 2021 to March 2023. They were divided into the study group (n = 42) and the control group (n = 42) by lottery method with a digital table. The patients in the control group received conventional rehabilitation, and the patients in the study group received balancing manipulation of the knee joint. The Hospital for Special Surgery (HSS) knee function score and gait indicators were compared between the two groups. The HSS score of patients in the study group was higher than that in the control group at 2 weeks after operation ($P < 0.05$). The gait indexes of patients in the study group were higher than those in the control group at 2 weeks after operation ($P < 0.05$). Knee-balancing manipulation after total knee arthroplasty can improve knee joint function and restore gait, which has the value of popularization and application.

Keywords: Knee-balancing manipulation; Total knee arthroplasty; Rehabilitation

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1. Introduction

Total knee arthroplasty is the main surgical method for the clinical treatment of advanced knee osteoarthritis and knee joint deformity. During the operation, artificial joints are used to replace the diseased knee joint, which can relieve pain and improve knee joint function [1]. Total knee arthroplasty has a large trauma area, which can destroy the integrity and continuity of the tissues around the knee joint, and affect the patient's balance ability and gait. Therefore, an effective rehabilitation treatment plan should be adopted after the operation [2,3]. Knee-balancing manipulation is based on traditional Chinese massage therapy, combined with knee osteoarthritis lesion characteristics and knee anatomical structure characteristics to determine the treatment plan, with satisfactory curative effect [4]. In this study, 84 samples of total knee arthroplasty patients were selected to explore the effect of knee-balancing manipulation on postoperative rehabilitation of patients.

2. Materials and methods

2.1. Demographic of study population

The research process and sample selection plan were submitted to the approval of the Medical Ethics Committee. 84 total knee arthroplasty patients admitted to our hospital were selected. The admission time was from March 2021 to March 2023. They were divided into study group (n = 42) and control group (n = 42) by lottery method with digital table. In the study group, there were 24 males and 18 females. The age range was 58–66 years old, with an average of 62.58±3.69 years old, and the disease duration ranged from 7 months to 5 years, with an average of 2.68±0.85 years. In the control group, there were 22 males and 20 females. The age range was 60–65 years old, with an average of 62.64±3.72 years old. The disease course ranged from 6 months to 5 years, with an average of 2.75±0.89 years. The general information of the two groups of patients was comparable ($P > 0.05$).

Inclusion criteria were patients who meet the diagnostic criteria for knee osteoarthritis in the "Guidelines for the Diagnosis and Treatment of Osteoarthritis," patients who meet the indications for total knee arthroplasty, and patients who understand the research process and content, and sign the consent form.

Exclusion criteria included patients with lower limb dysfunction caused by central nervous system diseases, patients with muscle atrophy, and patients with mental illness or other medical diseases.

2.2. Methods

Patients in the control group received conventional rehabilitation treatment after operation. The affected limb was raised 1 day after operation to maintain the functional position of the knee joint. Passive knee joint flexion and extension training was performed 3 to 7 days after operation, each training was 30 minutes, and the range of flexion and extension was gradually increased during the training period. Ankle pump exercises were performed 100–300 times a day, and patients were assisted in isometric quadriceps contraction training on the hospital bed, performed 300–500 times a day. Patients were guided to perform straight leg raising training 8 days after surgery, and maintain a sitting position, move their knee joints in a painless state, and parallel resistance flexion and extension training, walking training, and up and down stairs training.

According to the treatment plan of the control group, the patients in the study group were treated with knee joint balancing manipulation, plucking, and straightening out, and pressing and kneading for 1–3 days after operation, twice a day. Three days after the operation, patella release, knee flexion, and tendon regulation were performed, twice a week. The treatments are described in detail as follows.

(1) Pressing and kneading method. The doctor instructed the patient to maintain an upright sitting position beside the bed, with the legs drooping naturally, properly protected the surgical incision, and massaged the soft tissue around the knee joint on the outside of the incision for 3–5 minutes. The inner and outer sides of the knee joint and the tenderness points around the patella were palpated, spot kneading and massage was performed, and the intensity was gradually increased during the operation.

(2) Poking and regulating channels manipulation. The doctor massaged the starting and ending points of the rectus femoris, sartorius, and tensor fascia lata muscles of the patient, and plucked the lateral medial and lateral sides 5–10 times, and stretched the tendons 3–6 times through the starting point toward the insertion point.

(3) Releasing the patella. The doctor used the thumb and index finger to massage the inner and outer areas of the patella for 5–10 times. After the operation is completed, the patella was pressed down with the palm toward the surface of the femoral cartilage and rubbed 6–8 times.

(4) Regulating tendons while stretching out the legs. The starting point of the tensor fascia lata at the anterior inferior spinous spine of the patient was massaged several times, the muscle tissue was

pushed after the operation, and the lateral collateral ligament of the knee joint was massaged. The base of the palm was pushed along the direction of the iliotibial band 6–8 times. After completing the operation, the knee joint was repeatedly flexed and extended 8–10 times.

(5) Strengthening the tendons while bending the legs. The doctor massaged the starting point of the rectus femoris muscle of the patient, pushed along the direction of the quadriceps femoris, and used the heel of the palm to push the vastus medialis and sartorius muscles 8–10 times. The calf of the patient was protected with both hands, the posterolateral muscles of the calf was pressed and kneaded 8–10 times from top to bottom, and the push method was used to smooth the calf muscle tissue 8–10 times.

2.3. Evaluation criteria

The Hospital for Special Surgery (HSS) knee function score was compared between the two groups immediately after operation and 2 weeks after operation. The scoring items included pain, muscle strength, stability, and range of motion. The score was directly proportional to the degree of good knee function. Gait analyzers were used to measure the gait indexes of the two groups immediately after operation and 2 weeks after operation, including step length, pace speed, and stride frequency.

2.4. Statistical methods

SPSS23.0 software was used to calculate various data, the measurement data was ($\overline{x}$±s), the test method was *t*, the count data was %, and the test method was x^2 . If $P < 0.05$, there was a difference between groups.

3. Results

3.1. Comparing the HSS scores

As shown in **Table 1**, the HSS scores of patients in the study group were higher than those in the control group 2 weeks after operation ($P < 0.05$).

Table 1. Comparison of HSS scores between the two groups ($\overline{x}$±s)

Group	Pain		Muscle strength		Stability		Activity	
	Immediately after surgery	2 weeks after surgery	Immediately after surgery	2 weeks after surgery	Immediately after surgery	2 weeks after surgery	Immediately after surgery	2 weeks after surgery
Study group (n = 42)	12.38±2.05	23.55±3.68	7.14±0.85	12.33±1.86	7.14±0.68	9.94±1.25	9.17±1.05	16.58±1.96
Control group (n = 42)	12.41±2.09	20.06±1.77	7.09±0.92	10.75±1.02	7.19±0.64	8.27±0.66	9.22±1.09	14.95±0.88
t value	0.066	5.539	0.259	4.827	0.347	7.657	0.214	4.917
P value	0.947	0.000	0.797	0.000	0.729	0.000	0.831	0.000

3.2. Comparing the gait indicators

As shown in **Table 2**, the gait indexes of patients in the study group were higher than those in the control group at 2 weeks after operation ($P < 0.05$).

Table 2. Comparison of gait indicators between the two groups ($\overline{x}$±s)

Group	Step size (m)		Pace (m/s)		Cadence (step/min)	
	Immediately after surgery	2 weeks after surgery	Immediately after surgery	2 weeks after surgery	Immediately after surgery	2 weeks after surgery
Study group (n = 42)	0.55±0.12	0.73±0.18	0.72±0.11	0.92±0.15	90.11±6.25	102.45±6.48
Control group (n = 42)	0.59±0.08	0.62±0.11	0.69±0.12	0.73±0.08	90.07±6.19	97.11±3.18
t value	1.797	3.379	1.194	7.243	0.029	4.794
P value	0.076	0.001	0.236	0.000	0.977	0.000

4. Discussion

Knee osteoarthritis is a frequent knee joint disease in middle-aged and elderly people. The cause of the disease is knee joint strain, loose ligament tissue around the knee, soft tissue degeneration, knee cartilage degeneration, and secondary bone hyperplasia, which can lead to joint pain. The symptoms are pain, swelling, and limited movement. Total knee arthroplasty is an effective treatment for advanced knee osteoarthritis. During the operation, an artificial knee joint is used to replace the diseased knee joint, which can relieve pain and improve knee joint mobility [5]. The trauma area of total knee arthroplasty is large with long recovery time. In order to improve the prognosis, an effective and reasonable rehabilitation treatment plan should be formulated and implemented after surgery [6].

In the conventional postoperative rehabilitation treatment mode, doctors use passive exercise combined with active exercise to relax muscles and improve knee joint function, but the onset speed is slow, and some patients have poor improvement of knee joint function [7]. According to the theory of Chinese medicine, the key to rehabilitation after total knee arthroplasty is to loosen adhesion tissue, relieve spasm, adjust the stress distribution of the knee joint, and restore the normal anatomical structure of muscles and bones [8]. Knee joint balancing techniques and Chinese massage techniques are based on restoring the balance of soft tissue around the knee joints, which can achieve the effect of tendon binding, bone strengthening, and muscle softening. In the knee joint balancing manipulation therapy mode, the doctor touches the muscles around the knee to detect and repair abnormal knots in time. By massaging the pain points around the knee, the meridian *qi* in the body can be stimulated, the circulation of *qi* and blood can be improved, and the patient's sensitivity to pain and postoperative pain can be reduced [9,10]. During the treatment of knee joint balancing manipulation, the physician focuses on poking the rectus femoris, sartorius, and tensor fascia lata, and straightening out the muscle tissue, which can restore the soft tissue around the knee joint to a state of "dynamic and static balance," combined with the use of patellar release manipulation, it can promote the balance of medial and lateral tension, thereby improving the motor function of the patella [11]. The tendon-regulating manipulation of the knee joint can loosen the adhesion tissue, make the force on the soft tissue conform to the direction of knee joint movement, and increase the range of motion of the knee joint. Compared with the conventional rehabilitation treatment plan, knee-balancing manipulation after total knee arthroplasty can comprehensively adjust the physiological functions of joints, muscles, and soft tissues, and accelerate the recovery of knee joint function. The treatment is simple, with few adverse reactions and patient tolerance. The degree of cooperation is good, and it has high clinical application value [12].

The results of this study confirmed that the postoperative HSS score and gait-related indicators of the study group were significantly better than those of the control group, suggesting that knee-balancing manipulation therapy after total knee arthroplasty can improve gait and promote the recovery of knee joint function. Conventional knee joint functional training mostly adopts a combination of active and passive movements, the training efficiency is relatively slow, thus the rehabilitation effect on muscles and soft tissues is poor. According to Chinese medicine, total knee replacement can damage the muscles, tendons, and bones, resulting in poor flow of *qi* and blood, loss of nourishment of muscles, tendons, and bones, which in turn induces symptoms such as postoperative swelling and pain, and difficulty in moving [13]. Knee joint balancing techniques are based on Chinese medicine massage techniques. Through kneading, pinching, and plucking techniques, adhesions can be released, pain can be relieved, and knee joint movement can be improved. Modern medical research has shown that knee-balancing techniques can accelerate blood flow, reduce the level of pain-causing factors in the knee

joint, and relieve soft tissue adhesions around the knee joint, smooth the joint, relieve muscle tissue stiffness, and increase the range of motion of the knee joint [14]. According to another study, total knee arthroplasty can increase the strength of the musculature around the knee, enhance the stability of the knee joint, prevent various adverse events during the active phase of the knee joint, and help improve the recovery of knee joint function after surgery [15]. Compared with the conventional rehabilitation training program, the knee joint balancing technique is more comprehensive, it can effectively release adhesions, relieve pain, reduce patients' fear of rehabilitation treatment, improve the soft tissue function of the knee joint, restore the normal anatomical structure, and further improve the artificial knee joint stability, thereby promoting the recovery of knee joint function and gait.

Based on the above analysis, knee-balancing manipulation therapy after total knee arthroplasty can improve knee joint function and restore gait, which has clinical application value. The number of samples of total knee arthroplasty patients selected in this study is small, the specific process of analysis and evaluation still needs to be improved and adjusted, and the research period is relatively short. In-depth analysis on the effects and application of knee-balancing manipulation therapy after total knee arthroplasty is required.

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Disclosure statement

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References

[1] Feng J, Zhai Y, Li B, 2023, Meta-Analysis of the Effect of Manual Lymphatic Drainage on Rehabilitation After Total Knee Arthroplasty. Chongqing Medicine, 52(4): 562–568.

[2] Wang H, 2023, Study on the Effect of Standardized Enhanced Recovery Surgery Intervention in Preventing DVT Formation in Middle-aged and Elderly Patients After Total Knee Replacement. China Standardization, 2023(8): 294–297.

[3] Yu S, 2023, Application Effect of Lower Extremity Joint Rehabilitation Device Combined with Standardized Pain Management in Postoperative Rehabilitation of Patients with Total Knee Arthroplasty. Medical Theory and Practice, 36(2): 322–324.

[4] A X, Xu H, Bian Y, et al., 2023, Application Progress of Massage in Accelerated Rehabilitation After Total Knee Arthroplasty. Anhui Medicine, 27(2): 218–222.

[5] Yin X, Ma Z, Gu J, et al., 2023, Analysis of Risk Factors for Accelerated Recovery After Primary Total Knee Arthroplasty and 48h Postoperative Discharge. Journal of Practical Orthopedics, 29(5): 400–404.

[6] Liu B, Wang Z, Chen Y, et al., 2023, Effect of Cocktail Therapy Combined with Accelerated Rehabilitation Concept on Elderly Patients After Unilateral Total Knee Arthroplasty. Chinese Convalescent Medicine, 32(3): 298–301.

[7] Zhang L, Xu J, 2023, Effects of Three-Stage Rehabilitation Exercise Combined with Health Education on Postoperative Rehabilitation of Patients Undergoing Total Knee Arthroplasty. Chinese and Foreign Medical Research, 21(3): 89–93.

[8] Mao H, Zhang J, Zhang C, 2023, The Effect of Clinical-Rehabilitation-Nursing Full-Cycle Management Mode on

Recovery After Total Knee Arthroplasty for Traumatic Knee Arthritis. Practical Integrative Chinese and Western Medicine Clinic, 23(4): 114–117.

[9] Li J, Yang L, Tang N, et al., 2023, Application of Proximal and Distal Adductor Canal Block in Postoperative Analgesia and Early Functional Rehabilitation of Patients Undergoing Total Knee Arthroplasty. Anhui Medicine, 44(1): 68–73.

[10] Li X, 2022, The Effect of Early Quantitative Rehabilitation Training Combined with Pain Management on Postoperative Phobia in Patients Undergoing Total Knee Arthroplasty. Nursing and Rehabilitation, 21(4): 37–40.

[11] Yang M, Liu Q, Xiong X, et al., 2023, Effect of Rehabilitation Therapy Combined with Isokinetic Muscle Strength Training on Knee Joint Function in Patients after Total Knee Arthroplasty. Journal of Xinxiang Medical College, 40(3): 230–233.

[12] Zhu X, Shi J, Hu Q, et al., 2022, Observation on the Clinical Application Effect of the Rehabilitation Exercise Improvement Program After Total Knee Replacement. Nursing Research, 36(4): 650–653.

[13] Zhou H, Zhang L, Chen J, et al., 2022, Analysis of Nursing Effect of Enhanced Recovery Surgery in Total Knee Arthroplasty Under Multidisciplinary Collaboration. Chinese Journal of Practical Nursing, 38(3): 192–197.

[14] Liu L, Wang X, Yang Z, et al., 2023, The Effect of Proprioceptive Training Combined with Continuous Passive Exercise on the Rehabilitation Quality of Patients Undergoing Total Knee Arthroplasty. Nursing of Integrated Traditional Chinese and Western Medicine (Chinese and English), 9(4): 90–92.

[15] Zhong X, Gao Z, Wang J, 2023, Application Effect of Proprioceptive Intensive Training in Rehabilitation Treatment of Patients with Knee Osteoarthritis After Total Knee Replacement. Clinical Medical Research and Practice, 8(11): 23–25.

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Clinical Value of Tranexamic Acid Combined with Total Knee Arthroplasty in the Treatment of Knee Osteoarthritis

Fei Zhang*, Jieyong Zhang

Department of Orthopedics, Shuyang Guangji Hospital, Suqian 223600, Jiangsu Province, China

Corresponding author: Fei Zhang, zfei1984@163.com

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Abstract: This paper aims to explore the clinical value of tranexamic acid combined with total knee arthroplasty (TKA) in patients with knee osteoarthritis (KOA). The research period was from March 2020 to December 2022. A total of 50 samples of KOA patients were selected and divided into the study group (n = 25) and the control group (n = 25) by lottery method of medical record envelopes. The patients in the control group were treated with TKA, and the patients in the study group were treated with tranexamic acid combined with TKA. The surgery-related indicators, visual analogue pain score (VAS), inflammatory factor levels, motor function scores, and incidence of complications were compared between the two groups. The intraoperative blood loss in the study group was lower than that in the control group ($P < 0.05$), and there was no significant difference in postoperative hospital stay between the two groups ($P > 0.05$). The postoperative VAS scores in the study group were lower than those in the control group ($P < 0.05$), while the postoperative inflammatory factor levels of the study group were lower than those of the control group ($P < 0.05$). The postoperative motor function scores of the study group were higher than those of the control group ($P < 0.05$), and the incidence of complications in the study group was lower than that in the control group ($P < 0.05$). The treatment of KOA patients with tranexamic acid combined with TKA can reduce intraoperative blood loss, relieve pain, reduce the level of inflammatory factors, improve postoperative motor function, and reduce the incidence of complications, which can be widely applied in clinical practice.

Keywords: Tranexamic acid; Total knee arthroplasty; Knee osteoarthritis

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1. Introduction

Knee osteoarthritis (KOA) is a chronic joint disease with a high clinical incidence. The lesion is characterized by knee cartilage degeneration and bone hyperplasia. The main symptoms are knee joint pain and swelling, morning stiffness of joints, and inability to perform normal activities. In some patients, these are accompanied by joint deformities and muscle atrophy [1]. The clinical treatment of KOA includes conservative treatment and surgical treatment. Total knee arthroplasty (TKA) is the main surgical solution for the treatment of advanced severe KOA. During the operation, artificial prosthesis is used to replace the diseased knee joint tissue, which

can relieve pain and unfavorable activities, etc. [2,3]. Clinical studies have shown that TKA has a large trauma area with large amount of blood loss during the operation, and can damage the venous tissue around the knee joint. Postoperative problems such as prosthetic loosening and poor incision healing are very likely to occur. Therefore, other interventions must be combined during the operation to improve the prognosis [4]. Tranexamic acid is a procoagulant drug that has hemostatic, anti-inflammatory, and immune-regulating effects. In this study, 50 samples of KOA patients were selected to explore the clinical effect of tranexamic acid combined with TKA.

2. Materials and methods

2.1. Demographic of study population

The specific procedures of this study were submitted to the approval of the Medical Ethics Committee. The research period was from March 2020 to December 2022. 50 samples of KOA patients were selected and divided into study groups (n = 25) and control group (n = 25) by lottery method of medical record envelopes. In the study group, there were 10 males and 15 females. The age statistics were 62–70 years old, with an average of 66.48±3.25 years old, and the course of disease was 2–6 years, with an average of 4.09±0.72 years. In the control group, there were 9 males and 16 females. The age statistics were 64–69 years old, with an average of 66.52±3.19 years old ($P > 0.05$).

Inclusion criteria included that symptom observation and imaging examination were consistent with the KOA diagnostic criteria in the "Guidelines for Knee and Hip Osteoarthritis," TKA indications are met, and the cognitive consciousness is normal with agreement to cooperate with the research.

Exclusion criteria were patients having other joint diseases, or having circulatory system dysfunction and infectious diseases, and patients complicated with mental or psychological diseases, with low treatment compliance.

2.2. Methods

The patients in the control group were treated with TKA. An airbag tourniquet was tied to the appropriate part of the lower limbs of the patients, and the pressure was controlled at 270–290mmHg. Spinal anesthesia or general anesthesia was performed after the ideal lower limb hemostasis effect was achieved. After the anesthesia took effect, the doctor marked the nerves and blood vessels to determine the surgical plan. Before the operation, 250ml of normal saline was injected into the appropriate part of the knee joint, and an incision was made in the center of the prepatellar area of the patient. In order to obtain a clear surgical field, the cruciate ligament and meniscus were removed, the tibia and femur were washed, and osteotomy was performed. After the above operations, the doctor properly placed the knee prosthesis, fixed it properly with bone cement, checked the effect of the operation with a C-arm machine, transfused an appropriate amount of blood, sutured the joint capsule, loosened the tourniquet, placed a drainage tube, and sutured the surgical incision.

The patients in the study group were treated with tranexamic acid combined with TKA. 100ml of normal saline mixed with 1g tranexamic acid was administered intravenously 30 minutes before operation, and before tourniquet was inflated during operation. Hemostasis, preoperative preparation, and anesthesia plan were consistent with those in the control group. A mixture of 1g of tranexamic acid and 250ml of normal saline was injected at a suitable position of the knee joint before setting the incision approach. The operation plan was the same as that of the control group. The patients were consistent. After the prosthesis replacement, the doctor injected a mixture of 3g of tranexamic acid and 50ml of normal saline into the joint cavity, and sutured the joint capsule without blood transfusion. The tourniquet was removed without an indwelling drainage tube, 0.5g of tranexamic acid was injected into the joint cavity before suturing the incision. Patients in the two

groups received analgesia and anti-infection treatment after operation. Patients in the study group removed the urinary catheter on the first day after operation, they were guided to get out of bed, and completed knee joint rehabilitation training in a standardized manner. Patients in the control group underwent knee joint rehabilitation after the drainage tube was removed.

2.3. Evaluation criteria

The operation-related indicators of the two groups of patients were collected, including intraoperative blood loss and length of hospital stay. The visual analogue pain scale (VAS) scores of the two groups were evaluated before operation, 6 hours after operation, 24 hours after operation, and 48 hours after operation. The full score is 10 points. The higher the score, the more severe the pain. The physicians collected 3ml of venous blood samples from two groups of patients before operation and 7 days after operation. After high-speed centrifugation, the supernatant was taken, and the level of C-reactive protein (CRP) was detected by immunoturbidimetry, and the tumor necrosis factor-alpha (TNF-α) level was detected by enzyme-linked immunosorbent assay. The motor function of the two groups was evaluated before operation and 3 months after operation. The scoring scale was the Fugl-Meyer Assessment scale (FMA), and the lower limb scoring items in the scale were used for evaluation. The more functional the limb, the better the recovery. The incidence of complications in the two groups of patients was counted.

2.4. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data ($\bar{x}$±s) was *t* test, count data % was x^2 test, $P < 0.05$ indicated that there was a statistical level difference.

3. Results

3.1. Comparison of surgical related indicators

As shown in **Table 1**, the intraoperative blood loss in the study group was lower than that in the control group ($P < 0.05$), and there was no significant difference in the postoperative hospital stay between the two groups ($P > 0.05$).

Table 1. Comparison of surgery-related indicators between the two groups ($\bar{x}$±s)

Group	Intraoperative blood loss (ml)	Length of hospital stay (d)
Study group ($n = 25$)	70.58±3.66	13.86±1.77
Control group ($n = 25$)	91.84±6.95	14.03±1.75
t value	13.533	0.314
P value	0.000	0.734

3.2. Comparison of VAS scores

As shown in **Table 2**, the postoperative VAS score of the study group was lower than that of the control group ($P < 0.05$).

Table 2. Comparison of VAS scores between the two groups ($\bar{x}$±s)

Group	Preoperative	6 hours after operation	24 hours after operation	48 hours after operation
Study group ($n = 25$)	3.62±1.08	4.11±0.83	3.25±0.77	2.88±0.53
Control group ($n = 25$)	3.59±1.02	5.26±1.29	4.83±1.23	4.09±1.02
t value	0.101	3.748	5.444	5.263
P value	0.920	0.000	0.000	0.000

3.3. Comparison of inflammatory factor levels

As shown in **Table 3**, the levels of inflammatory factors in the study group were lower than those in the control group after surgery ($P < 0.05$).

Table 3. Comparison of inflammatory factor levels between the two groups ($\bar{x}$±s)

Group	CRP (mg/L)		TNF-α (ng/L)	
	Preoperative	7d after operation	Preoperative	7d after operation
Study group (n = 25)	33.98±2.35	36.88±2.59	748.96±21.05	811.26±25.98
Control group (n = 25)	34.02±2.31	42.76±3.72	749.02±20.97	903.75±33.62
t value	0.061	6.486	0.010	10.884
P value	0.952	0.000	0.992	0.000

3.4. Comparison of FMA scores

As shown in **Table 4**, the FMA score of the study group was higher than that of the control group after operation ($P < 0.05$).

Table 4. Comparison of FMA scores between the two groups ($\bar{x}$±s)

Group	Preoperative	3 months after operation
Study group (n = 25)	16.28±1.53	23.08±1.96
Control group (n = 25)	16.36±1.49	20.17±1.02
t value	0.187	6.585
P value	0.852	0.000

3.5. Comparison of the incidence of complications

As shown in **Table 5**, the incidence of complications in the study group was lower than that in the control group ($P < 0.05$).

Table 5. Comparison of complication rates between the two groups (n/%)

Group	Deep vein thrombosis	Prosthesis loosening	Poor incision healing	Complication rate
Study group (n = 25)	1	1	0	2 (8.0)
Control group (n = 25)	3	3	2	8 (32.0)
x^2 value	-	-	-	4.500
P value	-	-	-	0.033

4. Discussion

KOA has a high incidence rate in obese people, middle-aged and elderly people. The main features of the lesion are knee cartilage degeneration and bone hyperplasia, which can lead to knee joint pain and movement disorders, as well as knee deformity and muscle atrophy, which can reduce patients' quality of life of [5]. The clinical treatment of KOA includes conservative treatment and KTA. KTA is often used for severe patients, but the trauma area in this operation is large with high blood loss, and postoperative complications such as prosthetic loosening are very likely, which in turn affects the knee joint. Therefore, functional recovery requires

other therapeutic interventions [6,7].

The results of this study showed that the surgery-related indicators and the incidence of complications in the study group were better than those in the control group. This may be due to the fact that conventional TKA operation only adopts the conventional hemostasis plan, causing the patient to have a large amount of blood loss during the operation, and longer postoperative recovery period. Tranexamic acid can combine with fibrin in plasminogen and plasmin, block the decomposition of fibrin caused by plasmin, and then achieve a good hemostatic effect, which can significantly reduce intraoperative blood loss and surgical costs, decrease trauma, accelerate the recovery of physiological functions of patients, and lower the incidence of complications [8,9]. This study confirmed that the postoperative VAS score of the study group was lower than that of the control group. This may be explained by the effects of tranexamic acid, which include inhibiting the allergic immune response, weakening the rejection reaction after implantation of the prosthesis, and thus reducing the degree of postoperative pain [10]. The results also showed that the postoperative inflammatory factor levels in the study group were lower than those in the control group. Tranexamic acid can effectively inhibit the synthesis of various active peptides, inhibit allergic reactions, reduce vascular permeability, and relieve inflammatory reactions, while conventional surgery has no such effects [11,12]. Moreover, the results confirmed that the FMA score of patients in the study group was higher than that in the control group after surgery. Tranexamic acid has the effects of anti-inflammation, hemostasis, and allergies inhibition, which can reduce the discomfort of the knee joint after prosthesis implantation and reduce surgical trauma, without the need for indwelling drainage tubes, thus patients can get out of bed early, which contributes to the recovery of patients' knee function after surgery [13-15].

In summary, tranexamic acid combined with TKA treatment for KOA patients can reduce intraoperative blood loss, relieve pain, reduce the level of inflammatory factors, improve postoperative motor function, and reduce the incidence of complications. The number of samples of KOA patients included in this study is small, and the specific mechanism of tranexamic acid combined with TKA therapy still requires further research and analysis.

Disclosure statement

The authors declare no conflicts of interest.

References

[1] Alimujiang Y, Abduupur H, Qin Q, et al., 2023, Efficacy and Safety of Tranexamic Acid and Aminocaproic Acid in the Perioperative Period of Total Knee Arthroplasty. Chinese Tissue Engineering Research, 27(36): 5812–5817.

[2] Wang Y, 2023, Effects of Intravenous Combined Intra-Articular Injection of Tranexamic Acid on Blood Loss and Safety of Total Knee Arthroplasty. Reflexology and Rehabilitation Medicine, 4(5): 148–150,154.

[3] Cheng J, Ding Y, Dong L, et al., 2023, Efficacy and Safety of Total Knee Replacement Combined with Tranexamic Acid. Chinese Tissue Engineering Research, 27(22): 3514–3520.

[4] Wang P, 2023, Research Progress on the Efficacy and Safety of Tranexamic Acid in Total Knee Arthroplasty. Chinese Prescription Drugs, 21(2): 186–189.

[5] Li S, 2023, Effects of Tranexamic Acid Intravenous Infusion and Joint Cavity Perfusion on Blood Loss in Total Knee Replacement. Clinical Medicine, 43(1): 7–10.

[6] Sun B, Sun Y, 2023, Effect Analysis of Periarticular Injection and Infusion of Tranexamic Acid in Total Knee Arthroplasty. Systematic Medicine, 8(8): 115–118, 127.

[7] Liu J, Yin L, Zhang Y, et al., 2022, Effects of Different Volumes and Doses of Intra-Articular Injection of Tranexamic Acid on Blood Loss in Total Knee Replacement. Chinese Tissue Engineering Research, 26(33): 5303–5310.

[8] Zhang J, Yang T, Zhang B, et al., 2023, Effect of Cold Compress Combined with Tranexamic Acid on Early Local Reaction after Total Knee Arthroplasty. Ningxia Medical Journal, 45(5): 397–400.

[9] Zhao H, Zhang J, Zhang B, et al., 2022, Comparison of the Effect of Intravenous Injection of Different Doses of Tranexamic Acid in Elderly Patients with Total Knee Replacement. Chinese Journal of Gerontology, 42(17): 4180–4183.

[10] Zhang J, Man J, Feng S, et al., 2022, Comparison of the Efficacy of Periarticular Injection of Tranexamic Acid and Intra-Articular Infusion in Total Knee Arthroplasty. Journal of Practical Medicine, 38(14): 1788–1792.

[11] Zhang J, Yang Z, 2022, Meta-Analysis of Hemostatic Efficacy of Tranexamic Acid and ε-Aminocaproic Acid in Hip and Knee Arthroplasty. Chinese Orthopedics, 35(5): 484–490.

[12] Wu X, Zhang G, Chen W, et al., 2022, Effect of Cold Compress Combined with Tranexamic Acid on Early Local Reaction After Total Knee Arthroplasty. Journal of Clinical and Experimental Medicine, 21(8): 853–856.

[13] Sun S, Lu W, Shi S, 2022, Effects of Local Application of Bone Wax and Tranexamic Acid on Postoperative Bleeding and Short-Term Knee Joint Function in Unicompartmental Arthroplasty. Hebei Medicine, 28(12): 2017–2022.

[14] Wan X, Xu K, Wang H, et al., 2022, Bibliometric Analysis of Tranexamic Acid in Total Knee Arthroplasty Based on CiteSpace. China Medical Herald, 19(36):11–16.

[15] Wang W, Ping W, Song W, et al., 2022, Effect of Postoperative Intravenous Infusion of Tranexamic Acid on Perioperative Blood Loss in Patients Undergoing Knee Arthroplasty. Chinese Journal of Physician Training, 45(6): 502–505.

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Analysis of Negative Pressure Sealing Drainage Technology for the Treatment of Orthopedic Trauma Infection

Moyun Zhu*, Jianming Gao, Longqing Feng, Yongjing Xin

Xishan Traditional Chinese Medicine Hospital, Wuxi 214000, Jiangsu Province, China

Corresponding author: Moyun Zhu, zhumoyun1992@163.com

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Abstract: To explore the effective treatment of orthopedic trauma infection, the cases selected were 35 patients with orthopedic trauma infection. The study period was from January 2020 to December 2022. They were divided into the study group (n = 18) and the control group (n = 17) through the double-blind randomization of the medical record numbered envelopes. The patients in the control group were treated with conventional debridement and dressing change, and the patients in the study group were treated with negative pressure sealing drainage technology. The frequency of dressing changes, visual analogue scale (VAS) score, wound healing time, hospitalization time, and good wound healing rate were compared between the two groups. The number of dressing changes, VAS score, wound healing time, and hospitalization time in the study group were lower than those in the control group ($P < 0.05$), and the rate of good wound healing in the study group was higher than that in the control group ($P < 0.05$). Negative pressure sealing drainage technology for orthopedic trauma infection patients can decrease the number of dressing changes, reduce pain, accelerate the time for wound healing, shorten hospitalization time, and improve wound healing effect, which has the value of popularization and application.

Keywords: Orthopedic trauma infection; Dressing change; Debridement; Negative pressure sealing drainage

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1. Introduction

Orthopedic trauma infection is a common orthopedic clinical lesion, and if it is not treated early and effectively, it will negatively affect the wound healing. The conventional clinical treatment of orthopedic trauma infection is debridement and dressing change, followed by suture or skin grafting after the formation of granulation tissue, and some patients with severe infection need to be treated with flap transfer. The treatment cycle is too long, and the patient feels severe discomfort during the treatment [1]. Negative pressure sealing drainage technology is an emerging treatment plan for orthopedic trauma infection, which can ensure the cleanliness of the wound surface in the drainage area, improve blood circulation, and accelerate wound healing [2]. In this study, 35 samples of orthopedic trauma infection patients were selected to explore the therapeutic effect of negative

pressure sealing drainage technology.

2. Materials and methods

2.1. Demographic of study population

The relevant matters of this study were approved by the hospital's medical ethics committee. The cases selected were 35 patients with orthopedic trauma infection. The study period was from January 2020 to December 2022. The patients were divided into the study group (n = 18) and the control group (n = 17) through the double-blind randomization of the medical record numbered envelopes. The study group consisted of 11 males and 7 females, with an age range of 28–61 years, with a median of (44.52±3.64) years old, including 12 cases of fresh wounds and 6 cases of old wounds. In the control group, there were 11 males and 6 females. The age range was 26–63 years old, with a median of (44.48±3.69) years old. There were 10 cases of fresh wounds and 7 cases of old wounds. The general data of the two groups were comparable ($P > 0.05$).

The inclusion criteria included infected orthopedic wounds that could not be sutured at the first stage, completed clinical treatment, and signed the research informed consent document.

The exclusion criteria were wounds with critical complications, severe infection, and unable to cooperate to complete the research.

2.2. Methods

Patients in the control group were treated with conventional debridement and dressing change. Physicians observed the condition of the wound, performed routine debridement, and changed the dressing once every 1–2 days. If the wound area of the patient was large, drainage strips were placed. Etiological examination and drug sensitivity test were performed on the wound tissue, and highly sensitive antibiotics were injected for anti-infection. If the patient's wound area grows rosy with fresh granulation tissue, it needs to be sutured. If the granulation growth condition of the patient is not good or the wound area is too large, skin flap transfer is performed.

The patients in the study group were treated with negative pressure sealing drainage and routine debridement. The negative pressure sealing drainage dressing was cut according to the size and shape of the wound so that the dressing could completely cover the wound tissue. The surface area is covered with a translucent membrane. After completing the above operations, the negative pressure sealing drainage operation was performed, the negative pressure value was set to –125 ~ –450mmHg, if the dressing sags, it indicates that the negative pressure sealing drainage is effective. Antibacterial drugs were used to clean the wound tissue, and the negative pressure sealing drainage dressing was taken out at intervals of 5–7 days. Wound samples were collected for pathogenic testing, and the condition of the wound was observed. If fresh ruddy new granulation tissue was visible, suturing was performed. If the skin tissue is defective in the wound area, repeated negative pressure sealing drainage is required, and suturing is performed after fresh ruddy new granulation tissue is produced.

2.3. Evaluation criteria

The number of dressing changes, visual analogue scale (VAS) score, wound healing time, and hospitalization time of patients in the two groups were counted. The good wound healing rate of the two groups of patients was also evaluated. Wound healing was evaluated as good wound healing if the wound tissue is completely healed within 14 days, the dressing does not require changing, the wound coverage is good, or the wound forms new granulation tissue, the total amount of secretions is less, the wound area is reduced, or the wound area is

reduced after skin grafting.

2.4. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data ($\bar{x}\pm s$) was *t* test, count data % was x^2 test, $P < 0.05$ indicated that there was a statistical level difference.

3. Results

3.1. Comparing the dressing change frequency, VAS score, wound healing time and hospitalization time

The frequency of dressing changes, VAS score, wound healing time, and hospitalization time were compared between the two groups. The data in **Table 1** confirmed that the frequency of dressing changes, VAS score, wound healing time, and hospital stay in the study group were lower than those in the control group ($P < 0.05$).

Table 1. Comparison of dressing change frequency, VAS score, wound healing time, and hospitalization time between the two groups ($\bar{x}\pm s$)

Group	Dressing change (times)	VAS score (points)	Wound healing time (d)	Length of hospital stay (d)
Study group (n = 18)	2.14±0.35	1.64±0.51	15.84±2.05	19.27±3.11
Control group (n = 17)	9.72±1.68	2.98±0.84	22.79±3.84	26.04±4.83
t value	24.593	7.592	8.890	6.562
P value	0.000	0.000	0.000	0.000

3.2. Comparing the good rate of wound healing

The data in **Table 2** confirmed that the rate of good wound healing in the study group was higher than that in the control group ($P < 0.05$).

Table 2. Comparison of good wound healing rates between the two groups (n/%)

Group	Good wound healing	Poor wound healing	Rate of good wound healing
Study group (n = 18)	16	2	16 (88.9)
Control group (n = 17)	10	7	10 (58.8)
t value	-	-	4.137
P value	-	-	0.041

4. Discussion

Trauma infection in orthopedics is a common disease. The causes of the disease are low immunity of the patient, insufficient blood supply in the wound area, improper dressing operation, etc., which can lead to prolonged wound healing time, aggravated pain, and increased difficulty in debridement and dressing. It is not conducive to the rehabilitation of orthopedic diseases, so it is necessary to implement an effective treatment intervention plan [3].

The routine clinical treatment of orthopedic trauma infection is debridement and dressing change, its main function is to remove necrotic tissue, relieve inflammation, and promote the formation of granulation tissue, but frequent debridement and dressing changes can lead to aggravated pain in patients, and damage the new granulation tissue, resulting in prolonged wound healing time [4]. Negative pressure sealing drainage is an

emerging treatment approach for orthopedic trauma infection. Some studies have confirmed that this approach can protect the wound surface, remove exudate and necrotic tissue in time, inhibit bacterial reproduction, keep the wound surface clean, accelerate swelling and anti-inflammation, and make the wound heal early. Negative pressure sealing drainage technology uses biological translucent film to seal wound tissue, which can effectively prevent bacterial infection and reduce the incidence of complications [5]. At the same time, with the negative pressure sealing drainage technology, the drainage tubes with strong plasticity are evenly distributed in the dressing, which can ensure that each drainage area can obtain effective negative pressure, and the liquid produced by the wound tissue can be sucked out in time through continuous negative pressure suction. It also reduces the vascular permeability of the wound area, thereby effectively relieve edema, gradually restore the blood circulation of the wound, and effectively stimulate the epidermal growth factor in the wound area, significantly improve the phagocytosis of leukocytes, reduce the level of harmful bacteria, accelerate the synthesis of wound collagen tissue, and induce new granulation tissue formation and early wound healing [6]. In addition, the negative pressure sealing drainage technology does not require frequent debridement and dressing changes, which can reduce the pain of patients and the workload of medical staff.

The data of this study showed that the number of dressing changes, VAS scores, wound healing time, and hospital stay in the study group were lower than those in the control group, and the rate of good wound healing was higher than that in the control group. Based on this, negative pressure sealing drainage technology can decrease the number of dressing changes, reduce pain, accelerate, and improve wound healing. In the conventional treatment mode, medical staff performed debridement and dressing changes on the wound area many times, resulting in severe pain for patients and damage to new granulation tissue, which is not conducive to wound healing. The main advantages of negative pressure sealing and drainage technology are as follows. Through continuous negative pressure suction on the wound area, wound bacteria, exudate, and necrotic tissue can be removed in time to prevent such substances from accumulating on the wound, thereby ensuring a clean environment around the wound and providing a favorable condition for wound healing [7]. In addition, the negative pressure sealing drainage technology uses a biological translucent film to cover the wound surface, which can isolate bacteria, create a closed environment for the wound surface, and prevent cross-contamination and infection. Plus, negative pressure sealing drainage technology can significantly reduce the interstitial pressure in the wound area, promote the disappearance of edema, improve the blood circulation of the wound, effectively remove bacteria and necrotic tissue on the wound, accelerate the formation of granulation tissue, and improve the effect of wound healing. Importantly, negative pressure sealing drainage technology does not require frequent dressing changes, which can reduce the pain of patients [8].

This study believes that the negative pressure sealing drainage technique has outstanding clinical value in the treatment of orthopedic trauma infection, and is suitable for application in medical institutions at all levels. In order to ensure the treatment effect of negative pressure sealing drainage technology, physicians need to accurately grasp its indications and contraindications. Indications mainly include orthopedic wounds that cannot be sutured at the first stage, wounds that require drainage or infection after surgery, sinuses or fistulas in body surface areas, acute and chronic bone marrow wound repair, chronic wounds and wound tissues that are difficult to heal in a short time. Contraindications mainly include malignant transformation in the wound area, active bleeding in the wound area, osteomyelitis via organs or body cavities. During clinical negative pressure sealing drainage operation, physicians need to complete wound cleaning in a standardized manner. After debridement, the wound often oozes blood, physicians need to observe whether there is active tissue structure and remove it properly, and remove the skin edge of the wound to avoid residual cavity on the wound. Negative pressure needs to be controlled during the operation to ensure that the pipeline is unobstructed and moist, and lidocaine

can be used to relieve pain before removing the dressing. During the treatment using negative pressure sealing drainage technology, doctors need to strengthen the monitoring of wound tissue, focus on observing the growth of granulation tissue, conduct bacterial culture and drug sensitivity test regularly, and adjust the anti-infection plan in time to effectively prevent bacterial infection. Physicians also need to provide health guidance to patients, such as to protect the wound area to avoid damage to the drainage tube, and to inform the physician in time if the symptoms of discomfort in the wound area are aggravated.

In summary, the negative pressure sealing drainage technology for orthopedic trauma infection patients can decrease the number of dressing changes, reduce pain, accelerate wound healing, shorten hospitalization time, and improve wound healing effect, which has the value of popularization and application. The number of patients with orthopedic trauma infection included in this study is relatively small, and no multi-center comparative study has been carried out. The analysis and evaluation process still need to be improved and adjusted, and the relevant mechanism of negative pressure sealing drainage technology for orthopedic trauma infection patients still needs to be analyzed and studied.

Disclosure statement

The authors declare no conflicts of interest.

References

[1] Liu M, Chen K, Huang S, 2021, The Effect of Negative Pressure Sealing Drainage in the Treatment of Orthopedic Trauma Infection and its Influence on Inflammatory Markers. China Health Standard Management, 12(9): 62–64.

[2] Ma L, 2021, Nursing Analysis of Negative Pressure Sealing Drainage Technique in the Treatment of Orthopedic Trauma and Infected Wounds. China Disability Medicine, 29(9): 74–75.

[3] Huang K, 2019, Application of Negative Pressure Sealing Drainage Technology in Postoperative Infection of Trauma Orthopedics. Health Vision, 2019(17): 2.

[4] Luo J, Zhu P, Hou J, et al., 2018, Analysis of the Curative Effect of Closed Negative Pressure Drainage Technology in the Treatment of Orthopedic Trauma Infection. China Emergency Medicine, 38(z2): 23.

[5] Zhang L, Peng X, Zhang W, et al., 2017, Nursing Research on the Treatment of Orthopedic Trauma and Infected Wounds with Negative Pressure Sealing Drainage Technology. Journal of Practical Clinical Medicine, 21(4): 98–100.

[6] Zhou H, 2020, Clinical Effect of Negative Pressure Sealing Drainage Technique on Orthopedic Trauma and Infected Wounds. Chinese Community Physician, 36(22): 71–72.

[7] Li X, 2020, Observation on the Effect of Closed Negative Pressure Drainage in the Treatment of Trauma Infection in Orthopedic Patients. China Health and Nutrition, 30(28): 71–72.

[8] Zeng W, 2020, The Clinical Effect of Negative Pressure Sealing Drainage Technology in the Treatment of Patients with Orthopedic Trauma Infection. China Health Standard Management, 11(13): 43–45.

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Comparison of the Clinical Efficacy of Arthroscopic Surgery and Extracorporeal Shock Wave Therapy in the Treatment of Knee Osteoarthritis

Chao Tong*

Beijing Jishuitan Hospital Guizhou Hospital, Guiyang 550000, Guizhou Province, China

***Corresponding author:** Chao Tong, tongchao4515@hotmail.com

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Abstract: This paper aims to explore the clinical efficacy of arthroscopic surgery and extracorporeal shock wave therapy in patients with knee osteoarthritis. The research period was from February 2022 to January 2023. A total of 79 patients with knee osteoarthritis were included and divided into the study group (n = 40) and the control group (n = 39) by lottery method using computer software. The patients in the control group were treated with arthroscopic surgery, and the patients in the study group were treated with extracorporeal shock wave therapy. The Lysholm score, visual analogue scale (VAS) score, Western Ontario and McMaster University Osteoarthritis (WOMAC) score, superoxide dismutase (SOD) level, and malondialdehyde (MDA) level were compared between the two groups. After treatment, the Lysholm score of the study group was higher than that of the control group, and the VAS score and WOMAC score were lower than those of the control group ($P < 0.05$). While the MDA level of the study group was lower than that of the control group, and the SOD level was higher than that of the control group ($P < 0.05$). Extracorporeal shock wave therapy for patients with knee osteoarthritis can restore joint function, relieve pain, and effectively regulate the level of oxygen free radicals.

Keywords: Arthroscopic surgery; Extracorporeal shock wave; Knee osteoarthritis

Online publication: September 22, 2023

1. Introduction

Osteoarthritis of the knee joint is a common clinical chronic joint disease, characterized by knee cartilage degeneration, secondary bone hyperplasia, etc. The main clinical symptoms of patients are knee joint pain, deformity, swelling, and limited movement [1]. Arthroscopic surgery is a minimally invasive surgical technique for the clinical treatment of knee osteoarthritis. The surgical field of view is clear, and the diseased joint tissue can be removed to improve clinical symptoms. Some studies believe that the recovery of joint function in patients after arthroscopic surgery is poor and the pain is severe [2]. Extracorporeal shock wave is a physical therapy approach, and animal experiments have confirmed that it has a significant effect on the treatment of

osteoarthritis [3]. In this study, 79 patients with knee osteoarthritis were included, and the clinical effects of arthroscopic surgery and extracorporeal shock wave therapy were explored and analyzed.

2. Materials and methods

2.1. Demographic of study population

The specific process and selected samples of this study were approved by the hospital's medical ethics committee. The research period was from February 2022 to January 2023. 79 samples of patients with knee osteoarthritis were included, and they were divided into study group (n = 40) and control group (n = 39) by lottery method using computer software. In the study group, there were 24 males and 16 females, the age range was 52–66 years old, with an average of 59.74±3.66 years old. Among them, 25 cases were grade 2 and 15 cases were grade 3 according to Kellgren-Lawrence (KL) classification. In the control group, there were 22 males and 17 females, the age range was 54–64 years old, with an average of 59.68±3.71 years old. Among the control group, 23 cases were grade 2 and 16 cases were grade 3 according to the KL grading, the general data comparison results of the two groups were $P > 0.05$.

Inclusion criteria included that the diagnostic criteria of knee osteoarthritis in the "Guidelines for the Diagnosis and Treatment of Osteoarthritis" were in line with the imaging examination, patients who have not received symptomatic treatment intervention recently, and patients who understand the relevant content of the research and sign the agreement to cooperate with the research.

Exclusion criteria were patients who have other joint diseases, patients with knee joint varus or valgus deformity or knee joint injury, and patients who are unable to cooperate to complete the research.

2.2. Methods

The patients in the control group were treated by arthroscopic surgery. After the anesthesia took effect, the airbag tourniquet was tied on the upper thigh of the affected side, the skin tissue in the surgical area was sterilized, and then a towel was spread. Surgical incisions were made through the lateral and anteromedial areas of the knee joint and the arthroscope is inserted. Arthroscopic observation of the condition of the knee joint was performed, and abnormal tissues such as synovial villi in the hyperplastic state, synovial folds, and hyperemic fat pads were removed under the microscope. If there were loose bodies in the knee joint, they were removed. If the patient's meniscus ruptures, a partial resection of the damaged meniscus will be performed. After the operation, the incision was sutured and bandaged with elastic bandage.

The patients in the study group received extracorporeal shock wave therapy. The physician instructed the patients to actively flex and extend the knee joint, and stretched the knee joint. During the treatment, the patient was asked whether there was pain, and the pain point was confirmed and marked. The pain point is taken as the impact point, the shock wave energy focus is made to coincide with the impact point, the treatment pressure is set to 300kPa, and the shock wave frequency is set to 10Hz. There were 2000 shock treatments, with 1 treatment per week and 5 treatments in total.

2.3. Evaluation criteria

Lysholm score, visual analogue scale (VAS) score, and Western Ontario and McMaster University Osteoarthritis (WOMAC) score were compared between the two groups before treatment and after 3 months of treatment. Lysholm score is the knee joint function score, with a full score of 100 points, and the higher the score, the better the knee joint function. The VAS score is a visual analogue pain scale with a full score of 10, with higher scores indicating more severe pain. WOMAC score is the osteoarthritis index, with a full score of 100, and the

higher the score, the more severe the symptoms. Before treatment and after 3 months of treatment, the joint fluid of the two groups was extracted, and the level of superoxide dismutase (SOD) was detected by xanthine oxidase method, and the level of malondialdehyde (MDA) was detected by nitrate reductase method.

2.4. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data ($\bar{x}$±s) was *t* test, count data % was x^2 test, $P < 0.05$ indicated that there was a statistical level difference.

3. Results

3.1. Comparison of Lysholm score, VAS score, and WOMAC score

The data in **Table 1** showed that after treatment, the Lysholm score of the study group was higher than that of the control group, and the VAS score and WOMAC score were lower than those of the control group ($P < 0.05$).

Table 1. Comparison of Lysholm score, VAS score, and WOMAC score between the two groups ($\bar{x}$±s)

Group	Lysholm score		VAS score		WOMAC score	
	Before treatment	3 months after treatment	Before treatment	3 months after treatment	Before treatment	3 months after treatment
Study group (n = 40)	55.89±3.64	78.62±4.71	5.62±1.13	1.94±0.52	48.33±5.26	34.06±2.11
Control group (n = 39)	55.94±3.57	62.44±2.06	5.57±1.08	3.02±0.97	48.38±5.21	41.25±3.97
t value	0.062	19.693	0.201	6.189	0.042	10.087
P value	0.951	0.000	0.841	0.000	0.966	0.000

3.2. Comparison of SOD level and MDA level

The data in **Table 2** showed that after treatment, the MDA level of the study group was lower than that of the control group, and the SOD level was higher than that of the control group ($P < 0.05$).

Table 2. Comparison of SOD level and MDA level between the two groups ($\bar{x}$±s)

Group	SOD level (nU/ml)		MDA level (nmol/L)	
	Before treatment	3 months after treatment	Before treatment	3 months after treatment
Study group (n = 40)	88.31±4.63	95.77±5.28	6.94±1.12	5.81±0.56
Control group (n = 39)	88.27±4.58	89.71±2.56	6.88±1.17	6.77±1.02
t value	0.039	6.464	0.233	5.203
P value	0.969	0.000	0.816	0.000

4. Discussion

Epidemiological survey data confirm that the incidence rate of knee osteoarthritis in China is about 8%. There are symptoms such as swelling, and knee joint deformity in some severe patients, accompanied by clinical manifestations such as muscle atrophy [4].

Arthroscopic surgery is a routine surgical solution for the clinical treatment of early and mid-stage knee osteoarthritis. Its main features are minimally invasive, clear surgical field of vision, and it can clean up the diseased tissue inside the knee joint cavity and restore the flatness and smoothness of the articular surface, relieve pain, swelling, and other clinical symptoms [5]. According to the latest clinical research, arthroscopic

surgery can destroy the internal environment of the knee joint, which is not conducive to the recovery of knee joint function, and some patients have severe postoperative pain [6]. Extracorporeal shock wave therapy is a physical therapy approach for knee osteoarthritis. It is mostly used in the treatment of urinary calculi. The application of extracorporeal shock wave therapy in the treatment of knee osteoarthritis can produce strong physical stimulation to the patient's knee joint, promote microvascular regeneration, and accelerate the repair of damaged tissues [7]. Extracorporeal shock wave therapy can inhibit the synthesis and secretion of pain-causing substances and induce the body to synthesize endorphins. These substances can reduce the patient's sensitivity to pain, thereby achieving the effect of pain relief. At the same time, this approach can also improve the internal environment of the knee joint to speed up the repair process of damaged joints. According to another study, extracorporeal shock wave therapy can improve the local biological environment of the knee joint, increase the secretion of osteoblast cytokines, accelerate subchondral bone remodeling, promote cartilage metabolism, proliferation, and differentiation, and effectively repair cartilage tissue [8]. Compared with the treatment options of arthroscopic surgery, extracorporeal shock wave therapy has the characteristics of non-invasiveness, simple treatment operation, reduction of interference to the internal environment of the knee joint, and create favorable conditions for the recovery of joint function, and the analgesic effect is more obvious, with high clinical application value [9,10].

The results of this study showed that after treatment, the Lysholm score of the study group was higher than that of the control group, and the VAS score and WOMAC score were lower than those of the control group, suggesting that extracorporeal shock wave therapy is better than arthroscopic surgery in terms of improving knee joint function and relieving pain. Further analysis shows that arthroscopic surgery is an invasive operation that can traumatize the knee joint and affect the internal environment of the knee joint, resulting in varying degrees of pain after treatment and poor recovery of joint function [11,12]. Extracorporeal shock wave therapy can impact the pain points of the knee joint. Through continuous impact, the inflammatory factors accumulated in the pain point area can be dispersed and absorbed by the synovial tissue, thereby alleviating the local inflammatory response and reducing pain. Extracorporeal shock wave therapy is a non-invasive treatment plan. During the treatment period, it has a slight impact on the internal environment of the knee joint, and can induce the local biological response of the knee joint, thereby inhibiting the synthesis of pain-causing factors, increasing the level of local growth factors, and promoting the repair of articular cartilage injury, thereby improving joint function [13,14].

The results of this study showed that after treatment, the MDA level of the study group was lower than that of the control group, and the SOD level was higher than that of the control group, suggesting that extracorporeal shock wave therapy can regulate the level of oxygen free radicals and improve the health of the knee joint in patients with knee osteoarthritis. MDA is a product of lipid peroxidation, and its level is related to the degree of attack by free radicals. SOD level is related to the body's ability to scavenge oxygen free radicals. By improving the ability to scavenge oxygen free radicals and reducing the ability to synthesize oxygen free radicals, it can improve the health of the knee joint. Compared with arthroscopic surgery, extracorporeal shock wave therapy can destroy the cell membrane of pain receptors and play a role in denervation, induce the dispersion and absorption of free radicals through shock, and significantly reduce the level of free radicals in the knee joint of patients [15]. This study believes that extracorporeal shock wave therapy is a non-invasive physical therapy approach, in which the treatment process is safe and simple, with short treatment time, rapid onset, low treatment cost, early relief of pain and other symptoms, and promotion of the recovery of knee joint function in patients. In order to ensure the therapeutic effect of extracorporeal shock wave therapy, physicians need to accurately locate the pain points, reasonably set treatment-related parameters, and constantly adjust the

treatment plan.

In summary, extracorporeal shock wave therapy for patients with knee osteoarthritis can restore joint function, relieve pain, and effectively regulate the level of oxygen free radicals. Its clinical efficacy is better than that of arthroscopic surgery. Patients undergoing knee replacement receive extracorporeal shock wave therapy to prolong the life of the knee joint, relieve pain and other symptoms, and improve knee joint function. The total number of patients with knee osteoarthritis selected in this study is small, and multi-center data comparison has not been carried out. The relevant mechanisms of extracorporeal shock wave therapy and arthroscopic surgery still require further research.

Disclosure statement

The author declares no conflicts of interest.

References

[1] Wang Y, Li X, 2022, Clinical Effect of Arthroscopic Surgery and Extracorporeal Shock Wave Therapy in the Treatment of Knee Osteoarthritis. Chinese Journal of Endemic Disease Prevention and Treatment, 37(4): 338–341.

[2] Wei M, Li H, Yin D, et al., 2020, Extracorporeal Shock Wave Combined with Arthroscopy in the Treatment of Knee Osteoarthritis. Chinese Journal of Orthopedic Surgery, 28(7): 607–612.

[3] Chen S, 2020, Observation on the Curative Effect of Extracorporeal Shock Wave Therapy on Joint Pain after Arthroscopy. Minimally Invasive Medicine, 15(5): 636–638.

[4] Qin W, Qin J, 2023, Clinical Experience in Treating Knee Joint Injuries with Extracorporeal Shock Wave Therapy Guided by the Meridian Theory of Traditional Chinese Medicine. Xinjiang Traditional Chinese Medicine, 41(1): 20–21.

[5] Ma Z, Liu X, Lu T, et al., 2023, Meta-Analysis of Extracorporeal Shock Wave Therapy for Knee Osteoarthritis. Journal of Baotou Medical College, 39(3): 10–15.

[6] Zheng X, Lei S, Lu Q, et al., 2022, Observation on the Curative Effect of Extracorporeal Shock Wave Combined with Meridian Points in the Treatment of Knee Osteoarthritis. Chinese Rehabilitation, 37(12): 737–740.

[7] Li G, Li Z, Zhang N, et al., 2022, Effects of Glucosamine Hydrochloride and Celecoxib Combined with Extracorporeal Shock Wave on Knee Joint Function in Patients with Osteoarthritis. Journal of Guizhou Medical University, 47(9): 1097–1101.

[8] Li Z, He X, Han G, et al., 2022, Observation on the Effect of Extracorporeal Shock Wave Combined with Duhuo Jisheng Decoction in the Treatment of Knee Osteoarthritis. Journal of Practical Chinese Medicine, 38(4): 548–550.

[9] Li Y, Duan J, Sun C, et al., 2022, Clinical Efficacy Analysis of Platelet-Rich Plasma Combined with Extracorporeal Shock Wave in the Treatment of Knee Osteoarthritis. Laboratory Medicine and Clinic, 19(2): 240–243.

[10] Yu S, Li H, Xu X, et al., 2022, Observation on the Short-Term Curative Effect of Duhuo Jisheng Decoction Combined with Extracorporeal Shock Wave in the Treatment of Knee Osteoarthritis. Jiangxi Traditional Chinese Medicine, 53(7): 39–41, 52.

[11] Ren J, Zhou J, Zhu M, 2022, Effects of Extracorporeal Shock Wave Combined with Functional Rehabilitation Exercise on Inflammatory Response, Pain and Knee Joint Function in Patients with Knee Osteoarthritis. Reflexology and Rehabilitation Medicine, 3(21): 55–58.

[12] Xiao C, Ding W, Tan W, et al., 2021, Analysis of the Curative Effect of Extracorporeal Shock Wave Therapy Combined with Isokinetic Muscle Strength Training on Early and Mid-Stage Knee Osteoarthritis. Practical Integrative Traditional Chinese and Western Medicine Clinic, 21(12): 31–32, 78.

[13] Liu J, Tang Y, Chen J, et al., 2021, Observation on the Curative Effect of Wuma Paste Traditional Chinese Medicine Hot Compress Combined with Divergent Extracorporeal Shock Wave in the Treatment of Knee Osteoarthritis. Frontiers of Medicine, 11(26): 13–14, 17.

[14] Liu Y, Jin Y, Chen Y, 2021, The Effect of Extracorporeal Divergent Shock Wave Therapy under Musculoskeletal Ultrasound Positioning on the Joint Function Rehabilitation of Patients with Soft Tissue Adhesions after Knee Surgery. Reflexology and Rehabilitation Medicine, 2(8): 111–113, 117.

[15] Wang S, Zhang R, Cui J, 2021, Efficacy Analysis of Extracorporeal Shock Wave Application in Patients with Patellar Softening and its Impact on Pain and Knee Joint Function. Systematic Medicine, 6(21): 65–68.

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Application of Group Counseling Based on Positive Psychology Theory in Postoperative Total Hip Arthroplasty

Juan Qi[†], Jianna Zhang, Zhenying Mu, Cuibin Liang, Hongwen Ma*

Tianjin Union Medical Center, Tianjin 300121, China

[†]***First author:*** Juan Qi, qijuan0606@126.com

Corresponding author: Hongwen Ma, geilivable_mhw@126.com

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Abstract: *Objective:* This paper aims to explore and analyze the application of group counseling based on positive psychology theory in postoperative total hip arthroplasty. *Methods:* From July 2021 to April 2023, 110 patients with total hip arthroplasty admitted to the Department of Traumatology and Orthopedics in our hospital were selected as subjects of this study. They were divided into study group and control group by simple random sampling, with 55 cases in each group. The study group received group counseling based on positive psychology theory, and the control group received general nursing care. Harris hip function score, activities of daily living score (ADL), Hamilton depression rating scale (HAM-D), Hamilton anxiety rating scale (HAM-A), and postoperative complications were compared between the two groups. *Results:* Before nursing, the Harris and ADL scores of the two groups were compared, and the difference was not statistically significant ($P > 0.05$). After nursing, the Harris and ADL scores of the study group were significantly better than those of the control group, the difference was statistically significant ($P < 0.05$). Before nursing, the HAM-D and HAM-A scores of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). After nursing, the HAM-D and HAM-A scores of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). The incidence of postoperative complications in the study group was significantly lower than that in the control group, and the difference was statistically significant ($P < 0.05$). *Conclusion:* Based on the theory of positive psychology, the effect of group counseling after total hip arthroplasty is more significant, and it is recommended to be applied in clinical practice.

Keywords: Group counseling; Positive psychology theory; Postoperative total hip replacement; Nursing

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1. Introduction

Total hip replacement is a treatment for hip joint disease, it involves inserting the artificial acetabulum and femoral head to replace the function of the human hip joint [1]. At present, this treatment method has been developed and widely used, which is beneficial to many patients with hip joint diseases [2]. Total hip replacement

is a relatively traumatic operation, and good postoperative care is essential to the treatment [3]. In recent years, there is rapid development of nursing models, and many new nursing models have been applied clinically. The positive psychology theory group counseling is a type of new nursing model, which uses psychology as the main theory of nursing. The application effect after hip replacement is better [4]. The purpose of this paper is to study and analyze the application of group counseling based on positive psychology theory after total hip arthroplasty.

2. Materials and methods

2.1. General information

A total of 110 patients with total hip arthroplasty who were admitted to the Department of Traumatology and Orthopedics in our hospital from July 2021 to April 2023 were selected as subjects of this research. They were divided into study group and control group by simple random sampling, with 55 cases in each group.

In the study group, there were 36 males and 19 females, the age ranged from 45 to 74 years, with an average age of 62.67±6.54. In the control group, there were 37 males and 18 females, the age ranged from 51 to 75 years, with an average age of 65.2±6.65. There was no statistically significant difference ($P > 0.05$) in general information such as gender and age between the groups.

Inclusion criteria included patients after total hip arthroplasty, patients without bone disease, patients who have given informed consent, and patients with good compliance.

Exclusion criteria were patients with malignant tumors, patients with coagulation disorders, cognitively impaired patients, patients with old fractures, patients with fractures in other parts, patients with severe communication barriers, and patients with incomplete evaluation scales, or blurred and illegible handwriting.

2.2. Methods

The control group received general nursing care. The information about the operation of the patients was handed over, antibiotic skin test and intravenous infusion were given, including fluid infusion and supplement energy. Analgesic drugs were used to relieve pain after the operation, and a step-wise analgesic administration was adopted. The drug related matters were informed and dietary guidance was provided.

The study group was treated with positive psychology theory group counseling as follows.

(1) A positive psychology theory group assistance team was established, and the members were composed of a nurse who has obtained the qualification of a psychological counselor. The head nurse formulated nursing measures and divided individual responsibilities.

(2) Psychological lectures were conducted in the department, the principles and prognosis of total hip replacement were explained, and patients were taught the methods and skills of postoperative care.

(3) For patients with lower limb dysfunction and limb abnormalities, nursing staff should focus on caring for them, pay attention to maintaining the self-esteem of patients, help them to establish a positive and optimistic attitude, and return to life and society.

(4) The individual differences of patients were considered when implementing psychological counseling. Patients need to have a correct understanding of total hip arthroplasty and the treatment method, eliminate anxiety and be positive about the treatment and rehabilitation. Patients were informed of the methods and importance of postoperative rehabilitation in detail, and allowed to actively cooperate with exercise.

(5) The family members of the patients were allowed to spend more time with the patients, provide the patients with psychological care and spiritual sympathy, so that the patients have sufficient

psychological security.

(6) The number of visits to the ward was increased and the patient's state was observed. If the patient is found to be emotionally abnormal, appropriate measures should be taken to resolve the patient's negative emotion. It is necessary to choose an easy-to-accept method for patients to carry out psychological guidance. It is possible to organize patient exchange meetings to share treatment conditions and interesting stories about treatment, create an interesting treatment environment, and eliminate strangeness. Patients were allowed to watch more entertainment movies and read some books to enrich their daily life.

2.3. Observation indicators and evaluation tools

The indicators and evaluation tools below were used to compare the two groups.

(1) The Harris hip joint function score and activities of daily living score (ADL) were compared between the groups. The Harris score includes pain, function, deformity, and joint mobility. The score is 0–100 points, and the higher the score, the better the joint function. The cumulative variance contribution rate was 73.14%, Cronbach's α coefficient was 0.872, and the split-half reliability was 0.874. ADL score includes position transfer, personal hygiene, communication, housework, social cognition. The total score is 100 points, the cumulative variance contribution rate was 72.44%, the Cronbach's α coefficient was 0.868, and the split-half reliability was 0.862.

(2) Hamilton depression rating scale (HAM-D) and Hamilton anxiety rating scale (HAM-A) scores were compared between groups. HAM-D score is a score for assessing depression, with a 5-level scoring method of 0–4 points. It is evaluated with a 24-item version, and more than 35 points are considered serious depression, more than 20 points are considered mild or moderate depression, less than 8 points are no depression, the lower the score, the better the mood. The cumulative variance contribution rate was 73.61%, the Cronbach's α coefficient was 0.879, and the split-half reliability was 0.883. HAM-A score is used to assess anxiety, with a 5-point scoring method of 0–4 points. The total score is 64 points, more than 29 points are considered severe anxiety, more than 21 points are considered obvious anxiety, more than 14 points are considered anxiety, more than 7 points may be anxiety, and less than 7 points is no anxiety, the lower the score, the lesser the anxiety. The cumulative variance contribution rate was 73.81%, Cronbach's α coefficient was 0.894, and the split-half reliability was 0.891.

(3) The incidence of postoperative complications between the groups was compared, including infection, pressure injury, deep vein thrombosis of lower extremities, prosthetic dislocation, and so on.

2.4. Statistical analysis

SPSS21.0 statistical software was selected to process and analyze the data, the count data were expressed by the number of cases (n) and percentage (%), the x^2 test was implemented, the measurement data were expressed by the mean ± standard deviation (SD), and the t test was implemented, $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of the Harris and ADL scores

Before nursing, the Harris and ADL scores of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). After nursing, the Harris and ADL scores of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of Harris and ADL scores between groups (mean ± SD)

Group	Harris score		ADL score	
	Before nursing	After nursing	Before nursing	After nursing
Study group (n = 55)	53.47±4.27	87.44±7.94	54.86±5.61	81.57±8.54
Control group (n = 55)	53.69±4.38	75.42±6.59	54.96±5.76	72.84±6.22
t value	0.2667	8.6391	0.0922	6.1280
P value	0.7902	0.0000	0.9267	0.0000

3.2. Comparison of HAM-D and HAM-A scores

Before nursing, the HAM-D and HAM-A scores of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). After nursing, the HAM-D and HAM-A scores of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of HAM-D and HAM-A scores between groups (mean ± SD)

Group	HAM-D score		HAM-A score	
	Before nursing	After nursing	Before nursing	After nursing
Study group (n = 55)	37.42±5.49	17.56±3.99	39.57±5.84	21.48±4.85
Control group (n = 55)	37.85±5.68	25.16±4.27	39.65±5.44	26.52±5.63
t value	0.4036	9.6445	0.0743	5.0299
P value	0.6872	0.0000	0.9409	0.0000

3.3. Comparison of the incidence of postoperative complications

Based on **Table 3**, the incidence of postoperative complications in the study group was significantly lower than that in the control group, and the difference was statistically significant ($P < 0.05$).

Table 3. Comparison of the incidence of complications between the groups [n (%)]

Group	Infection	Pressure injury	Lower extremity deep vein thrombosis	Prosthetic heterotopia	Total incidence
Study group (n = 55)	1 (1.82)	0 (0.00)	0 (0.00)	0 (0.00)	1 (1.82)
Control group (n = 55)	2 (3.64)	3 (5.45)	1 (1.82)	1 (1.82)	7 (12.73)
x^2 value	-	-	-	-	4.8529
P value	-	-	-	-	0.0275

4. Discussion

Total hip arthroplasty is the insertion of artificially synthesized hip joints into the human body, which can be used to treat various hip joint diseases [5,6]. Total hip arthroplasty does a lot of damage to the body, since the operation will cause damage to the surrounding tissues with a lot of bleeding, thus it takes a long time to recover after the operation [7,8]. There will be pain in the wound after total hip replacement, and the patient's psychology will also be affected, which is unfavorable for the disease prognosis [9,10]. Therefore, nursing care after total hip replacement is very important. Conventional nursing mode is the most widely used nursing

mode. Based on treatment, the nursing content is simplified, and the nursing effect cannot reach the ideal state [11,12]. In recent years, the nursing model has gradually focused on psychological nursing. Based on basic treatment, psychological intervention is the core of nursing. Positive psychology theory group counseling is a nursing mode based on psychological theory, in which a nursing team is established to provide patients with professional psychological intervention. This nursing model is a new type of nursing that has gained a good reputation in current clinical applications. A long rehabilitation period is required after total hip arthroplasty, during which the physiological function of the patient's hip joint will be temporarily limited, and the patient's living status will be affected to a certain extent, which will negatively affect the mental health of the patient [13,14]. Positive psychology theory group counseling helps to reflect the individual differences of patients, provides patients with personalized nursing experience, and guides patients to develop a positive and optimistic attitude, thus playing a certain role in promoting the recovery of the disease [15].

Before nursing, the Harris and ADL scores of the groups were compared, and there was no statistically significant difference ($P > 0.05$). After nursing, the Harris and ADL scores of the study group were significantly better than those of the control group, the difference was statistically significant ($P < 0.05$). Before nursing, the HAM-D and HAM-A scores of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). After nursing, the HAM-D and HAM-A scores of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). The incidence of postoperative complications in the study group was significantly lower than that in the control group, and the difference was statistically significant ($P < 0.05$). The implementation of positive psychology theory group counseling can create an optimistic and positive attitude in the patients, which can help the recovery of the disease and the hip joint, with less limitation of physical activities and improved quality of life. After the application of this nursing model, the patient's mood has improved greatly, negative emotions such as anxiety and depression have been greatly reduced, and the postoperative complications have also reduced, which has positive significance for the health of patients.

In summary, group counseling based on positive psychology theory has achieved significant clinical value in patients after total hip arthroplasty. Thus, this nursing program is worthy of wide application in clinical practice.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Wen X, Yang F, 2023, The Application Value of the "Hospital-Community-Family" Triple Linkage Continuous Nursing Model in the Rehabilitation of Elderly Patients After Hip Replacement Surgery. Clinical Medicine Research and Practice, 8(13): 125–127.

[2] Wang Z, Ren C, 2023, Effects of Step-By-Step Rehabilitation Nursing Combined with Orem's Self-Care Theory on the Rehabilitation, Pain Mediators and Self-Management Ability of Patients After Hip Replacement. Clinical Medicine Research and Practice, 8(11): 170–172.

[3] Liu T, Liu Y, Huang J, et al., 2023, Effect of Nursing Intervention Program Based on Transtheoretical Model on Rehabilitation Training Compliance and Rehabilitation Effect of Patients After Total Hip Replacement. Chinese Folk Therapy, 31(01): 98–100.

[4] Liu Q, Liu X, Wang L, 2022, Effect of Continuous Nursing Based on Big Data Platform on Functional Recovery and

Quality of Life of Elderly Patients After Total Hip Replacement. Chinese Contemporary Medicine, 29(27): 181–184.

[5] Lin K, Li X, 2022, Application of Fast-Track Surgery Nursing Mode in Postoperative Nursing of Elderly Patients with Artificial Hip Replacement and its Impact on Sleep Quality of Patients. World Journal of Sleep Medicine, 9(09): 1628–1630.

[6] Peng X, 2022, Effects of Integrated Medical Care and Nursing Care on the Mastery of Health Knowledge and the Incidence of DVT in Elderly Patients with Femoral Neck Fractures After Total Hip Arthroplasty. Dialysis and Artificial Organs, 33(02): 130–132.

[7] Xu X, Yin W, 2022, The Effect of Targeted Nursing Based on the Concept of Rapid Recovery on the Recovery and Short-Term Complications of Elderly Patients Undergoing Surgical Stress After Hip Replacement. Shanxi Medical Journal, 51(03): 341–344.

[8] Bi H, Ma H, 2022, The Effect of Nursing Intervention Based on Health Beliefs Combined with Mindfulness-Based Stress Reduction on the Hope Level and Psychological Resilience of Patients after Total Hip Replacement. Clinical Medical Engineering, 29(02): 249–250.

[9] He D, 2021, Study on the Clinical Intervention and Effect of Rapid Recovery Nursing in Patients with Femoral Neck Fractures Undergoing Total Hip Replacement. Shanxi Medical Journal, 50(6): 1048–1049.

[10] Li M, 2021, Effects of Three-Dimensional Nursing Combined with Rehabilitation Training on Joint Function and Prognosis of Patients with Femoral Neck Fracture Undergoing Total Hip Arthroplasty. Modern Journal of Integrated Traditional Chinese and Western Medicine, 030(031): 3512–3515.

[11] Zhang Z, Zuo C, 2021, The Effect of Perioperative Nursing Based on the Concept of Accelerated Recovery Surgery on the Rapid Postoperative Recovery of Patients Undergoing Total Hip Arthroplasty. Chinese Medicine and Clinic, 21(20): 3487–3489.

[12] Yuan Y, Song H, Lin Y, et al., 2023, Effects of Preventive Nursing on Hypothermia in Elderly Patients Undergoing Total Hip Replacement on Perioperative Blood Loss, Coagulation Function and Stress Response. Geriatrics and Health Care, 29(1): 100–104.

[13] Zhou Q, Zhou Y, Li L, et al., 2020, The Application of Whole-Course Nursing Care in the Nursing of Patients with Femoral Neck Fractures in Hemihip Replacement Surgery and its Impact on Patients' QOL Scores. Guizhou Medicine, 44(3): 494–496.

[14] Feng S, Chen L, 2020, Analysis of the Effect of Perioperative Nursing Measures of Accelerated Recovery Surgery on the Rehabilitation of Elderly Patients with Primary Unilateral Total Hip Replacement. Journal of Guangxi University: Natural Science Edition, 45(4): 841–847.

[15] Shi L, Liu Y, Zhou Y, et al., 2020, Intervention Study of Standardized Pain Management on Pain Outcome and Hip Joint Function in Patients Undergoing Artificial Hip Replacement. Chinese Journal of Practical Nursing, 36(30): 2331–2337.

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Analysis of the Clinical Efficacy of Anterior Cervical Decompression and Posterior Cervical Decompression with Internal Fixation in the Treatment of Cervical Spinal Cord Injury

Yilei Zhao*

Zhenjiang First People's Hospital, Zhenjiang 212002, Jiangsu Province, China

***Corresponding author:** Yilei Zhao, 15952844320@163.com

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Abstract: This paper aims to explore the appropriate treatment plan for cervical spinal cord injury. Retrospective analysis of the treatment of 30 patients with cervical spinal cord injury in our hospital was carried out, with 15 patients treated with anterior cervical decompression and internal fixation as the study group, and 15 patients treated with posterior cervical decompression and internal fixation as the control group. There was no significant difference in postoperative and follow-up Japanese Orthopaedic Association (JOA) scores, and the incidence of postoperative complications between the two groups. The blood loss and the improvement of cervical lordosis in the study group were better than those in the control group. For patients with cervical spinal cord injury, both anterior and posterior decompression and internal fixation can achieve good clinical results, but anterior decompression and internal fixation can better maintain cervical lordosis and reduce blood loss.

Keywords: Cervical spinal cord injury; Decompression and internal fixation; Anterior approach; Posterior approach

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1. Introduction

Cervical spinal cord injury is mostly caused by asymptomatic cervical spondylosis, under the condition of external force, the degenerated frontal intervertebral disc tissue, posterior longitudinal ligament, even bone fragments, posterior laminar bone tissue, and ligamentum flavum protrude into the patient's vertebral body. Inside the canal, it compresses on the spinal cord and the blood vessels related to spinal cord. Common clinical symptoms are numbness of extremities, decreased muscle strength, defecation dysfunction, and significantly reduced quality of life [1]. The morbidity rate is high, and surgical intervention is required in time. The surgical plan for the treatment of cervical spondylosis mainly includes anterior and posterior decompression and internal fixation. Anterior surgery can remove intervertebral disc tissue and vertebral bone tissue, relieve spinal cord compression, and combined with internal fixation to achieve therapeutic effect. Posterior surgery

uses hemilaminectomy or total laminectomy + screw-rod system fixation, and single-door and double-door laminoplasty are the main methods [2,3]. For simple cervical spinal cord injury, there are few articles comparing the anterior and posterior approaches. In this study, 30 patients with cervical spinal cord injury were selected as the sample to compare and analyze the clinical effects of anterior and posterior decompression and internal fixation.

2. Materials and methods

2.1. General information

Retrospective analysis of the treatment of 30 patients with cervical spinal cord injury in our hospital was done from January 2018 to December 2021. 15 patients were treated with anterior cervical decompression and internal fixation as the study group, and 15 patients were treated with posterior cervical decompression and internal fixation as the control group. Criteria for excluding cases from the anterior cervical study group were patients with spinal tumors, other types of cervical spondylosis, and patients who could not tolerate surgical treatment, patients with cervical spinal cord injury who underwent single-space anterior cervical discectomy and fusion (ACDF) decompression, patients with severe cervical trauma combined with paraplegia, and patients who underwent combined cervical spine surgery before and after. Inclusion criteria included patients with 2 or more segmental spaces through the anterior cervical approach. For posterior cervical approach, the inclusion criteria were patients with cervical posterior approach equal to or greater than 2 segments who underwent single-door and full-laminar decompression screw-rod fixation. Exclusion criteria were combined cervical 1 and 2 fracture fixation patients, conservative treatment patients, combined cervical spine surgery before and after surgery. Both groups had a clear history of trauma. The average age of the 15 patients in the study group was 52.1±9.3 years old, 8 cases underwent subtotal resection of the vertebral body + titanium cage plate fixation, there were 2 cases of intervertebral space decompression + zero-profile fusion cage fixation, and 5 cases of space decompression + titanium cage and cage fixation. The lesion segment is C2–C7. The average age of the 15 patients in the control group was 55.4±9.4 years old, among which 8 cases were fixed with single door + support plate (6 cases from C3–C6, 1 case from C4–C7, 1 case from C3–C7), 7 cases were fixed with compression + posterior screw-rod system (5 cases in C3–C7, 1 case in C3–C6, 1 case in C4–C7).

2.2. Evaluation criteria

The evaluation criteria of the two groups, such as Japanese Orthopaedic Association (JOA) score, cervical lordosis, intraoperative blood loss, hospitalization time, and other surgical related indicators, and the incidence of complications were compared.

2.3. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data ($\bar{x}$±s) was t test, count data % was x^2 test, $P < 0.05$ indicated statistical difference.

3. Results

3.1. Comparison of JOA score and cervical lordosis

Based on **Table 1**, there was no significant difference in JOA score between the two groups before operation, after operation, and at the last follow-up ($P > 0.05$). The degree of postoperative and final cervical lordosis in the study group was higher than that in the control group ($P < 0.05$).

Table 1. Comparison of JOA score and cervical lordosis between the two groups ($\bar{x}$±s)

Group	JOA score			Cervical lordosis		
	Preoperative	3 months after surgery	Last follow-up	Preoperative	3 months after surgery	Last follow-up
Study group (n = 15)	9.44±1.25	14.19±2.57	14.53±1.84	11.62±2.75	17.94±1.53	16.88±1.72
Control group (n = 15)	9.48±1.19	14.41±2.55	14.73±1.89	12.48±2.77	15.11±0.86	12.89±1.15
t value	0.090	0.235	0.294	0.853	6.245	7.469
P value	0.929	0.816	0.771	0.401	0.000	0.000

3.2. Comparison of intraoperative blood loss and hospital stay

The intraoperative blood loss and hospital stay in the study group were lower than those in the control group (P < 0.05), as shown in **Table 2**.

Table 2. Comparison of intraoperative blood loss and hospital stay between the two groups ($\bar{x}$±s)

Group	Intraoperative blood loss (ml)	Length of hospital stay (d)
Study group (n = 15)	143.35±5.38	14.26±1.77
Control group (n = 15)	181.64±9.25	17.29±2.28
t value	13.858	4.066
P value	0.000	0.000

3.3. Comparing the incidence of complications

The two groups were followed-up after operation. In the study group, there was 1 case of hoarseness and 1 case of coughing, accounting for 13.3%. Both groups showed significant improvement after 6 months. In the control group, there was 1 case of neck pain, which was relieved after follow-up, and no surgical intervention was required again. C5 nerve root palsy occurred in 1 case and recovered 3 months after operation. The ratio was 13.3%, and there was no significant difference between the two groups (P > 0.05).

4. Discussion

The cervical spinal cord injuries refer to cervical spinal cord injuries stemmed from cervical spondylosis in middle-aged and elderly patients. Therefore, the number of diseased segments in patients is large, and the degree of spinal cord compression varies [4]. It is necessary to relieve the compression through surgical treatment as soon as possible to improve related symptoms [5]. At present, the main surgical options include anterior and posterior decompression and internal fixation. The surgical procedure of posterior decompression and internal fixation is relatively simple, which is familiar to most doctors. After compression, the spinal cord can also be moved backward to increase the distance between the spinal cord and the intervertebral disc herniation, and other compressive objects, and the effect of indirect decompression can be achieved with internal fixation [6]. Posterior decompression and internal fixation surgery does not require removal of the anterior tissue that compresses the spinal cord, and the risk of surgery is relatively low. Its main drawback is that complete decompression cannot be achieved, and complications such as C5 nerve root palsy and cervical spine instability are prone to occur when the cervical spinal cord moves backward. Anterior decompression and internal fixation surgery can remove the herniated intervertebral disc, thickened posterior longitudinal ligament, and hyperosteogeny at the posterior edge of the vertebral body, thereby achieving the effect of direct

decompression and promoting the recovery of cervical spinal cord function. At the same time, the slightly overextended position of the patient in the anterior approach and the use of intervertebral space distractors during the operation can partially restore the height and physiological curvature of the intervertebral space, expand the spinal canal space, and strengthen the decompression effect [7,8]. For the decompression of the spinal cord, either direct decompression without wheels or indirect decompression through the posterior approach can achieve ideal clinical results. In this study, a total of 30 patients underwent anterior and posterior decompression + internal fixation, and the improvement of JOA score was higher than that of the previous study. There was a significant improvement before operation, and there was no statistically significant difference between the two groups. Therefore, a good grasp of surgical indications and a sound surgical plan can benefit patients with cervical spinal cord injury.

The postoperative follow-up of the cervical spine physiological curvature of the study group was better than that of the control group, suggesting that anterior surgery can improve the cervical spine physiological curvature and body function recovery effect. This could be due to the fact that the posterior muscle structure is more damaged in the posterior operation mode. After total laminectomy or open-door laminoplasty, the original mechanical stability of the cervical spine is disrupted, and the physiological curvature of the cervical spine is lost during the follow-up process. During the anterior surgery, the supine position with the back of the neck raised and slightly extended, according to the preoperative imaging examination, the main vertebral body subtotal resection + titanium plate fixation, or the hybrid intervertebral fusion and internal fixation scheme was adopted. The application of the intervertebral spacer can restore part of the height of the intervertebral space and lordosis, implanting a titanium cage for fixation, and strengthening the fixation with the front steel plate, thereby maintaining the normal curvature and height of the cervical spine, and then improving the overall effect of cervical spine function recovery [9,10]. It can significantly improve and maintain the normal physiological curvature of the cervical spine, and enhance the decompression effect.

Moreover, the blood loss and hospitalization time of the study group were also less than those of the control group. The possible reason is that the posterior incision of the cervical spine is longer, and too much muscle tissue needs to be stripped. At the same time, the internal environment and blood coagulation mechanism of trauma patients are changed in an emergency state, while the muscle tissue in the posterior exposure is less, which may lead to more bleeding than the anterior approach. However, the number of samples in this group of patients is small, and follow-up studies with a large sample size are needed to confirm these findings.

In summary, both anterior and posterior decompression and internal fixation can achieve good clinical results in patients with cervical spinal cord injury. Anterior decompression and internal fixation can maintain the curvature of the cervical spine, with less blood loss and hospitalization, which can be applied in clinical practice. The number of patients included in this study is small, and the mechanism of anterior and posterior decompression and internal fixation in patients with cervical spinal cord injury still needs further analysis and research.

Disclosure statement

The author declares no conflicts of interest.

References

[1] Zhang Q, Ma Y, Wang T, et al., 2021, Anterior Cervical Subtotal Corpectomy and Bone Graft Fusion and Posterior Single Open-Door Laminoplasty in the Treatment of Multi-Level Cervical Spondylotic Myelopathy: the Impact on

the Range of Motion of the Cervical Spine. Chinese Tissue Engineering Research, 25(24): 3870–3874.

[2] Xiao F, 2022, Comparison of the Curative Effect of Posterior Single Open-Door Laminoplasty and Anterior Decompression and Fusion in the Treatment of Multi-Segment Cervical Spondylotic Myelopathy. Contemporary Medicine, 28(8): 118–120.

[3] Tian L, Sun J, Huang S, et al., 2022, Comparison of Curative Effect of Zero-Profile Bridge Locking Fusion and Titanium Plate-Intervertebral Fusion System Anterior and Posterior Combined Surgery on Cervical Spondylotic Myelopathy. Henan Medical Research, 31(8): 1421–1425.

[4] Yang S, 2021, Analysis of the Effect and Complications of Anterior and Posterior Decompression and Bone Graft Internal Fixation in the Treatment of Patients with Cervical Spondylotic Myelopathy. Healthy Vision, 2021(14): 214.

[5] Zhang F, 2021, Comparison of the Effect of Anterior Decompression Surgery and Posterior Decompression Surgery in the Treatment of Multi-Segment Continuous Cervical Spondylotic Myelopathy. Contemporary Medical Forum, 19(18): 72–74.

[6] Song S, Hou J, Zhou H, 2021, Effects of Anterior Cervical Surgery and Posterior Single-Door Laminoplasty on Postoperative Cervical Sagittal Balance Parameters for Cervical Spondylotic Myelopathy. Journal of Neck and Lumbar Pain, 42(4): 571–573.

[7] Li Y, Wang H, Wang Y, et al., 2010, Comparison of Curative Effect of Single-Door Posterior Approach and One-Stage Anterior-Posterior Approach Surgical Decompression Before and After Treatment of Compressed Cervical Spondylotic Myelopathy. Chinese Journal of Spinal Cord, 20(3): 197–200.

[8] Zhang S, 2020, Comparison of the Effect of Anterior Segmental Decompression and Posterior Laminoplasty in the Treatment of Multi-Segment Cervical Spondylotic Myelopathy. Henan Medical Research, 29(17): 3162–3163.

[9] Ma H, Li Z, Li G, et al., 2017, Comparison of the Curative Effect of Anterior Subtotal Vertebral Body Resection and Posterior Single-Door Surgery in the Treatment of Multi-Segment Cervical Spondylotic Myelopathy. Hainan Medicine, 28(2): 296–299.

[10] Zhou Y, 2019, Comparative Analysis of the Effect of Anterior and Posterior Decompression in the Treatment of Multi-Segment Continuous Cervical Spondylotic Myelopathy. Frontiers of Medicine, 9(4): 32–33.

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Comparison of the Clinical Effects of Internal Fixation Combined with Vertebroplasty and Internal Fixation Alone on Patients with Spinal Fractures

Chen Chen*

Anyang People's Hospital, Anyang 455000, Henan Province, China

***Corresponding author:** Chen Chen, aysrmyygkcc@163.com

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Abstract: *Objective:* This study aims to explore and analyze the comparison of clinical treatment effects of internal fixation combined with vertebroplasty and internal fixation alone on patients with spinal fractures. *Methods:* The experimental time was from April 2021 to April 2023. 80 spinal fracture patients treated by spinal surgery in our hospital were used as research objects, and grouped by double-blind method into study group (n = 40) and control group (n = 40). The study group received internal fixation combined with vertebroplasty, and the control group received internal fixation alone. The restoration of spinal structure, treatment, surgical treatment index, and incidence of adverse events were compared between the groups. *Results:* Before operation, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). The degree of compression and the compression ratio of the affected prevertebral height in the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). The rating of the treatment situation in the study group was significantly higher than that of the control group, the difference was statistically significant ($P < 0.05$). The surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group, and the difference was statistically significant ($P < 0.05$). The incidence of adverse events in the study group was significantly lower than that in the control group, and the difference was statistically significant ($P < 0.05$). *Conclusion:* Internal fixation combined with vertebroplasty is more effective than internal fixation alone in treating spinal fractures.

Keywords: Internal fixation combined with vertebroplasty; Simple internal fixation; Spinal fracture

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1. Introduction

Spinal fracture is a very serious bone injury, which is mainly resulted from traumas. There are spinal cord and nerves in the spine, thus fractures can cause spinal cord and nerve damage, which can lead to disability of patients, and death in severe cases [1]. Most patients with spinal fractures are men, and the elderly with osteoporosis, workers

with physically demanding jobs, and patients with rheumatoid diseases are all prone to this disease [2]. Spinal fractures can cause severe pain, limited movement of the neck or chest and back, and affect the overall movement of the limbs [3]. Spinal fractures are mainly treated with surgery, and patients with undamaged spinal cords can be treated with rehabilitation therapy. Internal fixation is the most common way to treat spinal fractures. It can restore the physiological height of the spine and reduce the pain of patients. The short-term curative effect after surgery is ideal, but there are certain disadvantages in the long-term curative effect. The height of the intervertebral space of patients will gradually change [4]. Based on this, vertebroplasty is added to improve the long-term treatment effect [5]. The purpose of this paper is to study and analyze the clinical effect of internal fixation combined with vertebroplasty and internal fixation alone on patients with spinal fractures.

2. Methods

2.1. General information

The experimental time was from April 2021 to April 2023. 80 spinal fracture patients treated by spinal surgery in our hospital were used as the research object, grouped by double-blind method into study group (n = 40) and control group (n = 40). The males and females in the study group are 27 and 13 cases, respectively, aged 33–57 years old, with an average of 46.22±1.34 years old. The males and females in the control group are 26 and 14 cases, respectively, aged 33–57 years, with an average of 46.36±1.43 years old. There was no statistically significant difference ($P > 0.05$) in the general information such as gender and age between the groups.

Inclusion criteria included patients who met the diagnosis of spinal fracture, patients with clear indications for surgery and anesthesia, and patients with informed consent.

Exclusion criteria were patients with coagulation disorders, patients with diabetes, hypertension, and other diseases, patients with incomplete clinical data, and patients with mental illness.

2.2. Methods

The control group received simple internal fixation, where X-rays were taken, and the fracture site was marked. After the patient was anesthetized, an incision was made to expose the bone tissue, the pedicle was placed, the misplaced bone tissue was reset, and the incision was sutured.

The study group received internal fixation combined with vertebroplasty. The internal fixation method was the same as above. Bone cement was used as the main material for vertebroplasty. The needle tip was placed in a suitable position under fluoroscopy while lying on the side. The powder and calcium hydrochloride were injected into the fracture site, and the plane was sealed with 4ml bone wax.

2.3. Observation indicators

The indicators below were observed for both the study and control groups.

(1) The recovery of vertebral structure was compared between the two groups, including the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the affected vertebra.

(2) The treatment situation between the groups was compared, and the Prolo score was used to evaluate the treatment results, including excellent (17–20 points), good (9–16 points), and poor (4–8 points).

(3) Surgical treatment indicators were compared between the groups, including tissue bleeding volume, hospitalization time, and intraoperative operation time.

(4) The incidence of adverse events between the groups was compared, including hypostatic pneumonia, deep vein thrombosis of lower extremities, loosen nails, and infection.

2.4. Statistical analysis

SPSS 21.0 statistical software was selected to process and analyze the data, the count data were expressed by the number of cases (n) and percentage (%), the x^2 test was implemented, the measurement data were expressed by the mean ± standard deviation (SD), and the t test was implemented, $P < 0.05$ were considered statistically significant.

3. Results

3.1. Comparison of the recovery of spinal structure

Before operation, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the prevertebral height of the two groups were compared, and there was no statistically significant difference ($P > 0.05$). As shown in **Table 1**, the compression ratio of prevertebral height of patients in the study group was significantly better than that of control group, and the difference was statistically significant ($P < 0.05$).

Table 1. The comparison of spinal structure recovery between groups (mean ± SD)

Group	Affected vertebra Cobb angle (°)		Degree of spinal canal invasion (%)		Compression ratio of prevertebral height (%)	
	Before surgery	After surgery	Before surgery	After surgery	Before surgery	After surgery
Study group (n = 40)	15.57±3.55	5.31±1.55	33.24±4.31	19.27±3.21	59.37±4.33	94.31±5.28
Control group (n = 40)	15.68±3.69	9.57±1.69	33.35±4.26	26.31±4.56	59.63±4.15	81.49±5.22
t value	0.1358	11.7490	0.1148	7.9843	0.2741	10.9203
P value	0.8923	0.0000	0.9089	0.0000	0.7847	0.0000

3.2. Comparison of the treatment situation with Prolo score

Based on **Table 2**, the excellent and good rate of treatment in the study group was significantly higher than that of the control group ($P < 0.05$), the difference was statistically significant.

Table 2. The treatment comparison between the groups [n (%)]

Group	Excellent	Good	Poor	Excellent rate
Study group (n = 40)	28 (70.00)	11 (27.50)	1 (2.50)	39 (97.50)
Control group (n = 40)	23 (57.50)	9 (22.50)	8 (20.00)	32 (7.94)
x^2 value	-	-	-	6.1346
P value	-	-	-	0.0132

3.3. Comparison of surgical treatment indicators

As presented in **Table 3**, the surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant.

Table 3. Comparison of surgical treatment indicators between groups (mean ± SD)

Group	Tissue bleeding	Hospitalization time	Intraoperative operation time
Study group (n = 40)	79.24±8.31	9.21±2.64	59.22±4.56
Control group (n = 40)	95.24±9.33	13.58±2.66	77.32±5.33
t value	8.0991	7.3747	16.3198
P value	0.0000	0.0000	0.0000

3.4. Comparison of the incidence of adverse events

The incidence of adverse events in the study group was significantly lower than that in the control group ($P < 0.05$), and the difference was statistically significant. The data are shown in **Table 4**.

Table 4. The incidence of adverse events between groups [n (%)]

Group	Collapsing pneumonia	Lower extremity deep vein thrombosis	Loosen nails	Infection	Total incidence
Study group ($n = 40$)	1 (2.50)	0 (0.00)	0 (0.00)	0 (0.00)	1 (2.50)
Control group ($n = 40$)	3 (7.50)	1 (2.50)	1 (2.50)	1 (2.50)	6 (15.00)
x^2 value	-	-	-	-	3.9139
P value	-	-	-	-	0.0478

4. Conclusion

Spinal fracture refers to the fracture of the spine bones under the action of external force, and the thoracolumbar segment is the most common site for spinal fractures [6]. Mild spinal fractures can present as spinal pain and limited movement, while severe spinal fractures can damage the patient's spinal cord and nerves. Internal fixation is a surgical method used to treat fractures, and it is a relatively traditional type of surgery [7]. Internal fixation returns the fractured bone to its original physiological position. Using steel plates, screws, steel wires, and other materials as support can strengthen the strength of the fixation, and external fixation after surgery is no longer mandatory. External fixation is performed depending on the situation. However, the fixation materials used in internal fixation are exogenous items [8]. It is a foreign body in the human body, and it is prone to loosen nails or infection. After infection, it will prolong the healing of the fracture, and it is an open operation, which will affect the blood supply of the human body during the operation. In order to avoid the above adverse events, an improvement was made on the basis of internal fixation [9]. Internal fixation combined with vertebroplasty is a combined operation method. Calcium sulfate powder is perfused at the site of injured vertebral body to further strengthen the fixation of the vertebral body and stabilize the bone fixation. It is effective for osteoporosis and loose nails with certain preventive effect [10]. Vertebroplasty can reduce the stress of the fixed metal, prevent the occurrence of postoperative adverse events such as loosen nails and collapsing pneumonia, and provide a guarantee for the long-term effectiveness of surgical treatment [11,12]. In the process of vertebroplasty, injecting bone cement in the cavity can maintain the height of the vertebral body for a long time. The bone cement is relatively safe without harming the tissues of the human body and will not cause damage to the spinal cord and nerves [13,14].

Before surgery, the Cobb angle of the affected vertebra, the degree of spinal canal invasion, and the compression ratio of the affected vertebra in the two groups were compared ($P > 0.05$), and the difference was not statistically significant. The degree of tube invasion and the compression ratio of the affected prevertebral height were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant. The excellent and good rate of the treatment in the study group was significantly higher than that of the control group ($P < 0.05$), the difference was statistically significant. The surgical treatment indicators such as tissue bleeding volume, hospitalization time, and intraoperative operation time in the study group were significantly better than those in the control group ($P < 0.05$), and the difference was statistically significant. The incidence of adverse events in the study group was significantly lower than that in the control group ($P < 0.05$), and the difference was statistically significant. Internal fixation combined with vertebroplasty is

a combined surgical plan. The short-term effect of internal fixation is relatively stable. Vertebroplasty can strengthen the long-term effect of internal fixation, promote the recovery of the anatomical position and physiological function of the spine, and shorten the recovery time of fractures and reduce tissue damage [15].

In summary, internal fixation combined with vertebroplasty in the treatment of spinal fractures has a high short-term curative effect, better recovery of spinal physiological functions and anatomical positions, and it is relatively reliable and safe. This treatment plan is worthy of widespread clinical application.

Disclosure statement

The author declares no conflict of interest.

References

[1] Cao L, Liu Y, Cao W, et al., 2023, Comparison of Clinical Effects Between Open Pedicle Fixation and Sextant Minimally Invasive Percutaneous Pedicle Screw Fixation in the Treatment of Multiple Thoracolumbar Spine Fractures. Jiangxi Medicine, 58(05): 595–597.

[2] Yin H, Yu L, Fang T, 2023, Effects of Shujin Zhuanggu Decoction Combined with Percutaneous Vertebroplasty in the Treatment of Osteoporotic Compression Spinal Fractures on Lumbar Function and Bone Metabolism in Patients. Chinese Journal of Integrated Traditional Chinese and Western Medicine Surgery, 29(01): 47–51.

[3] Chen B, Chen D, Liang Q, 2023, Clinical Curative Effect Observation of Sextant Minimally Invasive Percutaneous Pedicle Screw Internal Fixation and Open Pedicle Internal Fixation in the Treatment of Thoracolumbar Multiple Spinal Fractures. Guizhou Medicine, 47(01): 83–84.

[4] Zhang H, Tang C, 2022, The Effect of Sextant Minimally Invasive Percutaneous Pedicle Screw Internal Fixation in the Treatment of Multiple Thoracolumbar Spine Fractures and its Impact on Patients' Pain and Lumbar Function. Chinese and Foreign Medicine, 41(32): 85–88 + 93.

[5] He C, Xiang F, Zhang X, et al., 2022, The Application Effect of Internal Fixation Combined with Vertebroplasty in Patients with Spinal Fractures and its Impact on Imaging Parameters, Nerve Function, and Spinal Function. Clinical Medicine Research and Practice, 7(17): 101–104.

[6] Fan L, Zhang L, Luo M, et al., 2022, Analysis of Curative Effect of Ultrasound-Guided Lauromacrogol Injection in the Treatment of Refractory Seroma after Spinal Fracture Internal Fixation. Chinese Journal of Bone and Joint Injury, 37(05): 521–522.

[7] Huang F, Gan R, Wei C, et al., 2022, Efficacy of Percutaneous Pedicle Screw Internal Fixation in the Treatment of Thoracolumbar Spinal Fractures and its Impact on Oxidative Stress and Postoperative Pain. Advances in Modern Biomedicine, 22(07): 1267–1271.

[8] Su W, Tang K, Wang X, et al., 2022, Comparison of Curative Effect of Anterior Short-Segment Internal Fixation + Injured Vertebral Screw Placement and Posterior Median Small Incision Non-Fusion Surgery in the Treatment of Thoracolumbar Spinal Fractures. Jilin Medicine, 43(03): 657–658.

[9] Cheng F, Wu C, Zhang H, et al., 2022, The Method, Effect, and Complication Analysis of Minimally Invasive and Precise Surgery for Thoracolumbar Multiple Spinal Fractures under the Guidance of Tianji Orthopedic Robot. Medical Diet Therapy and Health, 20(05): 25–27 + 31.

[10] Pan Y, Tao T, Wu Y, 2021, Application Effect of Air Pressure Wave Therapy Instrument Combined with Somatosensory Evoked Potential Monitoring in Preventing Lower Extremity Deep Vein Thrombosis after Spinal Fracture Surgery. Chinese Journal of Medical Physics, 38(12): 1554–1559.

[11] Gao D, 2021, Comparison of the Effect of Sextant Percutaneous Minimally Invasive Pedicle Screw Internal Fixation

and Traditional Posterior Open Internal Fixation in the Treatment of Multiple Thoracolumbar Spinal Fractures. China Medical Device Information, 27(23): 123–125.

[12] Zhu L, Zhang Y, Wang Z, et al., 2021, The Effect of Pedicle Screw Fixation Through the Multifidus Space Combined with Bone Grafting in the Injured Vertebrae in the Treatment of Single-Segment Osteoporotic Thoracolumbar Spinal Fractures. Chinese Medicine, 16(11): 1683–1687.

[13] Song X, Zhang F, Han S, et al., 2021, Posterior Median Approach Through Quadrant Channel Decompression and Reduction of the Spinal Canal Combined with Percutaneous Pedicle Screw Fixation in the Treatment of Single-Segment AO Type A3 Thoracolumbar with Nerve Injury Segmental Spinal Fractures. Journal of Spine Surgery, 19(05): 289–295.

[14] Wang J, Zhang Y, Ren S, 2021, Exploring the Diagnostic Effect of 12-Lead Ambulatory Electrocardiogram and Conventional Electrocardiogram on Asymptomatic Myocardial Ischemia and Arrhythmia in Elderly Patients with Coronary Heart Disease. Imaging Research and Medical Application, 5(19): 227–228 + 230.

[15] Cai H, Zhang M, Luo X, 2021, Diagnostic Value of ST Segment Combined with Lecithin Cholesterol Lipid Acyltransferase and Lipoprotein A Based on 12-Lead Ambulatory Electrocardiogram for Coronary Heart Disease. Chinese Medicine Science, 11(15): 180–182 + 196.

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Clinical Efficacy of Traditional Chinese Medicine Orthopedic in the Treatment of Senile Osteoarthritis

Wenguang Chen*

Qingyun County Dongxindian Hospital, Dezhou 253700, Shandong Province, China

***Corresponding author:** Wenguang Chen, jrtzxjh@163.com

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Abstract: *Objective:* This paper aims to explore and analyze the clinical effect of traditional Chinese medicine (TCM) orthopedic treatment on elderly patients with osteoarthritis. *Methods:* The study period is from January 2021 to June 2023. 62 elderly patients with osteoarthritis admitted to our hospital were selected and divided into the study group (n = 31) and the control group (n = 31) using the random number table scheme. The patients in the control group were treated with conventional Western medicine acemetacin, and the patients in the study group were treated with traditional Chinese medicine orthopedic. The treatment options included manual massage, traditional Chinese medicine fumigation, and oral administration of traditional Chinese medicine. The clinical effective rate, osteoarthritis function Japanese Orthopedic Association score (JOA), visual analogue pain score (VAS), and incidence of adverse reactions were compared between the two groups. *Results:* The clinical effective rate of patients in the study group was higher than that of the control group ($P < 0.05$), the JOA score of the patients in the study group was higher than that of the control group after treatment ($P < 0.05$), while the VAS score of the patients in the study group was lower than that of the control group after treatment ($P < 0.05$). Plus, the incidence of adverse reactions in the study group was lower than that in the control group ($P < 0.05$). *Conclusions:* TCM orthopedic treatment for elderly patients with osteoarthritis has a significant effect, it can improve joint function, relieve pain, with a low incidence of adverse reactions, which can be widely applied in clinical practice.

Keywords: TCM orthopedic; Senile osteoarthritis; Joint function; Pain; Adverse reaction

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1. Introduction

Osteoarthritis is a common joint tissue lesion in clinical practice. The main lesion feature is the damage of articular cartilage, which can lead to the damage of the entire joint tissue. The main clinical symptoms are joint pain, swelling, bone friction sound, deformity, accompanied by joint stiffness, decreased joint range of motion, etc., which can adversely affect patients' daily activities [1]. The main goal of clinical treatment of osteoarthritis is to relieve pain, correct joint deformity, improve joint function, and improve the patients' quality of life [2]. The main solution of Western medicine for the treatment of osteoarthritis is analgesic drug intervention, which has

the main drawback of short duration of drug effect and frequent adverse reactions. In the theory of traditional Chinese medicine (TCM), senile osteoarthritis is a bone numbness, and the treatment should be based on the principle of regulating *qi* and blood, and removing pathogenic wind, cold, and dampness [3,4]. In this study, 62 elderly patients with osteoarthritis were selected to explore and analyze the clinical effect of traditional Chinese medicine orthopedic treatment.

2. Materials and methods

2.1. General information

The relevant procedures of this study are all submitted to the approval of the Medical Ethics Committee. The study period is from January 2021 to June 2023. 62 elderly patients with osteoarthritis admitted to our hospital were selected and divided into the study group (n = 31) and the control group (n = 31) by random number table scheme. The study group consisted of 17 males and 14 females, aged 65–77 years, with an average of 71.58±3.66 years old, and a range of disease duration of 1–5 years, and an average of 2.96±0.77 years. In the control group, there were 19 males and 12 females, aged 66–75 years, with an average of 71.62±3.61 years old, the disease duration was 1–4 years, and the average was 2.88±0.79 years.

Inclusion criteria included patients diagnosed with osteoarthritis by imaging examination, patients who did not receive symptomatic treatment before enrollment, and patients who know the study process and content and sign the consent document.

Exclusion criteria were patients with systemic diseases such as liver and kidney diseases, patients who have recently taken anti-inflammatory and analgesic drugs, and patients with pregnancy disorders or mental diseases.

2.2. Methods

The patients in the control group were treated with conventional Western medicine acemetacin, 3 times a day orally, 30–60mg a day, for a total of 1 month.

The patients in the study group were treated by TCM orthopedic. The physician followed the theory of TCM and adopted the following treatment plan in combination with the characteristics of the patient's condition, for a total of 1 month.

(1) Physician performs pinching manipulation on the patient's quadriceps muscle, pulls the knee joint, massages the patella, and performs point pressing on the patient's Liangqiu, Xuehai, inner and outer knee eyes, and Weizhong acupoints, 2 times a day, with 30 minutes for each treatment.

(2) Oral administration of traditional Chinese medicine. Physicians determine the medication plan based on the patient's condition and TCM syndrome type, guide the patient to take Xiaobi Decoction, Liuwei Dihuang Pill, Duhuo Jisheng Decoction, and other drug prescriptions, and adjust the medication plan appropriately according to the patient's clinical symptoms to achieve the best therapeutic effect.

(3) Traditional Chinese medicine fumigation. The traditional Chinese medicine fumigation drug prescription is *Lycopodium clavatum* 25g, *Radix aconiti* 15g, *Clematis* 25g, *Angelica dahurica* 15g, *Pittosporum* bark 30g, Sperancus 30g, *Ligusticum wallichii* 15g, *Saposhnikovia divaricata* 10g, and Sappanwood 25g. 1L of clear water is added to the above medicinal formula and soaked for 30 minutes, and after boiling, the joint lesion area is fumigated, twice a day, with each fumigation time of 20–30 minutes.

2.3. Evaluation criteria

After 1 month of treatment, the clinical effective rate of the two groups was assessed. The following performance were evaluated as effective: relief of pain and other symptoms, improvement of joint function, no complications of other types, mild limitation of daily activities. If the treatment does not meet the criteria of evaluation, the treatment is ineffective. The effective samples are included as the category of effective treatment. Moreover, the osteoarthritis function Japanese Orthopedic Association score (JOA) of the two groups was evaluated before treatment and after 1 month of treatment. The scoring items include sensation, bladder function, upper limb motor function, and lower limb motor function. The full score for each item is 5 points, the higher the score, the better the joint function. Additionally, the visual analogue pain scale (VAS) of the two groups was evaluated before treatment and after 1 month of treatment. The full score is 10 points. The higher the score, the more severe the pain. Statistics on the incidence of adverse reactions in the two groups of patients were also evaluated.

2.4. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data (mean ± standard deviation) was *t* test, count data % was x^2 test, $P < 0.05$ indicated that there was a statistical level difference.

3. Results

3.1. Comparison of the clinical effective rate

As shown in **Table 1**, the clinical effective rate of patients in the study group was higher than that in the control group ($P < 0.05$).

Table 1. Comparison of clinical effective rate between two groups of patients (n/%)

Group	Markedly effective	Effective	Ineffective	Total effective rate
Study group ($n = 31$)	24	7	2	29 (93.5)
Control group ($n = 31$)	17	6	8	23 (74.2)
x^2 value	-	-	-	4.292
P value	-	-	-	0.038

3.2. Comparison of JOA scores

As presented in **Table 2**, after treatment, the JOA scores of the patients in the study group were higher than those in the control group ($P < 0.05$).

Table 2. Comparison of JOA scores between the two groups (mean ± standard deviation)

Group	Overall feeling		Bladder function		Upper limb motor function		Motor function of lower extremities	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group ($n = 31$)	1.63±0.41	4.08±0.55	1.84±0.52	4.12±0.63	1.77±0.24	4.01±0.63	1.59±0.44	3.96±0.57
Control group ($n = 31$)	1.59±0.44	2.97±0.24	1.79±0.56	3.08±0.25	1.75±0.28	2.58±0.29	1.62±0.38	2.84±0.33
t value	0.370	10.299	0.364	8.543	0.302	11.480	0.287	9.468
P value	0.712	0.000	0.717	0.000	0.764	0.000	0.775	0.0000

3.3. Comparison of VAS scores

As shown in **Table 3**, the VAS score of the study group was lower than that of the control group after treatment ($P < 0.05$).

Table 3. Comparison of VAS scores between the two groups (mean ± standard deviation)

Group	Before treatment	After treatment
Study group ($n = 31$)	4.88±1.26	1.35±0.29
Control group ($n = 31$)	4.93±1.22	2.27±0.71
t value	0.159	6.679
P value	0.874	0.000

3.4. Comparison of the incidence of adverse reactions

As demonstrated in **Table 4**, the incidence of adverse reactions in the study group was lower than that in the control group ($P < 0.05$).

Table 4. Comparison of the incidence of adverse reactions between the two groups of patients (n/%)

Group	Headache	Gastrointestinal reaction	Rash	Incidence of adverse reactions
Study group ($n = 31$)	0	1	0	1 (3.2)
Control group ($n = 31$)	2	3	1	6 (19.4)
x^2 value	-	-	-	4.026
P value	-	-	-	0.044

4. Discussion

Osteoarthritis is a lesion that involves the entire joint tissue, with articular cartilage damage as the main lesion. It is the main cause of articular cartilage fibrosis, degeneration, defect, and fracture. The main clinical symptoms were joint pain, stiffness, and reduced motion, and these were accompanied by joint deformity and enlargement, joint weakness, and muscle atrophy in some patients [5]. Osteoarthritis mainly affects the elderly, and it can have an impact on the work and life of patients, thus it is necessary to control the disease early.

The goal of clinical treatment of osteoarthritis is to relieve discomfort symptoms, correct joint deformities, control disease progression, and gradually improve joint function [6]. The conventional treatment for osteoarthritis in Western medicine is analgesic and anti-inflammatory drug intervention. Acemetacin is a typical analgesic and anti-inflammatory drug. After medication, it can inhibit the body's inflammatory response, and relieve pain and other symptoms, but the duration of the drug's effect is short, hence recurrent pain after drug withdrawal, long-term drug resistance, and adverse reactions are likely to occur, which then affect the recovery process [7,8]. According to the traditional Chinese medicine, senile osteoarthritis is bone arthralgia, and its main pathogenesis is that wind-cold-damp pathogens invade the joint tissues, leading to stagnation of *qi* and blood stasis, damage to joints, muscles, tendons, and bones, resulting in morning stiffness, pain, numbness, swelling, and other clinical symptoms [9]. Traditional Chinese medicine treatment of senile osteoarthritis is based on the characteristics of the patient's condition. The use of drugs, massage, and other programs can relieve symptoms and eliminate the pathogen. The treatment is simple, without toxic side effects, and the patient's tolerance to the treatment program is high. Tuina therapy is a characteristic treatment plan of traditional Chinese medicine. Massage of muscles, joints, and specific acupoints can improve local blood supply, loosen joint adhesions,

repair damage, and improve joint mobility [10]. In the internal treatment plan of traditional Chinese medicine, doctors use prescriptions such as Xiaobi Decoction, Liuwei Dihuang Pills, and Duhuo Jisheng Decoction. Long-term use can dispel wind and cold, promote blood circulation, and remove blood stasis, clear the internal pathogen of the body, and effectively relieve various symptoms. Traditional Chinese medicine fumigation is a characteristic TCM external treatment program. The thermal stimulation can induce the drug to penetrate into the subcutaneous joint tissue, and can achieve the clinical effects of expelling wind and cold, promoting blood circulation, relieving pain, and removing blood stasis. The rational use of different TCM treatment programs can relieve pain and other symptoms, improve local blood circulation, and eliminate pathogen such as wind, cold and dampness, and its curative effect is significantly better than that of a single Western medicine treatment [11].

The results of this study showed that the clinical effective rate of patients in the study group was higher than that of the control group, and JOA score and VAS score were both better than those of the control group, suggesting that orthopedic treatment of traditional Chinese medicine can relieve pain and improve joint function in elderly patients with osteoarthritis, and the efficacy is better than that of single Western medicine treatment. Acemetacin is an anti-inflammatory and analgesic drug with a rapid onset of effect, which can relieve inflammation and pain in a short period of time, but the long-term treatment effect is poor, which is not conducive to the recovery of the patient. In the orthopedic treatment mode of traditional Chinese medicine, physicians perform massage therapy on diseased joints, which can improve local metabolism and blood circulation, loosen adhesions, repair damaged tissues, relieve pain, and improve motor function [12]. In the treatment plan of traditional Chinese medicine, doctors combine oral medicine with traditional Chinese medicine fumigation. The selected medicine formula has the effects of promoting blood circulation and relieving pain, reducing swelling and diuresis, warming meridian and dispelling cold and wind, which can eliminate internal pathogen, strengthen local stimulation, and then effectively control the disease and improve the therapeutic effect [13]. Compared with Western medicine treatment schemes, TCM orthopedic treatment schemes are diverse, and different schemes can produce synergistic effects, which can effectively control the patient's condition and improve the therapeutic effect [14]. The results of this study showed that the incidence of adverse reactions in the study group was lower than that in the control group. The reason is that long-term application of Western medicine can produce side effects. The orthopedic treatment of traditional Chinese medicine uses pure natural Chinese medicinal materials, and the incidence of adverse reactions is low [15].

In summary, the orthopedic treatment of traditional Chinese medicine has a significant effect on elderly patients with osteoarthritis, can improve joint function, relieve pain, with a low incidence of adverse reactions, which can be widely applied. The number of elderly patients with osteoarthritis included in this study was small, and the specific plan and mechanism of traditional Chinese medicine orthopedic treatment for elderly patients with osteoarthritis still need to be analyzed.

Disclosure statement

The author declares no conflict of interest.

References

[1] Xia W, Hu J, Xu M, et al., 2023, Clinical Observation of Arthroscopic Limited Debridement of the Knee Joint Combined with Comprehensive Traditional Chinese Medicine Therapy in the Treatment of Knee Osteoarthritis. Basic Chinese Medicine, 2(6): 69–74.

[2] Song D, Que M, 2023, Clinical Research on Comprehensive Traditional Chinese Medicine Therapy in the Treatment of Knee Osteoarthritis with Cold-Dampness Obstruction Type. Journal of Practical Chinese Medicine, 39(2): 247–249.

[3] Zhao K, Liu A, Zhang Z, et al., 2022, Analysis of TCM Syndrome and Treatment of Yang Deficiency Knee Osteoarthritis Based on Qi, Blood, and Body Fluid Theory. Journal of Hubei University of Traditional Chinese Medicine, 24(6): 52– 55.

[4] Li H, Li N, Xie X, et al., 2022, Research Progress of Traditional Chinese Medicine Intervention Matrix Metalloproteinase Expression in the Treatment of Knee Osteoarthritis. Chinese Journal of Osteoporosis, 28(1): 120–123, 138.

[5] Song S, Xue M, Tao Q, et al., 2023, A Randomized Controlled Study of Bone-Setting Massage with Traditional Chinese Medicine in the Treatment of Early and Mid-Term Knee Osteoarthritis. Chinese Journal of Integrated Traditional Chinese and Western Medicine, 43(3): 281–286.

[6] Zheng J, Li C, Zhang H, et al., 2022, Observing the Effect of Floating Acupuncture Combined with Traditional Chinese Medicine Acupoint Massage on Bone and Joint Function and Sleep Quality in Elderly Patients with Knee Osteoarthritis and Insomnia. World Journal of Sleep Medicine, 9(4): 642–644.

[7] Liu F, 2022, The Effect of Traditional Chinese Medicine-Directed Drug Penetration Therapy Combined with Rehabilitation Training on Knee Joint Function and Pain Degree in Patients with Knee Osteoarthritis. Reflexology and Rehabilitation Medicine, 3(9): 22–24, 32.

[8] Xie N, 2022, The Application of TCM Characteristic Rehabilitation Nursing Combined with Isokinetic Muscle Strength Training in Patients with Knee Osteoarthritis. Medical Equipment, 35(14): 117–119.

[9] Guo D, 2022, Analysis of the Application Effect of Traditional Chinese Massage Manipulation Combined with Traditional Chinese Medicine in the Treatment of Knee Osteoarthritis After Total Knee Arthroplasty. Henan Journal of Surgery, 28(6): 155–157.

[10] Wei G, Tang H, Wang Z, et al., 2021, Research on TCM Syndrome Differentiation and Treatment of Knee Osteoarthritis in the Early and Middle Stages. Western Traditional Chinese Medicine, 34(1): 137–140.

[11] Liu J, Liu R, 2021, Meta-Analysis of Traditional Chinese Medicine Massage Manipulation Combined with Sodium Hyaluronate in the Treatment of Knee Osteoarthritis. Journal of Jiangxi University of Traditional Chinese Medicine, 33(4): 27–31.

[12] Sun S, Zhong S, Xu H, et al., 2021, Observation on Clinical Curative Effect of Traditional Chinese Medicine Manipulation on Knee Osteoarthritis and its Influence on NF-κB Signaling Pathway. Chinese Medicine Science and Technology, 28(1): 17–20.

[13] Meng W, Ming L, Ming X, et al., 2021, Proximal Fibula Osteotomy Combined with Traditional Chinese Medicine in the Treatment of Middle-Aged and Elderly Knee Varus Osteoarthritis. Journal of Practical Hand Surgery, 35(2): 259–261.

[14] Yu T, Yang Q, Wang J, 2021, Research Progress of Traditional Chinese Medicine Nursing Techniques Guided by Ziwu Liuzhu in Knee Osteoarthritis. Yunnan Journal of Traditional Chinese Medicine, 42(5): 88–91.

[15] Li W, Xie X, Gu Y, et al., 2022, Based on PI3K/Akt Signaling Pathway to Explore the Research Progress of Traditional Chinese Medicine Intervention in Knee Osteoarthritis. Chinese Medicine Information, 39(10): 75–79.

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Effect of Electroacupuncture Combined with Rehabilitation Training on the Recovery of Quadriceps Femoris Muscle Strength After Knee Joint Surgery

Lantai Xue*

Hubei University of Chinese Medicine, Wuhan 430060, Hubei Province, China

***Corresponding author:** Lantai Xue, yuw46010699@outlook.com

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Abstract: *Objective:* This paper aims to discuss and analyze the effect of electroacupuncture combined with rehabilitation training on the recovery of quadriceps femoris muscle strength after knee joint surgery. *Methods:* The study period is from May 2021 to May 2023. 60 patients with postoperative knee joint surgery admitted to the rehabilitation department of our hospital were selected as the research objects, and divided into the study group and the control group by using the odd-even number lottery method with 30 cases in each group. The study group received electroacupuncture and rehabilitation training, and the control group received only rehabilitation training. The recovery of knee joint function, 60°/s isokinetic muscle strength test, and rehabilitation effect were compared between the groups. *Results:* Before rehabilitation, there was no statistically significant difference ($P > 0.05$) in the comparison of knee joint function recovery indicators such as function, muscle strength, flexion deformity, range of motion, and stability between the groups. After rehabilitation, the function, muscle strength, knee joint function recovery indexes such as flexion deformity, range of motion, and stability in the study group were significantly better than those in the control group, and the difference was statistically significant ($P < 0.05$). Before rehabilitation training, the peak torque (PT), total work (TW), and average power (AP) at 60°/s isokinetic muscle strength tests of the two groups were compared, and the difference was not statistically significant ($P > 0.05$). After rehabilitation, the PT, TW, and AP at 60°/s isokinetic muscle strength tests of the study group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$). The rehabilitation effect of the study group was significantly higher than that of the control group, the difference was statistically significant ($P < 0.05$). *Conclusion:* Electroacupuncture combined with rehabilitation training can promote the recovery of quadriceps femoris muscle strength after knee joint surgery, and the recovery of knee joint function is better, which is worthy of widespread application in clinical practice.

Keywords: Electroacupuncture; Rehabilitation training; Quadriceps muscle strength recovery; Knee joint surgery

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1. Introduction

Knee joint surgery is a treatment for knee joint diseases. It is a common type of surgery in orthopedics. This surgery will affect the knee joint and its related tissues. After surgery, patients need to take some measures to promote the recovery of knee joint function and restore the joint to normal range of motion, thus reducing the limitation of limb movement [1]. In recent years, great progress has been made in rehabilitation technology, especially traditional Chinese medicine rehabilitation technology, which has important clinical value for the recovery of patients' limb functions, such as massage, acupuncture, etc [2]. Electroacupuncture is a special acupuncture method. Electroacupuncture is used in the early stage of postoperative recovery to stimulate acupoints, promote wound healing, and activate damaged knee joint function [3]. Rehabilitation training usually refers to physical exercise methods. Performing joint function exercises after surgery can stimulate muscle contraction and restore muscle strength on the one hand, and promote the recovery of joint function and restore normal joint flexibility on the other hand [4]. Combined application of electroacupuncture and rehabilitation training in patients after knee joint surgery can effectively promote the recovery of quadriceps muscle strength. This article aims to study and analyze the effect of electroacupuncture combined with rehabilitation training on the recovery of quadriceps femoris muscle strength after knee joint surgery.

2. General information and methods

2.1. General information

60 cases of knee surgery patients admitted to the rehabilitation department of our hospital from May 2021 to May 2023 were selected as the research objects, and divided into the study group and the control group by using the lottery method with odd and even numbers, with 30 patients in each group. In the study group, there were 19 males and 11 females, aged 39–64 years old, with an average age of 51.24±0.76. In the control group, there were 20 males and 10 females, aged 38–64 years, with an average age of 51.43±0.65. There was no statistically significant difference ($P > 0.05$) in general information such as gender and age between the groups.

Inclusion criteria included patients after knee joint surgery, patients with informed consent, patients with normal cognitive function, and patients undergoing knee surgery for the first time.

Exclusion criteria were patients with mental illness, patients with severe cardiovascular and cerebrovascular diseases, patients with fractures in other parts, and patients with distant metastasis of malignant tumors.

2.2. Methods

The control group underwent rehabilitation training, during which the patients were taught to do closed-chain exercises such as leggings, squats, and pedal bicycles, and then performed isometric quadriceps contraction exercises. 10 actions were taken as a group, and 2–3 groups were performed every day. This was continued for 14 days.

The study group received electroacupuncture and rehabilitation training. Electrothermal acupuncture was done at 2.7Hz frequency with continuous fluctuation, the intensity should be controlled until the muscle contraction is observed, and Zusanli, Liangqiu, Futu, Dubi, and other acupoints were selected. The patient was asked to lie down, the acupoints were disinfected, and punctured with a 1.5-inch needle once a day for 20 minutes. Rehabilitation training is the same as above. These were continued for 14 days.

2.3. Observation indicators

The indicators below were observed in the two groups.

(1) The functional recovery of the knee joint was compared between the groups, and the Hospital for Special Surgery (HSS) score was used to evaluate the recovery, including function, muscle strength, flexion deformity, range of motion, and stability, with a total score of 100 points.
(2) The 60°/s isokinetic muscle strength test was compared between the groups, and isokinetic muscle strength indicators were measured, including PT (peak torque), TW (total work), and AP (Average Power).
(3) The rehabilitation effects between the groups were compared, including markedly effective (disappearance of joint symptoms and functional recovery), effective (almost complete recovery of function, but mild symptoms), and ineffective (severe impairment of joint function and muscle strength, with obvious symptoms).

2.4. Statistical analysis

SPSS21.0 statistical software was selected to process and analyze the data, the count data were expressed by the number of cases (n) and percentage (%), the x^2 test was implemented, the measurement data were expressed by the mean ± standard deviation (SD), and the t test was implemented, $P < 0.05$ were considered statistically significant.

3. Results

3.1. Comparing the recovery of knee joint function

Before recovery, there was no statistically significant difference in function, muscle strength, flexion deformity, range of motion, stability, and other knee joint function recovery indicators between the groups ($P > 0.05$). After recovery, knee joint function recovery indicators in the study group, such as function, muscle strength, flexion deformity, range of motion, stability, and other indicators were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). These are presented in **Table 1**.

Table 1. Comparison of knee joint function recovery between groups (mean ± SD)

Group	Function		Muscle strength		Flexion deformity		Range of motion		Stability	
	Before recovery	After recovery	Before recovery	After recovery	Before recovery	After recovery	Before recovery	After recovery	Before recovery	After recovery
Study group (n = 30)	10.57±2.51	25.78±1.54	4.31±1.28	9.85±1.55	4.31±1.85	9.57±1.26	3.89±1.24	9.66±1.42	8.31±1.27	19.57±1.22
Control group (n = 30)	10.65±2.42	22.57±1.96	4.42±1.35	7.46±1.24	4.52±1.74	7.44±1.35	3.78±1.31	7.28±1.36	8.35±1.33	17.24±1.32
t value	0.1256	7.0535	0.3238	6.5948	0.4528	6.3176	0.3340	6.6298	0.1191	7.1000
P value	0.9044	0.0000	0.7472	0.0000	0.6523	0.0000	0.7396	0.0000	0.9056	0.0000

3.2. Comparing the 60°/s isokinetic muscle strength test

Before recovery, the PT, TW, and AP at 60°/s isokinetic muscle strength tests of the two groups were compared, and the difference was not statistically significant ($P > 0.05$). After recovery, the PT, TW, and AP at 60°/s isokinetic muscle strength tests of the study group were significantly higher than those of the control group, and the difference was statistically significant ($P < 0.05$). The results are shown in **Table 2**.

Table 2. Comparison of 60°/s isokinetic muscle strength test between groups (mean ± SD)

Group	PT (kgm)		TW (Nm)		AP (W)	
	Before recovery	After recovery	Before recovery	After recovery	Before recovery	After recovery
Study group (n = 30)	45.21±5.21	61.27±4.52	430.51±7.32	497.58±7.23	24.61±5.37	37.61±4.31
Control group (n = 30)	45.36±5.46	52.48±5.61	430.52±7.55	444.21±6.59	24.75±5.63	28.47±4.51
t value	0.1088	6.6827	0.0052	29.8813	0.0985	8.0249
P value	0.9137	0.0000	0.9959	0.0000	0.9218	0.0000

3.3. Comparing the recovery effect

The recovery effect of the study group was significantly higher than that of the control group, the difference was statistically significant ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of the effective rate of recovery among the groups [n (%)]

Group	Markedly effective	Effective	Ineffective	Total recovery effect
Study group (n = 30)	19 (63.33)	11 (36.67)	0 (0.00)	30 (100.00)
Control group (n = 30)	15 (50.00)	11 (36.67)	4 (13.33)	26 (86.67)
x^2 value	-	-	-	4.2857
P value	-	-	-	0.0384

4. Discussion

The knee joint is the most complex joint, and it is easily damaged during exercise. Mild cases can be treated conservatively, while severe cases require surgical treatment [5]. Knee joint surgery is a large-scale operation, which will cause damage to human tissue during the operation, and requires long-term immobilization of the patient after the operation, thus the muscle function is likely to decline, which will cause joint dysfunction [6]. The quadriceps is an important muscle group of the knee joint. It is the largest and most powerful muscle. Poor recovery of this muscle will directly affect the function of the lower limbs. Therefore, the rehabilitation of patients after knee joint surgery is very important [7]. In Chinese medicine, joint damage is regarded as damage caused by blocked meridians, and poor *qi* and blood. Electroacupuncture is a new type of acupuncture based on traditional acupuncture and uses the principle of electric pulses to apply electroacupuncture to acupuncture points in order to stimulate blood flow and dredge the meridians [8,9]. Under the action of electric current, the capillaries will gradually expand after stimulation, which will speed up circulation, provide blood supply to joints and nearby muscles, and also eliminate local hematoma and relieve pain [10,11]. Rehabilitation training is mainly aimed at exercising limb functions, activating and exercising the quadriceps, promoting the recovery of muscle function, restoring the original range of motion of the knee joint, reducing the adhesion between ligaments, strengthening muscle strength, effectively preventing muscle pain, and strengthening muscle control [12,13]. The combination of electroacupuncture and rehabilitation training stimulates the muscles from the inside out, which can not only promote the recovery of joints and muscles, but also effectively prevent the occurrence of joint deformities and protect the normal physiological structure of joints, which has a certain value to the rehabilitation of patients after surgery [14,15].

Before recovery, there was no statistically significant difference ($P > 0.05$) in the recovery indexes of knee joint function such as function, muscle strength, flexion deformity, range of motion, and stability between the groups. After recovery, the function, muscle knee joint function recovery indicators such as strength, flexion

deformity, range of motion, and stability in the study group were significantly better than those in the control group, and the difference was statistically significant ($P < 0.05$). Before recovery, the PT, TW, and AP at 60°/s isokinetic muscle strength tests of the two groups were compared, and the difference was not statistically significant ($P > 0.05$). After recovery, the PT, TW, and AP at 60°/s isokinetic muscle strength tests of the study group were significantly higher than those of the control group, the difference was statistically significant ($P < 0.05$). The recovery effect of the study group was significantly higher than that of the control group, the difference was statistically significant ($P < 0.05$). Under the implementation of electroacupuncture combined with rehabilitation training, the recovery of joint function in patients is more ideal, the degree of recovery of quadriceps muscle strength is more significant, and the overall recovery effect is better. The application of this program in patients after knee joint surgery has achieved high clinical value and is significant in the recovery of quadriceps muscle strength.

In summary, the application of electroacupuncture combined with rehabilitation training after knee joint surgery can promote the recovery of quadriceps muscle strength and improve knee joint function. This rehabilitation program is worthy of wide application in clinical practice.

Disclosure statement

The author declares no conflict of interest.

References

[1] Huang W, Hu L, Luo L, et al., 2023, Effects of Conventional Muscle Strength Rehabilitation Training Combined with Blood Flow Restriction Training on Knee Joint Function, Quadriceps Femoris Function and Balance Function in Patients After Anterior Cruciate Ligament Reconstruction. Modern Biomedicine Progress, 23(10): 1929–1933.

[2] Zuo H, Geng Z, Chen P, et al., 2023, Meta-Analysis of Blood Flow Restriction Training on Knee Joint Function Recovery in Patients with Anterior Cruciate Ligament Reconstruction. Chinese Tissue Engineering Research, 28(12): 1962–1968.

[3] Fan X, Wang Y, Cao X, et al., 2023, Observation on the Curative Effect of Acupuncture Combined with Rehabilitation Training in the Treatment of Quadriceps Femoris Atrophy After Anterior Cruciate Ligament Reconstruction. Shanghai Journal of Acupuncture and Moxibustion, 42(03): 294–299.

[4] Yang M, Liu Q, Xiong X, et al., 2023, Effect of Rehabilitation Therapy Combined with Isokinetic Muscle Strength Training on Knee Joint Function in Patients After Total Knee Arthroplasty. Journal of Xinxiang Medical College, 40(03): 230–233.

[5] Peng J, Cai L, Wu Y, 2022, Effects of Isokinetic Muscle Strength Training Combined with Lower Extremity Blood Flow Restriction Technique on Quadriceps Muscle Circumference, Muscle Strength and Knee Joint Function After Anterior Cruciate Ligament Reconstruction. Zhongwai Medical Research, 20(31): 106–109.

[6] Zhang L, Gao H, Wang J, et al., 2023, Accelerated Rehabilitation of Quadriceps Femoris Function in Patients After Total Knee Arthroplasty with Combined Tendon and Bone Manipulation. Chinese Tissue Engineering Research, 27(09): 1383–1389.

[7] Yu Z, Luo J, Xu G, 2020, Clinical Application of Improved Static Quadriceps Muscle Contraction Training Device in Supine Position in Patients with Knee Osteoarthritis. Contemporary Medicine, 26(24): 135–137.

[8] Tian X, Sun Y, Xu T, et al., 2021, Observation on the Application Effect of Pressurization Training and Low Load Resistance Training in Rehabilitation After Total Knee Arthroplasty. Chinese Journal of Bone and Joint Injuries, 36(12): 1312–1314.

[9] Xue Z, Liu Z, Wang Q, 2021, Efficacy of Comprehensive Rehabilitation of Traditional Chinese Medicine in the Treatment of Knee Osteoarthritis and its Impact on Bone Joint Function and Bone Metabolism. Laboratory Medicine and Clinic, 18(20): 2976–2980.

[10] Xu L, Hu L, Wei X, et al., 2021, Application Value of Ultrasound-Guided Continuous Adductor Canal Block Combined with Posterior Capsule Space Block in Elderly Patients with Total Knee Arthroplasty. Clinical Military Medical Journal, 49(08): 876–879.

[11] Gao Y, Chen L, Jiang W, et al., 2020, Effect of Different Concentrations of Ropivacaine Adductor Canal Block on Analgesic Effect and Quadriceps Muscle Strength After Total Knee Arthroplasty. Journal of Clinical Anesthesiology, 36(11): 1055–1058.

[12] Zhang Y, 2020, Analysis of the Curative Effect of Sanqi Xuejie Capsules Combined with Traditional Chinese Medicine Acupuncture and Moxibustion on Functional Rehabilitation of Knee Meniscus Injury After Arthroscopic Plasty. Chinese and Foreign Medical Research, 18(16): 27–29.

[13] Feng K, Shao M, Li F, et al., 2020, Effect of Ultrasound-Guided Continuous Femoral Nerve Block on Analgesia and Rapid Recovery in Patients Undergoing Total Knee Arthroplasty for Bone Tumors Around the Knee Joint. Tumor Prevention and Treatment, 33(02): 154–158.

[14] Lu L, Sheng Y, Zhang L, et al., 2018, Based on the Isokinetic Muscle Strength Test, the Clinical Effect of Electroacupuncture at Different Frequencies on Functional Rehabilitation After Knee Arthroscopic Reconstruction of the Anterior Cruciate Ligament. Journal of Hunan University of Traditional Chinese Medicine, 38(09): 1073–1076.

[15] Ding L, Chen Y, Gu L, et al., 2018, Observation on the Effect of Laser Therapy Combined with Rehabilitation Training on Promoting Joint Function Recovery After Tibial Plateau Fractures. Chinese Journal of Bone and Joint Injuries, 33(02): 176–177.

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Application of Unilateral Double-Channel Endoscopic Lamina Fenestration Decompression in Lumbar Spinal Stenosis

Bo Wei*

Taizhou City Hospital of Traditional Chinese and Western Medicine, Taizhou 225300, Jiangsu Province, China

***Corresponding author:** Bo Wei, 15951175462@163.com

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Abstract: *Objective:* This paper aims to observe and explore the application effect of unilateral double-channel endoscopic lamina fenestration decompression in the clinical treatment of patients with lumbar spinal stenosis. *Methods:* The study period is from January 2020 to December 2022, 60 patients with lumbar spinal stenosis were recruited and divided into the control group (traditional interlaminar fenestration) and the study group (unilateral double-channel endoscopic lamina fenestration decompression) according to the method of coin tossing, with 30 cases in each group. The operation time, perioperative blood loss, incision diameter, total hospitalization time, postoperative complications, Japanese Orthopedic Association (JOA), Numerical Rating Scale (NRS) pain score, and excellent rate of lumbar recovery were compared. *Results:* The operation time of the study group was longer than that of the control group, the amount of perioperative blood loss was lower than that of the control group, the incision diameter was smaller than that of the control group, and the total hospitalization time was shorter than that of the control group ($P < 0.05$). Postoperative complications such as dural tear, cerebrospinal fluid leakage, infection, and paravertebral muscle injury in the study group were less than those in the control group ($P < 0.05$). The JOA score of the study group was higher than that of the control group, and the NRS score was lower than that of the control group 6 months after operation ($P < 0.05$). The operation effect was evaluated according to the modified MacNab standard 6 months after operation, and the excellent rate of lumbar spine recovery in the study group was higher than that in the control group ($P < 0.05$). *Conclusion:* Unilateral double-channel endoscopic fenestration decompression of the lamina has a definite application effect, it can significantly reduce postoperative complications of lumbar spinal stenosis, and promote the recovery of lumbar spine function. It has the advantages of mild pain, high safety, less bleeding, small incision, and other advantages, which can be recommended in the treatment of lumbar spinal stenosis.

Keywords: Lumbar spinal stenosis; Unilateral dual-channel endoscopy; Decompressive laminectomy; Lumbar function; Pain

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1. Introduction

Lumbar spinal stenosis is a degenerative spinal disease with a risk of disability. It is common in the elderly,

and can cause intermittent claudication and low back pain in patients. Surgical intervention is often used when conservative drug treatment is not effective [1]. However, the paravertebral muscles need to be stripped during conventional open resection, which can easily damage the spinal structure and lead to a decrease in the stability of the lumbar spine [2]. Therefore, in order to make up for the shortcomings of traditional open surgery, clinical medicine has begun to explore minimally invasive spinal surgery treatment options, especially as endoscopic technology is becoming more and more advanced, the decompression of the lamina fenestration based on unilateral dual-channel endoscopic technology is relatively developed. Its advantages of practicability, flexible operation, safety and efficiency, wide operative field, minimally invasive, and less complications have gradually attracted the attention of clinical orthopedic surgeons [3]. Therefore, this study selected 60 patients with lumbar spinal stenosis to observe and explore the application effect of unilateral dual-channel endoscopic lamina fenestration decompression, hoping to provide evidence-based support for promoting the health of patients.

2. Materials and methods

2.1. General information

From January 2020 to December 2022, 60 patients with lumbar spinal stenosis were recruited, and they were divided into the control group (n = 30) and the study group (n = 30) according to the method of coin tossing. The ratio of male to female in the control group was 16:14, the age range was 37–75 years old, with an average of 55.58±7.89 years old. Among them, there were 4 cases of L2–3 segment, 7 cases of L3–4 segment, 11 cases of L4-5 segment, 8 cases of L5–S1 segment. The ratio of male to female in the study group was 15:15, the age range was 38–76 years old, with an average of 55.61±7.87 years old. Among them, there were 3 cases of L2–3 segment, 8 cases of L3–4 segment, 13 cases of L4–5 segment, 6 cases of L5–S1 segment. There was no difference in general data between the two groups ($P > 0.05$).

Inclusion criteria included patients with lumbar spinal stenosis confirmed by imaging examinations, patients with ineffective recovery for more than 12 weeks after conservative treatment, patients who can complete regular follow-up for 6 months after surgery, patients who have given informed consent to this study.

Exclusion criteria were patients with scoliosis, patients with spinal infection, patients with spinal tuberculosis, patients with spinal instability, patients with a history of lumbar spine surgery, patients with malignant tumors and intervertebral discitis, patients with mental illness, patients with hip and knee joints disease, patients with coagulation disorders.

2.2. Methods

In the control group, 30 patients with lumbar spinal stenosis underwent traditional interlaminar fenestration. After successful general anesthesia, the waist and abdomen were suspended in the air to open the interlaminar space. Under the guidance of a C-arm X-ray machine, the responsible intervertebral space was identified. The incision was centered on the tip of the lumbar spinous process (on the responsible intervertebral space), and the skin was cut 0.5–1.0cm beside the spinous process. The length of the incision was 5.0–8.0cm. Then along the fascia, incision was made on the erector spinae of the affected side near the spinous process, the attachment point of the ligamentum flavum on the lower edge of the upper lamina was peeled off, the upper lamina was taken out with forceps to expose the upper edge of the ligamentum flavum, and part of the articular process was osteotomized. The inner edge of the articular process was exposed, and then the inner edge of the outer side of the ligamentum flavum was taken out with forceps. After the ligamentum flavum was cut off, the upper edge of the inferior lamina was taken out with forceps.

In the study group, 30 patients with lumbar spinal stenosis underwent unilateral double-channel endoscopic

lamina fenestration decompression. After successful general anesthesia, the entry points were clearly defined and marked by the C-arm X-ray machine. A positioning pin was placed in the center of the upper edge of the lower plate of the responsible intervertebral space. The double channel was established in the X-ray projection part of the upper and lower pedicle body surface on the same side of the responsible intervertebral space. The incision is 0.5–0.8cm long, and then the probe and light source were inserted through the observation channel, and the instruments were inserted through the operation channel. With the positioning needle as the center, the plasma knife head was used to create a cavity next to the spinous process, 1/2 of the upper and lower lamina was fully exposed, and part of the lamina and part of the articular process were resected (upper boundary: lower 1/3 of the upper cone and plate; lower boundary: lower cone 1/3 of the board; medial border: the root of the spinous process; lateral border: the connection between the inner edge of the upper and lower pedicles). The ligamentum flavum was also resected, the hyperplastic tissue behind the dural sac was cleaned up, the nerve root and dural sac were exposed, and the compression of the nerve roots and the degree of compression of the dural sac were identified, they were released one by one, the intervertebral disc was exposed, and the herniated disc tissue was removed, so that the dura mater and nerve root pulsated well. If the contralateral side is narrow, the bony structure along the root of the spinous process is removed, the ligamentum flavum is taken out with forceps, the contralateral dural sac is exposed, and the contralateral side is treated in the same decompression manner. Standardized hemostasis in the operation area was performed, the operation channel was evacuated, the incision was closed and covered with sterile dressing, and bandaged with pressure.

2.3. Observation indicators

The indicators below were observed for the two groups.

(1) Perioperative indicators including operation time, perioperative blood loss, incision diameter, and total hospitalization time.

(2) Postoperative complications including dural tear, cerebrospinal fluid (CSF) leak, infection, paravertebral muscle injury, etc.

(3) Lumbar function was evaluated by the Japanese Orthopedic Association Evaluation Score (JOA) [4] before operation and 6 months after operation, with a total score of 0–29 points. The better the lumbar function recovery, the higher the evaluation score.

(4) The Numerical Rating Scale (NRS) [5] was used to evaluate the degree of low back pain in patients before operation and 6 months after operation, with a total score of 0–10 points. The lighter the low back pain, the lower the evaluation score.

(5) Excellent rate of lumbar recovery was evaluated. According to the modified MacNab standard [6], the curative effect of the operation was evaluated 6 months after the operation, that is, the symptoms such as claudication, numbness and pain in the lower limbs, low back pain, and other symptoms are absent, and they could carry out normal activities and life, which was judged as “excellent.” Those with relieved symptoms and can carry out basic activities and have little impact on daily life are judged as “good.” Those whose symptoms are not relieved and cannot perform normal activities with daily life greatly affected are judged as “poor.” Among them, the sum of the number of excellent and good cases is the percentage of the total number of cases, which is the excellent and good rate.

2.4. Statistical processing of data

SPSS22.0 software was used to statistically observe the indicators, and the postoperative complications and lumbar spine recovery rate of the two groups of patients were described in the form of [n (%)] and the

difference between the two groups was tested by x^2. Perioperative period indicators, JOA score, NRS score, and other measurement data are described in the form of mean ± standard deviation (SD), and the data difference between groups is tested by t test. When the test result $P < 0.05$, the difference is statistically significant.

3. Results

3.1. Comparison of perioperative indicators

Compared with the control group, the operation time of the study group was slightly longer, but the perioperative blood loss was less, the diameter of the incision was smaller, and the total hospitalization time was shorter. There was a significant difference between the two groups ($P < 0.05$). Perioperative indicators are shown in **Table 1**.

Table 1. Comparison of perioperative indicators between the two groups (mean ± SD)

Group	Operation time (min)	Perioperative blood loss (ml)	Cutting diameter (mm)	Total hospital stay (day)
Study group (n = 30)	72.78 ± 5.96	46.88 ± 5.26	17.65 ± 1.25	7.12 ± 1.38
Control group (n = 30)	55.92 ± 6.04	60.33 ± 5.29	68.74 ± 12.33	9.08 ± 2.24
t	6.756	4.327	9.088	5.124
P	<0.05	<0.05	<0.05	<0.05

3.2. Comparison of postoperative complications

Compared with the control group, the study group had fewer postoperative complications, and the results of the two groups were significantly different ($P < 0.05$). This can be seen in **Table 2**.

Table 2. Comparison of postoperative complications between the two groups [n (%)]

Group	Dural tear	CSF leak	Infection	Paravertebral muscle injury	Total incidence
Study group (n = 30)	1 (3.33)	0	1 (3.33)	2 (6.67)	4 (13.33)
Control group (n = 30)	3 (10.00)	2 (6.67)	5 (16.67)	2 (6.67)	12 (40.00)
x^2	-	-	-	-	6.043
P	-	-	-	-	<0.05

3.3. Comparison of JOA score and NRS score

Before operation, there was no difference in JOA score and NRS score between the two groups. Compared at 6 months after operation, the JOA score of the study group was higher than that of the control group, and the NRS score of the study group was lower than that of the control group ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of JOA score and NRS index between the two groups (mean ± SD)

Group	JOA score		NRS score	
	Preoperative	6 months after operation	Preoperative	6 months after operation
Study group (n = 30)	18.44 ± 2.75	24.33 ± 1.95	5.15 ± 0.74	1.35 ± 0.52
Control group (n = 30)	18.45 ± 2.79	20.21 ± 1.91	5.12 ± 0.75	2.36 ± 0.96
t	0.412	7.534	0.586	4.125
P	>0.05	<0.05	>0.05	<0.05

3.4. Comparison of the excellent rate of lumbar spine recovery

Based on **Table 4**, the excellent rate of lumbar recovery in the study group 6 months after operation was higher than that in the control group ($P < 0.05$).

Table 4. Comparison of good and good rates of lumbar recovery between the two groups [n (%)]

Group	Excellent	Good	Poor	Excellent rate
Study group ($n = 30$)	20 (66.67)	7 (23.33)	3 (10.00)	27 (90.00)
Control group ($n = 30$)	16 (53.33)	5 (16.67)	9 (30.00)	21 (70.00)
x^2	-	-	-	5.130
P	-	-	-	<0.05

4. Discussion

Patients with lumbar spinal stenosis are significantly impacted by the disease, in terms of daily life and work. If conservative intervention fails, surgical treatment is required as soon as possible to prevent the disease from worsening and progressing [7]. Unilateral dual-channel endoscopic fenestration decompression of the lamina is a new type of surgery developed under the concept of modern clinical minimally invasive treatment. It mainly provides corresponding interventions through the establishment of operating channels and observation channels. The dual-channel surgical field is wide and do not interfere with each other [8]. At the same time, the endoscope used in the operation is similar to the arthroscope, and can be applied to each other, which reduces the equipment cost to the greatest extent, and effectively solves the problems of high requirements for surgical equipment, narrow operative field, and limited decompression [9]. In this study, the operation time of the study group was longer than that of the control group, the amount of perioperative blood loss was lower than that of the control group, the incision diameter was smaller than that of the control group, and the total hospitalization time was shorter than that of the control group ($P < 0.05$). The reason may be that unilateral dual-channel endoscopic fenestration decompression of the lamina requires high precision, thus it takes a relatively long time of operation [10]. During the operation, according to the patient's treatment needs, the scope of the endoscopic field of view and the direction of observation are reasonably adjusted, and the whole process of visual decompression operation is performed without operating blind spots. Therefore, unnecessary damage is avoided to a certain extent, the amount of bleeding is reduced, and it is beneficial for patients to recover quickly after surgery ensuring shorter hospital stay [11]. At the same time, 13.33% of postoperative complications such as dural tear, cerebrospinal fluid leakage, infection, and paraspinal muscle injury in the study group were less than 40.00% in the control group ($P < 0.05$). The reason may be that operation under direct vision of the endoscope, full and comprehensive decompression through multi-angle and dual channels, coupled with a wide field of vision, minimizes the trauma to the human body and avoids the occurrence of related complications [12]. Lastly, the JOA score of the study group was higher than that of the control group, and the NRS score was lower than that of the control group 6 months after operation ($P < 0.05$). Since the fenestration and decompression of the lamina under the unilateral dual-channel endoscope has a small opening, there is no need to stretch or peel off the paraspinal muscles during the operation, thus it can reduce the degree of muscle damage and the pain of the patient. Plus, it is beneficial for the patient to get out of bed early after the operation, which accelerates the recovery of lumbar spine function [13]. The operation effect was evaluated according to the modified MacNab standard 6 months after operation, and the excellent and good rate of lumbar spine recovery in the study group (90.00%) was higher than that in the control group (70.00%) ($P < 0.05$). It shows that unilateral double-channel endoscopic lamina fenestration decompression has a reliable therapeutic effect. Chen *et al.* [14] observed and discussed the treatment effect of unilateral dual-channel endoscopic spinal canal decompression in 13 patients

with lumbar spinal stenosis, and the excellent and good rate of the operation was as high as 92.31%. Tuo *et al.* [15] observed and compared the surgical efficacy of 47 patients with lumbar spinal stenosis. The results showed that the excellent and good rate of unilateral dual-channel endoscopic treatment was 90.91%, which was higher than that of traditional intervertebral disc endoscopic treatment (88.00%).

In conclusion, unilateral dual-channel endoscopic fenestration decompression surgery has a definite curative effect as well as significant advantages for patients with lumbar intervertebral stenosis. It can reduce postoperative complications, improve lumbar function, with the advantages of less pain, less bleeding, and smaller incisions, which is worthy of wide application in clinical practice.

Disclosure statement

The author declares no conflict of interest.

References

[1] Dong W, Chen Q, 2019, Analysis of Population Characteristics of Lumbar Degenerative Diseases Among Ethnic Minorities in Dali Area. Hainan Medicine, 30(05): 569–571.

[2] Xu S, Zhang J, Xing J, et al., 2022, Comparison of the Short-Term Efficacy of Unilateral Dual-Channel Endoscopy and Transforaminal Endoscopy in the Treatment of Lumbar Spinal Stenosis. Chinese Journal of Minimally Invasive Surgery, 22(09): 712–716.

[3] Lu H, Hu P, Tian L, et al., 2022, Comparison of Unilateral and Bilateral Decompression Under Unilateral Dual-Channel Endoscopy for Lumbar Spinal Stenosis. Chinese Journal of Orthopedic Surgery, 30(18): 1643–1647.

[4] Sun B, Che X, 2012, Evaluation and Treatment of Japanese Orthopedic Association (JOA score). Chinese Journal of Neurosurgery, 28(06): 623–623.

[5] Li C, Zhang W, Fan B, 2016, Comparison of Numerical Scale (NRS) and Verbal Scale (VRS) in Elderly Patients with Chronic Pain. Chinese Journal of Pain Medicine, 2016(09): 683–686.

[6] Su B, Luan S, Sun L, et al., 2022, Unilateral Dual-Channel Endoscopic Treatment of Double-Segment Lumbar Spinal Stenosis. Chinese Journal of Orthopedic Surgery, 30(16): 1508–1511.

[7] Huang Y, Luo S, Liang G, 2019, A Meta-Analysis of the Clinical Efficacy of Simple Decompression and Decompression Fusion in the Treatment of Lumbar Spinal Stenosis. Journal of Guangxi Medical University, 36(06): 929–934.

[8] Fan L, Ma Y, Luo Y, et al., 2022, Research Progress of Unilateral Dual-Channel Spinal Endoscopy in the Treatment of Lumbar Spinal Stenosis. Chinese Journal of Orthopedics and Traumatology, 30(09): 82–88.

[9] Jiang C, Huang Y, Zuo H, et al., 2022, Early Clinical Efficacy of Unilateral Dual-Channel Endoscopic Lumbar Fusion and Minimally Invasive Transforaminal Lumbar Fusion in the Treatment of Single-Segment Lumbar Spinal Stenosis with Instability. Chinese Academy of Medical Sciences, 44(04): 563–569.

[10] Ma M, Ma Z, Wang Y, et al., 2022, Single-Axis Endoscopic Decompression - Double-Channel Endoscopic Visual Lumbar Fusion in the Treatment of Lumbar Spinal Stenosis Combined with Lumbar Instability. Chinese Journal of Bone and Joint Injuries, 37(07): 686–690.

[11] Hu Q, Xie S, Sun L, et al., 2022, Clinical Efficacy Analysis of Unilateral Dual-Channel Endoscopy in the Treatment of Lumbar Spinal Stenosis. Journal of Practical Orthopedics, 28(06): 533–536.

[12] Chen T, Cheng Z, Zhang C, 2022, Application Progress and Thinking of Unilateral Dual-Channel Spinal Endoscopy in the Treatment of Lumbar Spinal Stenosis. Massage and Rehabilitation Medicine, 13(11): 70–73.

[13] Pan Y, Shi C, Sun H, 2022, Clinical Efficacy and Long-Term Safety Evaluation of Different Surgical Methods for the

Treatment of Degenerative Lumbar Scoliosis and Lumbar Spinal Stenosis. Chinese Journal of Gerontology, 42(09): 2147–2150.

[14] Chen T, Wang Q, Zhang C, et al., 2021, Observation on the Curative Effect of Spinal Canal Decompression Under Unilateral Dual-Channel Endoscopic Technique in the Treatment of Lumbar Spinal Stenosis. Chinese Journal of Bone and Joint Injuries, 36(09): 905–908.

[15] Tuo W, Zhou L, Liu D, et al., 2021, A Preliminary Study on the Treatment of Lumbar Spinal Stenosis with Unilateral Dual-Channel Endoscopy. Chinese Journal of Minimally Invasive Surgery, 21(01): 56–60.

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Clinical Analysis of Minimally Invasive Arthroscopic Surgery in the Treatment of Knee Osteoarthritis

Hongwei Shao, Aiqun Gu, Qirong Shuai, Feng Li, Ying Lu, Min Shen*

Taizhou City Hospital of Traditional Chinese and Western Medicine, Taizhou 225300, Jiangsu Province, China

***Corresponding author:** Min Shen, shw_20008@126.com

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Abstract: *Objective:* This paper aims to analyze the effect of minimally invasive arthroscopic surgery on knee osteoarthritis (KOA). *Methods:* A total of 60 patients with KOA admitted to the hospital between January 2021 and February 2023 were selected. They were divided into two groups by table of random numbers, 30 cases in the study group were treated with minimally invasive arthroscopic surgery, and 30 cases in the control group were treated conservatively. The treatment effects of the groups were compared. *Results:* The total effective rate of the study group was higher than that of the control group ($P < 0.05$). Before treatment, there was no difference in knee joint function scores between the groups ($P > 0.05$). After treatment, the knee joint function score in the study group was higher than that in the control group ($P < 0.05$). The complication rate and recurrence rate in the study group were lower than those in the control group ($P < 0.05$). *Conclusion:* Minimally invasive arthroscopic surgery for KOA patients can improve the overall curative effect, significantly restore knee joint function, and reduce complications and recurrence.

Keywords: Minimally invasive arthroscopic surgery; Knee osteoarthritis; Knee function score; Complications

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1. Introduction

Knee osteoarthritis (KOA) is a chronic joint disease with a high incidence rate. The etiology is knee cartilage degeneration and articular surface wear, and the symptoms are knee joint pain, stiffness, and dysfunction [1]. Treatment for this condition varies and includes conservative treatment (drug therapy, physical therapy, injections) and surgery. Among them, conservative treatment has the advantages of less pain and high patient compliance. However, its long-term recurrence rate is high, and it has significant treatment limitations, thus other treatment methods are needed [2]. Minimally invasive arthroscopic surgery is a new treatment method, which can use small incisions to insert arthroscopic and minimally invasive surgical instruments to directly observe and treat knee joint lesions, which has significant therapeutic advantages [3]. Therefore, this study selected 60 patients with KOA to analyze the therapeutic effect of minimally invasive arthroscopic surgery.

2. Materials and methods

2.1. General information

A total of 60 patients with KOA admitted to the hospital between January 2021 and February 2023 were selected. Table of random numbers was used to divide them into study group and control group. There were 30 cases in the study group, with 19 male and 11 female, the age ranged from 51 to 72 years old, with a mean age of 28.65±2.17. Their course of disease ranged from 2 to 11 years, with a mean of 6.42±1.08 years. Among them, 15 cases were in the right knee, 9 cases in the left knee, and 6 cases in both knees. There were 30 cases in the control group, with 18 male and 12 female, the age ranged from 50 to 74 years old, with an average of 28.71±2.55 years old. Their course of disease ranged from 3 to 12 years, with an average of 6.81±1.34 years. Among them, there were 14 cases in the right knee, 10 cases in the left knee, and 6 cases in both knees. After the data were compared, it was recorded as $P > 0.05$.

2.2. Methods

The study group was treated with minimally invasive arthroscopic surgery. The patient was asked to stay in the supine position, combined with spinal epidural anesthesia, and a tourniquet was tied on the thigh of the affected side. An arthroscope is placed into the incision to detect the condition of the knee joint, observe the suprapatellar bursa, patellar joint, and meniscus, and after determining the location of cartilage damage, the damaged area was grinded and trimmed. The joint loose bodies and inflammatory synovium were removed, meniscal diseased areas were trimmed and polished, and bone spurs were removed. If the movement of the patellar joint is limited, the ligament is released, and the patellar joint is fully flushed with sodium chloride solution (0.9%) to ensure that the pain-causing substances are completely removed. Then it is pressurized and bandaged, and the patient was instructed to take oral antibiotics.

The control group received conservative treatment. The affected knee area was disinfected, local infiltration anesthesia was done by using an appropriate amount of lidocaine (10%), 2ml of sodium hyaluronate was taken for injection treatment, once a week for 5 consecutive weeks, anti-inflammatory drugs and pain relievers were prohibited.

2.3. Observation indicators

The New York Hospital for Special Surgery-Scoring System (HSS) was used to evaluate knee joint function, including pain (record 30 points), muscle strength (record 10 points), function (record 22 points), activity (record 18 points), knee flexion deformity (record 10 points), and stability (record 10 points), a total of 100 points positive scoring.

Observation of joint hematoma, intestinal reaction, infection, and other complications in the groups was also performed. The patients were followed-up for 1 to 6 months to evaluate the recurrence rate of the disease. The recurrence criteria were continuous knee pain, abnormal articular cartilage, osteophyte, or synovial hyperplasia on MRI examination.

2.4. Efficacy evaluation criteria

“Basic cure” means no pain and other symptoms, and the knee joint can move freely. “Significant improvement” means slight pain and limp. “Preliminary improvement” means more obvious pain and limp. “No improvement” means severe pain and limp, and the condition remains unchanged.

2.5. Statistical analysis

The data were processed by using SPSS28.0 software, the measured values were compared and tested by *t*

value, and the counted values were compared and tested by x^2 value. Statistically significant was defined as P value less than 0.05.

3. Results

3.1. Comparison of the total effective rate

The total effective rate of the study group was significantly higher than that of the control group ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of total effective rate between the two groups [n (%)]

Group	Basic cure	Significant improvement	Preliminary improvement	No improvement	Total effective rate
Study group ($n = 30$)	18 (60.00)	8 (26.67)	3 (10.00)	1 (3.33)	96.67 (29/30)
Control group ($n = 30$)	11 (36.67)	7 (23.33)	5 (16.67)	7 (23.33)	76.67 (23/30)
x^2	-	-	-	-	5.192
P	-	-	-	-	0.023

3.2. Comparison of knee joint function scores

Before treatment, there was no difference in knee joint function scores between the groups ($P > 0.05$). After treatment, the functional score of the study group was significantly higher than that of the control group ($P < 0.05$), as presented in **Table 2**.

Table 2. Comparison of knee joint function scores between the two groups (mean ± standard deviation/min)

Group	Pain		Muscle strength		Function		Activity		Knee deformity		Stability	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group ($n = 30$)	15.32±2.62	22.68±3.75	5.23±0.75	8.16±0.94	12.36±2.88	18.65±1.74	10.23±1.54	15.32±1.64	4.26±0.88	7.29±1.22	4.16±0.82	7.95±0.97
Control group ($n = 30$)	15.39±2.71	18.26±3.62	5.26±0.77	7.02±0.91	12.40±2.89	15.08±1.66	10.29±1.55	13.22±1.50	4.30±0.81	6.07±1.17	4.11±0.80	5.98±0.91
t	0.102	4.645	0.153	4.773	0.054	8.131	0.150	5.175	0.183	3.953	0.239	8.113
P	0.919	0.000	0.879	0.000	0.957	0.000	0.881	0.000	0.855	0.000	0.812	0.000

3.3. Comparison of complication rates

Based on **Table 3**, the complication rate in the study group was significantly lower than that in the control group ($P < 0.05$).

Table 3. Comparison of complication rates between the two groups [n (%)]

Group	Arthrodesis	Gut reaction	Infection	Incidence rate
Study group ($n = 30$)	1 (3.33)	1 (3.33)	0	6.67 (2/30)
Control group ($n = 30$)	3 (10.00)	3 (10.00)	2 (6.67)	26.67 (8/30)
x^2	-	-	-	4.320
P	-	-	-	0.038

3.4. Comparison of recurrence rates

During the follow-up of 1 to 6 months, the recurrence rate of the study group was lower than that of the control group ($P < 0.05$), as displayed in **Table 4**.

Table 4. Comparison of recurrence rates between the two groups [n (%)]

Group	Follow-up for 1 month	Follow-up for 2 months	Follow-up for 3 months	Follow-up for 4 months	Follow-up for 5 months	Follow-up for 6 months
Study group (n = 30)	0	0	1 (3.33)	1 (3.33)	1 (3.33)	2 (6.67)
Control group (n = 30)	4 (13.33)	4 (13.33)	6 (20.00)	7 (23.33)	7 (23.33)	8 (26.67)
x^2	4.286	4.286	4.043	5.192	5.192	4.320
P	0.038	0.038	0.044	0.023	0.023	0.038

4. Discussion

KOA is a common chronic and degenerative joint disease, and its pathogenic factors are complex. For example, aging will cause gradual thinning and degeneration of articular cartilage, which will lead to KOA [4]. The knee joint is subjected to high load for a long time, or repeated use, such as standing for a long time, high-intensity exercise, carrying heavy objects, etc., will also increase the risk of the disease. In addition, a history of serious injury to the knee joint such as fracture or meniscus injury can lead to articular cartilage lesions, which then progress into KOA [5]. The typical symptoms of the disease are joint pain, and the pain becomes worse after activity or prolonged weight carrying. Painful symptoms persist as the disease progresses. Joint stiffness and swelling are common symptoms of this disease, and these are accompanied by structural changes or severe wear of knee articular cartilage in some patients, and there may be dysfunction in going up and down the stairs or walking [6].

Sodium hyaluronate injection is a common treatment for this disease [7]. Sodium hyaluronate is a high-molecular-weight polysaccharide naturally present in joint fluid, which can form a thick lubricating film in joints, reduce joint friction, and improve joint lubrication. By lubricating the joints, the drug can increase the range of motion of the joints, thereby improving the mobility of the patient's knee joints and restoring their self-care abilities such as walking, and going up and down stairs [8]. More importantly, although sodium hyaluronate cannot restore the damaged cartilage structure, it can inhibit inflammatory response, regulate joint stability, and delay the degeneration of articular cartilage. However, long-term injection of sodium hyaluronate may lead to joint hematoma or intestinal reactions, and even drug dependence, and the dosage needs to be increased to maintain the therapeutic effect.

Minimally invasive arthroscopic surgery is an ideal treatment for this disease. It can directly observe and remove the inflammatory tissue in the joint, reduce the inflammatory response, and relieve symptoms such as joint pain and swelling [9,10]. In arthroscopic surgery, doctors can repair or trim the articular cartilage to reduce the damaged surface of the cartilage and improve joint function. Minimally invasive arthroscopic surgery can clean and repair the synovial tissue in the joint, promote the production of synovial fluid, thereby improving the lubrication function of the joint, reducing the friction between the joints, and relieving joint pain [11]. In addition, the irregular bone surface and cartilage fragments need to be removed during the operation to avoid infection caused by stimulation of the bone surface or fragments, thus the success rate of the operation is high and the recurrence rate is low. The advantages of this surgical method are minimally invasive and high accuracy. In this minimally invasive surgery, arthroscopes and surgical instruments are placed through small incisions, thus avoiding large incisions and tissue damage in traditional open surgery, which can reduce surgical trauma and shorten postoperative recovery time [12]. In addition, doctors can observe the intra-articular lesions through the arthroscopic lens, to clearly locate and accurately treat the lesion, thereby reducing the risk of tissue damage [13].

The results showed that the total effective rate of the study group was higher than that of the control group.

After treatment, the knee function score of the study group was higher than that of the control group, and the complication rate and recurrence rate of the study group were lower than those of the control group ($P < 0.05$). The reason is that arthroscopic surgery can accurately locate and treat knee articular cartilage damage, bone spurs, and joint loose bodies during the operation, and completely remove the diseased tissue, hence the total effective rate is high [14]. Spinal and epidural anesthesia before the operation can ensure a smooth operation and improve the patient's surgical tolerance. In addition, the surgical operation has the advantages of standardization and high precision, thus there are fewer postoperative complications. After the operation, the patient can resume activities in a short period of time, and then carry out early rehabilitation training, hence the patient's knee joint function score is excellent [15]. In addition, this surgical method can carry out individualized treatment according to the specific lesion of the patient, and the surgical plan can be flexibly adjusted based on the degree of lesion observed by arthroscopy during the operation. Therefore, the surgical flexibility and pertinence are strong, it can completely treat the disease with less long-term recurrence.

In summary, minimally invasive arthroscopic surgery can be used as a routine surgery for patients with KOA. It can effectively improve the curative effect of surgery and maximize the recovery of knee joint function. It is also safe and beneficial, and less prone to adverse events such as disease recurrence. Surgical practicality and feasibility are high, thus it can be applied in clinical practice for the treatment of KOA.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Yu S, Li H, Kuang C, et al., 2022, Comparison of Curative Effect Between Arthroscopic Surgery and Extracorporeal Shock Wave in the Treatment of Knee Osteoarthritis. Chinese Journal of Physical Medicine and Rehabilitation, 44(4): 334–337.

[2] Wei M, Li H, Yin D, et al., 2020, Extracorporeal Shock Wave Combined with Arthroscopy in the Treatment of Knee Osteoarthritis. Chinese Journal of Orthopedic Surgery, 28(7): 607–612.

[3] Lu L, Zhang H, Wang Z, et al., 2019, Clinical Research on Knee Arthroscopic Limited Debridement in the Treatment of Knee Osteoarthritis. South China National Defense Medical Journal, 33(11): 767–770.

[4] Bai X, Xu L, Mei S, et al., 2019, Arthroscopic Debridement Combined with Intra-Articular Injection in the Treatment of Knee Osteoarthritis. Journal of Clinical Orthopedics, 22(2): 252–252.

[5] Lu Q, Li L, Zhou Z, et al., 2021, Analysis of Curative Effect of Arthroscopic Cleaning Combined with Platelet-Rich Plasma Injection in the Treatment of Knee Osteoarthritis. Laboratory Medicine and Clinic, 18(13): 1915–1918.

[6] Zhang X, Bai B, Cui W, et al., 2023, Evaluation of the Effect of Transfibular Osteotomy Combined with Arthroscopic Knee Debridement in Patients with Knee Osteoarthritis. Chinese Journal of Physician Training, 46(5): 395–400.

[7] Zhang L, Gao W, Du B, 2019, Efficacy of Juanbi Jianxi Formula Combined with Arthroscopic Surgery on Knee Osteoarthritis. Journal of Bengbu Medical College, 44(2): 202–204.

[8] Ye F, Xie K, Liu Y, 2019, Clinical Research on "Fengsheng Characteristic Manipulation" Combined with Arthroscopic Debridement in the Treatment of Severe Knee Osteoarthritis. Chinese Journal of Traditional Chinese Medicine Information, 26(8): 30–34.

[9] Zhao P, Cheng J, Geng J, et al., 2019, Comparison of Early Clinical Efficacy of Three Surgical Methods in the Treatment of Medial Compartment Osteoarthritis of the Knee Joint. Journal of Wannan Medical College, 38(3): 254–257.

[10] Zhang M, Peng X, Tang R, 2022, Effect of Fibula Osteotomy Combined with Arthroscopic Microfracture on Joint Function and Quality of Life in Patients with Knee Osteoarthritis. Journal of Clinical and Experimental Medicine, 21(2): 171–174.

[11] Zhao K, Luo X, Yan L, et al., 2022, Analysis of Curative Effect of Open Wedge High Tibial Osteotomy Combined with Arthroscopic Surgery in the Treatment of Medial Compartment Knee Osteoarthritis. Chinese Journal of Bone and Joint Injury, 37(10): 1032–1036.

[12] Lu S, Zhang J, 2022, Analysis of the Role of Femoral Nerve + Sciatic + Lateral Femoral Cutaneous Nerve Block in Arthroscopic Surgery for Knee Osteoarthritis. Chinese Journal of Endoscopy, 28(12): 7–13.

[13] Liu N, Wei H, Tian X, et al., 2023, Clinical Observation of Arthroscopic Debridement Combined with High Tibial Osteotomy in the Treatment of Early Varus Knee Osteoarthritis. Clinical Misdiagnosis and Mistreatment, 36(2): 85–89.

[14] Li X, Qin H, Tan H, 2020, Observation on Curative Effect of Arthroscopic Debridement of Proximal Fibular Osteotomy Combined with Platelet-Rich Plasma in the Treatment of knee Osteoarthritis. Chinese Journal of Bone and Joint Injury, 35(12): 1299–1301.

[15] Chen K, Zhou S, Cheng Y, 2021, Efficacy of Huoxue Xiaozhong Decoction Combined with Arthroscopic Debridement in the Treatment of Knee Osteoarthritis and its Impact on Joint Function. Modern Journal of Integrated Traditional Chinese and Western Medicine, 30(9): 999–1001.

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Observation on the Effect of Shentong Zhuyu Decoction Combined with Acupotomy Lysis in the Treatment of Sciatica Caused by Lumbar Disc Herniation

Wei Qiu*

Jiayuguan Hospital of Traditional Chinese Medicine, Jiayuguan 735100, Gansu Province, China

***Corresponding author:** Wei Qiu, 19358055133@163.com

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Abstract: *Objective:* This paper aims to observe the curative effect of Shentong Zhuyu Decoction combined with acupotomy lysis in patients with lumbar disc herniation and sciatica. *Methods:* 72 patients with lumbar disc herniation and sciatica who were treated from March 2022 to March 2023 were randomly divided into two groups. The study group was treated with Shentong Zhuyu Decoction combined with acupotomy lysis, and the control group was treated with acupotomy lysis. The patients' walking ability, lumbar pain, lumbar function, quality of life, and complications were compared. *Results:* The walking ability indexes of the study group were better than those of the control group ($P < 0.05$). The visual analogue scale (VAS) and Oswestry disability index (ODI) of the study group were lower than those of the control group, and the Japanese orthopedic association score (JOA) was higher than that of the control group ($P < 0.05$). The quality of life scale using 36-item short-form (SF-36) survey in the study group was higher than that in the control group ($P < 0.05$). The complication rate of lumbar disc herniation in the study group was lower than that in the control group ($P < 0.05$). *Conclusion:* Shentong Zhuyu Decoction combined with acupotomy lysis can improve lumbar function, relieve pain, and restore walking ability in patients with lumbar disc herniation and sciatica, which is a highly effective and feasible treatment with great clinical value.

Keywords: Lumbar intervertebral disc herniation; Sciatica; Shentong Zhuyu decoction; Acupotomy lysis; Curative effect

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1. Introduction

There are many complications of lumbar disc herniation, one of which is sciatica. Sciatica is related to the increased pressure on the nerve root which is transmitted to the sciatic nerve pathway, causing patients to experience persistent pain in the calf, thigh, and buttocks, which has a great impact on physical function. Scholars of traditional Chinese medicine believe that sciatica after lumbar disc herniation is related to liver and kidney insufficiency, exogenous cold-damp pathogens and toxin, and long-term illness that causes meridian,

qi, and blood blockage, and conventional massage and acupuncture treatment have a high risk of recurrence [1]. Therefore, it should be treated with prescriptions for strengthening the bones and kidneys, and eliminating pathogens, such as Shentong Zhuyu Decoction, etc. However, taking traditional Chinese medicine alone cannot quickly restore the patient's lumbar spine function. With the analysis of clinical practice, the pressure on the lumbar spine increases after lumbar disc herniation, and acupotomy lysis can be used to release the blockage of the lumbar spine, reduce the pressure on the lumbar spine, and enhance the curative effect [2]. In this paper, a sample of 72 patients with lumbar disc herniation and sciatica treated from March 2022 to March 2023 was used to explore the curative effect of Shentong Zhuyu Decoction combined with acupotomy lysis.

2. Materials and methods

2.1. General information

A sample of 72 patients with lumbar disc herniation and sciatica admitted from March 2022 to March 2023 were randomly divided into two groups. The data of patients with lumbar disc herniation in the study group were compared with those in the control group ($P > 0.05$), as shown in **Table 1**.

Table 1. Data analysis of lumbar disc herniation patients

Group	Gender		Age (years)		Disease duration (years)	
	Male	Female	Range	Average	Range	Average
Study group ($n = 36$)	20 (55.56)	16 (44.44)	31–67	54.72±1.88	2–6	4.48±1.05
Control group ($n = 36$)	19 (52.78)	17 (47.22)	31–68	54.69±1.91	2–7	4.51±1.07
x^2/t	0.0559		0.0672		0.1201	
P	0.8130		0.9466		0.9048	

Inclusion criteria included patients with lumbar disc herniation confirmed by magnetic resonance imaging (MRI) and computed tomography (CT), patients with low back pain in spinal canal tension test, patients with lumbar spinal stenosis and local bone hyperplasia indicated by X-ray, patients with informed consent, and patients with radiating pain and numbness in the lower limbs.

Exclusion criteria were patients with bone tuberculosis, patients with spinal obstruction. patients with syringomyelia, patients with damaged organs, and patients with double fecal incontinence [3].

2.2. Methods

The study group was treated with Shentong Zhuyu Decoction in addition to acupotomy lysis, and the prescriptions were as follows: *Gentiana chinensis* and *Achyranthes bidentata* each 15g; *Notopterygium*, mulberry, and angelica each 12g; Safflower, peach nuts, myrrh, *Ligusticum wallichii*, *Cyperus rotundus*, Wulingzhi, fried eucommia, 10g each; earthworm 9g; licorice 6g. 300ml of juice was taken after decocting the aforementioned medicines, and 1 dose was taken in the morning and evening. Dosing was done for 4 weeks.

The control group was treated with acupotomy lysis. Patients with lumbar disc herniation were placed in the supine position, a thin pillow was prepared in advance on the patient's abdomen, and local disinfection was performed. Under the guidance of imaging equipment, the diseased lumbar segment, and the intertransverse processes and interspinous points were identified. The doctor takes the interspinous point as the entry point to release the tension between the vertebral bodies. It should be noted that the incision line must be parallel to the longitudinal direction of the spine, and ensured that the entry point is vertical. The interspinous bone area

was loosened, the blade was adjusted upward, and the ligament was peeled off normally. The intertransverse muscles and ligaments were released. Then, based on the imaging images, the acupotomy was inserted through the lateral intervertebral foramen. The edge of acupotomy must be parallel to the longitudinal axis of the spine. The peeling operation was stopped while in motion. After completion, the transverse process ligament of the superior horn was loosened, the point was fixed, and the acupotomy was inserted in the same way as the intertransverse muscle. This was done once a week for mild lumbar disc herniation, 2–3 times a week for moderate to severe lumbar disc herniation, with a treatment duration of 4 weeks.

2.3. Observation indicators

The indicators below were observed in the two groups.

(1) Walking ability including the pace speed, stride length, stride frequency, stride amplitude, and other indicators.

(2) Pain and lumbar function were evaluated. Visual analogue scale (VAS) is positively correlated with lumbar pain (0–10 points). Oswestry disability index (ODI) is positively correlated with lumbar dysfunction (0–50 points). Japanese orthopedic association (JOA) is positively correlated with lumbar function (0–29 points).

(3) Quality of life was assessed. 36-item short-form (SF-36) survey is positively correlated with quality of life in patients with lumbar disc herniation.

(4) Complications were observed including lumbar disjoint, dull pain, dizziness, and other symptoms.

2.4. Statistical analysis

Lumbar disc herniation data were processed with SPSS21.0, percentage (%) records (x^2 test) count data of lumbar disc herniation, mean ± standard deviation (SD) records (t test) measurement data of lumbar disc herniation. $P < 0.05$ indicates that there is a statistical difference.

3. Results

3.1. Comparison of walking ability

Based on **Table 2**, the walking ability indexes of the study group were better than those of the control group ($P < 0.05$).

Table 2. Comparison of walking ability in patients with lumbar disc herniation (mean ± SD)

Group	Step speed (cm/s)	Step length (cm)	Step frequency (step/min)	Step range (cm)
Study group (n = 36)	122.25±2.15	52.05±1.25	119.51±2.25	108.11±2.52
Control group (n = 36)	107.36±1.84	48.36±1.11	108.43±1.76	101.43±1.88
t	31.5705	13.2440	23.2725	12.7481
P	0.0000	0.0000	0.0000	0.0000

3.2. Comparison of lumbar pain and lumbar function

After treatment, the VAS and ODI scores in the study group were lower than those in the control group, and the JOA was higher than that in the control group ($P < 0.05$). The results are presented in **Table 3**.

Table 3. Comparison of lumbar pain and lumbar function (mean ± SD)

Group	VAS		ODI		JOA	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group (n = 36)	6.25±1.21	1.42±0.45	26.11±2.15	7.59±1.25	16.42±2.42	26.88±1.85
Control group (n = 36)	6.24±1.19	2.39±0.69	26.13±2.17	15.11±1.85	16.39±2.39	20.41±1.36
t	0.0354	7.0651	0.0393	20.2086	0.0529	16.9069
P	0.9719	0.0000	0.9688	0.0000	0.9579	0.0000

3.3. Comparison of quality of life

After treatment, the SF-36 score of patients with lumbar disc herniation in the study group was higher than that in the control group ($P < 0.05$), as shown in **Table 4**.

Table 4. Comparison of quality of life by SF-36 (mean ± SD)

Group	Physical health		Mental health		Physiological functions		Social functions	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group (n = 36)	62.58±1.28	83.41±2.42	61.88±1.34	83.58±2.39	62.24±1.41	84.11±2.43	61.51±1.36	82.43±2.51
Control group (n = 36)	62.61±1.31	76.26±2.36	61.91±1.33	75.49±2.15	62.19±1.43	76.21±2.09	61.49±1.37	75.36±1.87
t	0.0983	12.6914	0.0953	15.0992	0.1494	14.7887	0.0622	13.5526
P	0.9220	0.0000	0.9243	0.0000	0.8817	0.0000	0.9506	0.0000

3.4. Comparison of complications

According to **Table 5**, the complication rate of lumbar disc herniation in the study group was 2.78%, which was lower than that in the control group (16.67%), $P < 0.05$.

Table 5. Comparison of the complications of lumbar disc herniation [n (%)]

Group	Lumbar disjoint	Lumbar pain	Dizziness	Incidence rate
Study group (n = 36)	0 (0.00)	1 (2.78)	0 (0.00)	2.78
Control group (n = 36)	1 (2.78)	4 (11.11)	1 (2.78)	16.67
x^2	-	-	-	3.9560
P	-	-	-	0.0467

4. Discussion

Lumbar disc herniation occurs more frequently in middle-aged and elderly people. It can be secondary to sciatica and reduce the patients' quality of life. When a patient suffers from sciatica, the typical symptoms are pain in standing, sitting, and lying down, and unable to live a normal life. Western medicine scholars believe that patients with lumbar disc herniation have a herniated nucleus pulposus, which can stimulate adjacent tissues, aggravate pain and secondary inflammation, and affect lumbar nerve function. Conventional drugs are not effective in treating sciatica caused by lumbar disc herniation, thus doctors often recommend traction and surgical treatment to relieve the symptoms of sciatica [4]. In the theory of traditional Chinese medicine, there is no name for lumbar disc herniation. Some scholars include it in the category of "arthritis pain" and

"lumbar pain." Then, sciatica is secondary to lumbar disc herniation, and the long-term illness can turn into acute injury, which aggravates the pain in the waist and legs. Therefore, Chinese medicine scholars recommend strengthening the bones and kidneys, and eliminating pathogens for the treatment of lumbar disc herniation [4].

Conventional acupotomy lysis can relieve the pressure on the lumbar spine, restore the structural stability of the lumbar spine, and enhance the function of the spine. Combined with oral administration of traditional Chinese medicine, it can improve the outcome of lumbar disc herniation [5]. This article chooses Shentong Zhuyu Decoction, in which angelica is combined with safflower to dispel blood stasis and activate blood, *Notopterygium* is combined with Wulingzhi to dispel dampness, while *Gentiana chinensis* can prevent inflammation and relieve pain. The materials act as analgesic, with function of invigorating blood and removing blood stasis. Peach kernel can remove blood stasis and invigorate blood, myrrh can relieve pain, reduce swelling, and dispel stasis. *Ligusticum wallichii* can relieve pain and invigorate blood. Earthworm can dredge meridians, while licorice can harmonize various medicines. Relevant literature reports that acupotomy lysis alone has limited effect on restoring lumbar spine function, hence some scholars suggest combined treatment with Shentong Zhuyu Decoction to promote the patients' recovery [6].

Based on the data analysis in this study, the study group's step speed (122.25±2.15 cm/s), step length (52.05±1.25 cm), step frequency (119.51±2.25 steps/min), and step amplitude (108.11±2.52 cm) were all better than the control group ($P < 0.05$). It showed that the treatment with Shentong Zhuyu Decoction can enhance the patient's walking ability. During the treatment of needle-knife loosening, the tip of the acupotomy directly reaches the focus of the lesion to remove blood stasis. After loosening the local tissue, the pressure of the diseased nucleus pulposus on the adjacent tissue can be relieved, thus relieving the pain of the lumbar spine. With the treatment of Shentong Zhuyu Decoction, the physiological function of the lumbar spine can be further restored, thus patients have better recovery of walking ability [7]. Another set of data showed that the VAS (1.42±0.45) and ODI (7.59±1.25) scores of the study group were lower than those of the control group, and the JOA (26.88±1.85) score was higher than that of the control group ($P < 0.05$). This indicates that the addition of Shentong Zhuyu Decoction can relieve lumbar pain and enhance lumbar function. Acupotomy lysis is a physical treatment method, which can loosen the local ligaments of the lumbar spine, restore the balance of the spine, and reduce the pressure of the diseased lumbar spine on adjacent tissues. Acupotomy lysis combined with Shentong Zhuyu Decoction can restore the blood supply and enhance the function of the lumbar spine [8]. Moreover, the SF-36 score of patients with lumbar disc herniation in the study group was higher than that in the control group ($P < 0.05$). This shows that the addition of Shentong Zhuyu Decoction can improve the patients' quality of life. Combined application of needles and knife to loosen, peel off, remove local induration, adhesions, and pain points can dredge meridians, remove blood stasis, and activate blood circulation, and flexible use of knife tip can loosen local adhesions and relieve the tension of the lumbar spine muscles, thereby reducing symptoms of pain and spasm, and enhancing the patients' quality of life. Based on this, the addition of traditional Chinese medicine Shentong Zhuyu Decoction can nourish the liver and kidney, eliminate pathogenic factors, and strengthen the body [9]. The complication rate of lumbar disc herniation in the study group was 2.78%, which was lower than the 16.67% in the control group ($P < 0.05$). This may be because the prescription of Shentong Zhuyu Decoction has the functions of relieving pain, dredging meridians, removing blood stasis, and promoting blood circulation, and the medicinal properties of traditional Chinese medicine are safe without any side effects. The lesions are treated without opening the skin and subcutaneous tissue, which can reduce postoperative complications, promote postoperative lumbar self-repair, avoid complications such as radiating pain in the lower extremities, with high treatment safety [10].

In summary, the treatment of Shentong Zhuyu Decoction combined with acupotomy lysis in patients with sciatica after lumbar disc herniation can restore lumbar spine function, relieve lumbar pain, and reduce lumbar

complications, which has application value in clinical practice.

Disclosure statement

The author declares no conflict of interest.

References

[1] Li M, Liu Y, Wang N, et al., 2022, Clinical Observation of Modified Body Pain Zhuyu Decoction Combined with Lumbar Traction Therapy in the Treatment of Acute Lumbar Disc Herniation. Chinese Medicine Emergency, 31(5): 833–836.

[2] Li H, 2020, Clinical Research on Shentong Zhuyu Decoction Combined with Conventional Therapy in the Treatment of Postoperative Lumbar Disc Herniation. New Chinese Medicine, 52(15): 39–41.

[3] Du C, Lin Y, 2021, Observation on Clinical Curative Effect of Pricking and Cupping Triple Therapy on Lumbar Disc Herniation of Qi Stagnation and Blood Stasis Type. Sichuan Traditional Chinese Medicine, 39(9): 198–199.

[4] Su J, Wang X, 2021, Observation on the Curative Effect of Shentong Zhuyu Decoction Combined with Lateral and Posterior Spinal Endoscopic Nucleus Pulposus Removal in the Treatment of Lumbar Disc Herniation. Journal of Neck and Lumbago, 42(2): 227–229.

[5] Zhu F, Dong B, Li X, et al., 2021, Clinical Study of Percutaneous Transforaminal Endoscopic Nucleus Pulposus Combined with Shentong Zhuyu Decoction in the Treatment of Lumbar Disc Herniation of Qi Stagnation and Blood Stasis Type. Shaanxi University of Traditional Chinese Medicine Journal, 44(2): 87–92.

[6] Tan Z, Yang J, Dong J, et al., 2021, Clinical Application of Shentong Zhuyu Decoction Combined with Prone Position Homeopathic Traction in the Treatment of Lumbar Disc Herniation. Chinese Journal of Traditional Chinese Medicine, 39(4): 200–202.

[7] Yang Z, Chen Y, Xu X, et al., 2022, Clinical Observation of Shentong Zhuyu Decoction Combined with Acupuncture and Methylcobalamin Tablets in the Treatment of Lumbar Disc Herniation of Qi Stagnation and Blood Stasis Type. Modern Distance Education of Traditional Chinese Medicine, 20(8): 121–123.

[8] Zhu W, Su Y, Li R, et al., 2022, Observation on the Effect of Needle-Knife Treatment of Sciatica Caused by Lumbar Disc Herniation. China Health Standard Management, 13(23): 144–148.

[9] Ye Q, Zhang Y, Wang H, 2021, Clinical Research on Needle-Knife Treatment of Sciatica Caused by Lumbar Disc Herniation. Modern Distance Education of Chinese Medicine, 19(15): 108–110.

[10] Gao C, Wang B, Jin Z, et al., 2020, Clinical Research on Needle-Knife Superficial Fascia Release Combined with Nerve Root Block in the Treatment of Lumbar Disc Herniation. Chinese Journal of Basic Medicine of Traditional Chinese Medicine, 26(3): 369–371.

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Comparative Study of Percutaneous Kyphoplasty and Hyperextension Reduction Combined with Percutaneous Vertebroplasty in the Treatment of Osteoporotic Thoracolumbar Compression Fractures in the Elderly

Lixiang Wei*

Xishui County Hospital of Chinese Medicine, Huanggang 438200, Hubei Province, China

***Corresponding author:** Lixiang Wei, hemsy@163.com

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Abstract: *Objective:* This paper aims to explore the clinical effects of percutaneous kyphoplasty (PKP) and hyperextension reduction combined with percutaneous vertebroplasty (PVP) in elderly patients with osteoporotic thoracolumbar compression fractures (OVCF). *Methods:* A sample of 62 elderly OVCF patients was selected. The admission time was from June 2022 to June 2023. They were randomly divided into a study group (n = 31) and a control group (n = 31) using computer software lottery method. Patients in the control group were treated with PKP, while patients in the study group were treated with hyperextension reduction combined with PVP. The operation time, hospitalization time, the number of fluoroscopy, treatment costs, visual analog pain score (VAS), vertebral body height, and Cobb angle of the injured vertebra were compared between the two groups. *Results:* The operation time, hospitalization time, number of fluoroscopy, and treatment costs of the patients in the study group were all lower than those in the control group ($P < 0.05$). The VAS scores of the two groups after surgery were lower than those before surgery, and there was no significant difference between the groups ($P > 0.05$). After surgery, the vertebral body heights in both groups were more significant than before surgery, and the Cobb angle of the injured vertebra was smaller than before surgery. There was no significant difference between the groups ($P > 0.05$). *Conclusion:* PKP and hyperextension reduction combined with PVP treatment in elderly patients with OVCF can relieve pain and restore vertebral body height and Cobb angle. However, hyperextension reduction combined with PVP treatment can shorten the operation time and hospitalization time, with low treatment cost, which has the potential value to be widely applied.

Keywords: PKP; Hyperextension reduction; PVP; Osteoporotic thoracolumbar compression fractures; Elderly

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1. Introduction

Osteoporosis has a higher incidence among older people, which can lead to loss of bone mass, increased bone

fragility, trabecular bone degeneration, and other pathological changes. Patients have a high risk of osteoporotic thoracolumbar compression fractures (OVCF) under the influence of external forces [1]. The conventional clinical treatment for OVCF in older people is conservative. However, the treatment cycle is long and it can easily cause complications such as deep vein thrombosis of the lower limbs and pulmonary infection [2]. Percutaneous kyphoplasty (PKP) and hyperextension reduction combined with percutaneous vertebroplasty (PVP) are new clinical options for treating OVCF in elderly patients. PKP has the advantages of being minimally invasive and highly effective. Hyperextension reduction combined with PVP is relatively simple and can shorten the patient's postoperative recovery time [3]. This study selected 62 elderly patients with OVCF to explore the clinical value of PKP and hyperextension reduction combined with PVP treatment.

2. Materials and methods

2.1. General information

This study's relevant procedures and sample selection plan were submitted to the Medical Ethics Committee for approval. 62 samples of elderly OVCF patients were selected. The admission time was from June 2022 to June 2023. They were randomly divided into study group (n = 31) and control group (n = 31) using the computer software lottery method. There were 17 males and 14 females in the study group, with an age range of 65–79 years, and an average of 72.82±2.96 years, the disease duration ranged from 2 to 15 days, with an average of 8.52±1.29 days. There were 19 males and 12 females in the control group. The age range was 66–78 years old, with an average of 72.75±3.04 years. The disease duration was 3–15 days, with an average of 8.64±1.22 days. The general information of the two groups of patients was comparable ($P > 0.05$).

Inclusion criteria included patients diagnosed with OVCF by imaging examination, patients over 65 years old, and patients who know the research content and procedures, and sign the consent document.

Exclusion criteria were patients with vertebral compression fractures not caused by osteoporosis, patients with coagulation dysfunction, and patients who are unable to cooperate in completing the study.

2.2. Methods

Patients in the control group were treated with PKP. They underwent a C-arm machine examination before surgery to accurately locate the diseased pedicle and mark the skin tissue in the corresponding area. The doctor instructed the patient to maintain a prone position, and performed local skin disinfection and infiltration anesthesia. According to the pre-marked position, the needle was punctured through the midpoint of the vertebral pedicle outward and upward. The needle was slowly inserted under the guidance of the C-arm machine so that the needle tip reached the injured vertebra. In the area behind the vertebral body, the needle core was withdrawn. The solid vertebral body drill was started and slowly drilled through the direction of the casing to the area in front of the injured vertebra. A balloon was placed along the casing and expanded to restore the height of the injured vertebra. After the operation, the balloon was withdrawn to form a cavity inside the injured vertebra. Bone cement was slowly injected under C-arm machine fluoroscopy, the injection was stopped after the bone cement was distributed to the posterior edge of the vertebral body, bone cement leakage was avoided during the operation. The syringe was withdrawn after the bone cement solidified, and the patient was instructed to remain prone. After about 10 minutes, it was confirmed that there was no abnormality, and the patient was escorted back to the ward.

Patients in the study group were treated with hyperextension reduction combined with PVP. The specific operation plan is as follows. The first procedure was hyperextension reset. The doctor instructed the patient to maintain a prone position. An air cushion was placed under the injured vertebrae to raise the injured vertebrae

by about 5cm. Sandbags were placed under the chest and iliac spine to keep the abdomen suspended. The head and legs were elevated by about 20cm at a wide angle. The spine was extended on the back, and the doctor pressed the affected area with moderate force with both hands to standardize the reduction operation of the injured vertebra. After completing the above operations, the doctor adjusted the patient to a general prone position and performed PVP treatment. This was followed by PVP treatment. A C-arm machine examination was performed before surgery to accurately locate the diseased pedicle and mark the skin tissue in the corresponding area. The doctor selected the midpoint of the vertebral pedicle to puncture the needle slightly toward the outer and upper area so that the needle tip reached the front area of the diseased vertebral body through the vertebral pedicle. The bone cement was prepared and slowly injected using a puncture cannula. The injection was stopped after the bone cement was distributed to the posterior edge of the vertebral body. Bone cement leakage must be avoided during the operation. After the bone cement solidified, the syringe was withdrawn and the patient was instructed to stay prone for about 10 minutes. After confirming that there were no abnormalities, the patient was escorted back to the ward. After surgery, the doctor guided the patient to perform rehabilitation training and cooperate with the intervention of osteoporosis drugs treatment.

2.3. Evaluation criteria

The criteria below were evaluated in the two groups.

(1) The operation time, hospitalization time, number of fluoroscopy, and treatment costs were compared between the two groups.

(2) The visual analog pain score (VAS) of the two groups of patients was compared before surgery, three days after surgery, and one month after surgery. The score ranges from 0 to 10. The higher the score, the more severe the pain.

(3) The vertebral body height and Cobb angle of the injured vertebra were compared between the two groups before surgery and three days after surgery.

2.4. Statistical methods

SPSS23.0 software was used to analyze the research data, measurement data mean ± standard deviation (SD) was used as a test, count data % was used as x^2 test and $P < 0.05$ means that there is a statistical difference.

3. Results

3.1. Comparison of operation time, hospitalization time, number of fluoroscopies, and treatment costs

The operation time, hospitalization time, number of fluoroscopy, and treatment costs of the patients in the study group were all lower than those in the control group ($P < 0.05$). The results are presented in **Table 1**.

Table 1. Comparison of operation time, hospitalization time, number of fluoroscopies, and treatment costs between the two groups (mean ± SD)

Group	Operation time (minutes)	Length of stay (days)	Number of fluoroscopy (times)	Treatment cost (yuan)
Study group (n = 31)	30.55±2.38	8.14±1.02	9.76±1.18	19227.48±102.75
Control group (n = 31)	39.97±3.56	10.29±1.88	11.49±2.75	23795±227.86
t value	12.248	5.597	3.219	101.742
P value	0.000	0.000	0.002	0.000

3.2. Comparison of VAS scores

The VAS scores of both groups after surgery were lower than before surgery, and there was no significant difference between the groups ($P > 0.05$), as shown in **Table 2**.

Table 2. Comparison of VAS scores between the two groups (mean ± SD)

Group	Before surgery	Three days after surgery	One month after surgery
Study group ($n = 31$)	6.04±1.15	2.86±0.44 *	2.45±0.42 *
Control group ($n = 31$)	5.98±1.17	2.91±0.38 *	2.53±0.49 *
t value	0.204	0.479	0.690
P value	0.839	0.634	0.493

*$P < 0.05$ compared with preoperative

3.3. Comparison of vertebral body height and Cobb angle of injured vertebra

Based on **Table 3**, the height of the vertebral body in both groups after surgery was more significant than before surgery, and the Cobb angle of the injured vertebra was smaller than before surgery. There was no significant difference between the groups ($P > 0.05$).

Table 3. Comparison of vertebral body height and Cobb angle of injured vertebra between two groups (mean ± SD)

Group	Height of front edge of injured vertebra (mm)		Midline height of injured vertebra (mm)		Cobb angle of injured vertebra (°)	
	Before surgery	Three days after surgery	Before surgery	Three days after surgery	Before surgery	Three days after surgery
Study group ($n = 31$)	14.42±2.35	20.79±2.96 *	12.64±2.05	19.77±2.96 *	26.11±4.25	17.84±1.57 *
Control group ($n = 31$)	14.38±2.42	20.82±2.91 *	12.71±2.01	19.68±2.92 *	26.07±4.32	17.96±1.63 *
t value	0.066	0.040	0.136	0.121	0.037	0.295
P value	0.948	0.968	0.892	0.904	0.971	0.769

*$P < 0.05$ compared with preoperative

4. Discussion

The leading causes of OVCF in older people are bone decalcification, trabecular bone degeneration, and reduced bone density caused by osteoporosis. The strength of the patient's vertebral body decreases to varying degrees, and the ability to withstand load is weakened, leading to fractures under the action of external forces. Typical symptoms of OVCF in older people are pain and mobility impairment, which can seriously impact patients' lives. Therefore, effective treatment plans are needed to restore the anatomical structure of the vertebral body, and stabilize and strengthen the vertebral body [4,5].

The conventional clinical treatment plan for OVCF in older people is a conservative treatment plan such as bed rest, anti-osteoporosis drugs, and brace fixation. Its main disadvantages are long treatment cycles and slow onset of effect. Long-term bed rest can cause complications such as deep vein thrombosis [6,7]. PVP is a treatment plan for OVCF in elderly patients that has been widely used clinically in recent years. During the treatment, a treatment channel is established, and bone cement is injected into the injured vertebra, which can restore the height and normal physiological angle of the injured vertebra. The surgical operation is minimally invasive, and the postoperative recovery time is short, with good fixation effect [8]. Hyperextension reduction before PVP surgery can fully and effectively stretch the folded ligament tissue in the front area of the injured

vertebra, thereby restoring the tension of the annulus fibrosus and longitudinal ligament of the intervertebral disc, partially restoring the height of the injured vertebra, and reducing pain during PVP surgery, with low risk of bone cement leakage [9]. PKP is an improved surgical model of PVP. During the PKP operation, a balloon reduces the compressed vertebral body and constructs a cyst cavity. Bone cement injection can be completed under lower pressure, achieving good surgical results, and reducing the cost of bone cement. There is a risk of leakage, but the operation time is long, and the treatment cost is high [10,11].

The results of this study showed that the VAS scores, vertebral body height, and Cobb angle of the injured vertebra of the two groups of patients after surgery were all better than those before surgery. There was no significant difference between the groups. The operation time, hospitalization time, number of fluoroscopy, and treatment costs of the patients in the study group were all lower than those in the control group. In the control group, it is suggested that both PKP and hyperextension reduction combined with PVP treatment can effectively treat OVCF in older people. However, hyperextension reduction combined with PVP surgery takes a shorter time, and the treatment cost is lower than that of the control group. This may be due to that the hyperextension reduction operation is less difficult and non-invasive, and the patient's cooperation is high. It can complete the preliminary reduction of the injured vertebra before surgery, which helps to reduce the resistance of bone cement infusion, thereby reducing the number of intraoperative fluoroscopy, shortening the operation and postoperative recovery time, and reducing treatment costs [12,13]. PKP is a modified surgical plan of PVP, which is completed through balloon expansion, and can achieve ideal therapeutic effects. However, the operation time is long with high treatment cost [14,15].

Based on the above analysis, both PKP and hyperextension reduction combined with PVP treatment in elderly OVCF patients can relieve pain, and restore vertebral body height and Cobb angle. However, hyperextension reduction combined with PVP treatment can shorten the operation and hospitalization time, and lower the treatment cost, thus having high clinical application value.

Disclosure statement

The author declares no conflict of interest.

References

[1] Chen H, Chen Y, Liu H, et al., 2019, Comparing the Effects of Hyperextension Traction Reduction Plus PVP and PKP in Treating Thoracolumbar Osteoporotic Fractures. Chinese Disability Medicine, 27(8): 25–27.

[2] Chen G, Zheng J, Huang J, 2014, Comparative Study of Hyperextension Reduction Combined with PVP and PKP in Treating Osteoporotic Thoracolumbar Compression Fractures. International Medical and Health Herald, 20(7): 945–948.

[3] Yuan L, Zheng W, Liang Y, et al., 2023, Comparison of the Efficacy of Hyperextension Compression Manipulation to Reduce PVP and Simple PKP Surgery in Treating Osteoporotic Vertebral Compression Fractures. Chinese Journal of Bone and Joint Injury, 38(3): 273–276.

[4] Sun C, Liu T, Jia X, et al., 2022, Observation on the Efficacy of Lumbar Pillow Hyperextension Reduction Combined with Vertebroplasty in Treating Osteoporotic Vertebral Compression Fractures. Chinese Journal of Bone and Joint Injury, 37(7): 712–714.

[5] Wang P, Zhang X, Qin D, et al., 2020, Research Progress on Finite Element Analysis of Manual Reduction Combined with Minimally Invasive Surgery in Treating Osteoporotic Vertebral Compression Fractures. Research in Traditional Chinese Medicine, 33(2): 71–74.

[6] Liu J, Liu L, Sun R, et al., 2022, Analysis of the Effect of Combined Reduction Vertebroplasty and Kyphoplasty in Treating Osteoporotic Vertebral Fractures. Chinese Comprehensive Clinical Journal, 38(3): 250–255.

[7] Qin D, Zhang X, Quan Z, et al., 2021, Finite Element Analysis of Differences in Mechanical Stability Changes of the Vertebral Body in Treating Osteoporotic Thoracolumbar Compression Fractures with Different Methods. Chinese Journal of Traditional Chinese Medicine, 36(8): 4886–4895.

[8] Wang W, 2023, Comparison of the Effects of PKP and PVP Combined with Fracture Reducers in Treating OVCF on Patients' Injured Vertebra Morphology and Low Back Function. Primary Medicine Forum, 27(8): 38–40.

[9] Cao Q, Zhou Y, Duan M, et al., 2020, Comparative Analysis of the Efficacy of Manual Reduction Combined with Percutaneous Vertebroplasty and Percutaneous Kyphoplasty in Treating Osteoporotic Vertebral Compression Fractures. China Journal of Integrated Western Medicine Surgery, 26(1): 132–135.

[10] Zhao H, Pan Q, Li D, 2023, Percutaneous Vertebroplasty and Percutaneous Kyphoplasty in Treating Osteoporotic Vertebral Compression Fractures: a Meta-Analysis of Randomized Controlled Studies. Air Force Journal of Military Medical University, 44(4): 340–346.

[11] Wang Y, Wu X, Ding L, 2023, Effect of Modified Bushen Huoxue Decoction Combined with Zoledronic Acid on Osteoporosis after PKP/PVP of Thoracolumbar Compression Fracture in Older People. Chinese and Foreign Medical Research, 21(4): 30–35.

[12] Wang G, Bo T, Zhao H, et al., 2021, Analysis of the Efficacy of PVP or PKP Combined with Zoledronic Acid in Treating Osteoporotic Thoracolumbar Fractures in Older People. Contemporary Medical Discussions, 19(17): 97–99.

[13] Gu J, 2021, Comparison of Clinical Efficacy and Safety of Percutaneous Vertebroplasty (PVP) and Kyphoplasty (PKP) in the Treatment of Osteoporotic Vertebral Compression Fractures in Older People. Health Care Wenhui, 22(5): 101–102.

[14] Li J, Zhang J, Zhang H, et al., 2022, Comparison of PKP and PVP in Postoperative Pain and Vertebral Body Height Recovery after Osteoporotic Vertebral Compression Fractures. Zhejiang Trauma Surgery, 27(6): 1077–1079.

[15] Wang J, Xu Z, Lian Y, et al., 2021, Clinical Comparative Study of PVP and PKP in Treating Osteoporotic Lumbar Compression Fractures. Sichuan Journal of Physiological Sciences, 43(6): 1030–1031.

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Analysis of the Analgesic Effect of Dexmedetomidine Combined with Ropivacaine Retractor Tube Block After Total Knee Arthroplasty

Yingjun Yang*

Shuyang Guangji Hospital, Suqian 223600, Jiangsu Province, China

***Corresponding author:** Yingjun Yang, symzyyj@sina.com

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Abstract: *Objective:* This paper aims to explore and analyze the analgesic effect of dexmedetomidine combined with ropivacaine retractor tube block after total knee arthroplasty. *Methods:* The study period was from January 2023 to July 2023. 50 patients admitted to our hospital after total knee arthroplasty were selected as the study subjects, and were divided into the study group (n = 25) and the control group (n = 25) according to double-blind method. The study group was given dexmedetomidine combined with ropivacaine and the control group was given ropivacaine. The analgesic effect and hemodynamic indexes were compared between the groups. *Results:* At 3 hours postoperatively, the analgesic effects of resting numeric rating scale (NRS) score and activity NRS score between the groups were compared, and the difference was not statistically significant ($P > 0.05$). At 12 hours and 24 hours postoperatively, the resting NRS score and activity NRS score of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). Before treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes were compared between the groups, the difference was not statistically significant ($P > 0.05$). After treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes of the study group were significantly better than those of the control group, the difference was statistically significant ($P < 0.05$). *Conclusion:* Dexmedetomidine combined with ropivacaine retractor block has better analgesic effect after total knee arthroplasty, and it can be widely used and promoted in the clinic.

Keywords: Dexmedetomidine combined with ropivacaine; Retractor tube block; Total knee arthroplasty; Analgesic effect

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1. Introduction

Surgery is needed to treat knee diseases that are ineffective with conservative treatment, but the damaged knee joint cannot be recovered. For the knee joint to function normally, an artificial prosthesis is needed instead of the articular cartilage, i.e., knee arthroplasty, of which total knee arthroplasty is one type [1]. Total knee arthroplasty is

a large operation, which is very traumatic and can easily damage the nerves of the leg, and the patients' pain level after the operation is very severe, thus it is necessary to reduce the postoperative pain, which has a certain positive significance on the postoperative rehabilitation and patients' quality of life [2]. Ultrasound-guided retractor tube block has a certain inhibitory effect on postoperative pain, and the commonly used drug for this anesthesia method is ropivacaine, which can prolong the duration of the block, and its combined application with dexmedetomidine can strengthen the effect on postoperative pain [3]. This drug is a new type of adrenergic receptor agonist with an excellent sedative effect, which can effectively reduce postoperative pain [4]. The purpose of this paper is to study and analyze the analgesic effect of dexmedetomidine combined with ropivacaine retractor tube block after total knee arthroplasty.

2. Materials and methods

2.1. General information

The study period was from January 2023 to July 2023. 50 cases of post-total knee replacement patients admitted to our hospital were selected as the study subjects and grouped according to the double-blind method into study group (n = 25) and control group (n = 25). There were 11 male patients and 14 female patients in the study group, their ages were 55–75 years old, with a mean age of 65.98 ± 2.48 years. In the control group, there were 10 male patients and 15 female patients, with age range of 55–78 years and mean age of 66.05 ± 2.53 years. Comparing the general information of gender and age between the groups, the difference was not statistically significant ($P > 0.05$).

Inclusion criteria included total knee arthroplasty patients, and patients with informed consent.

Exclusion criteria were patients with blood system diseases, patients with autoimmune diseases, and patients with psychiatric diseases.

2.2. Methods

The control group was given ropivacaine: ropivacaine hydrochloride injection (Renfu Pharmaceuticals, 10ml, 100mg), 20mg was taken into the retractor tube.

The study group was given dexmedetomidine combined with ropivacaine:

(1) Dexmedetomidine hydrochloride injection (Renfu Pharmaceutical, 2ml, 200μg), 0.6μg/kg was taken into the retractor tube.

(2) Ropivacaine hydrochloride injection was used as above.

2.3. Observation indexes

The indexes below were observed in the two groups.

(1) Comparing the analgesic effect between groups, including resting numeric rating scale (NRS) score and active NRS score. NRS is the pain numerical scoring method, with 0–10 points.

(2) Comparing hemodynamic indexes between groups, including output per beat, cardiac output, and cardiac index.

2.4. Statistical analysis

SPSS21.0 statistical software was selected to process and analyze the data. Count data were expressed as the number of cases (n) and percentage (%), and the x^2 test was implemented, and the measurement data were expressed as the mean ± standard deviation (SD), and the t test was implemented, and the difference was regarded as statistically significant ($P < 0.05$).

3. Results

3.1. Comparison of analgesic effects

In 3 hours after operation, the analgesic effects of resting NRS score and activity NRS score were compared between the groups, the difference was not statistically significant ($P > 0.05$). In 12 hours and 24 hours after operation, the resting NRS score and activity NRS score of the study group were significantly better than those of the control group, the difference was statistically significant ($P < 0.05$), as shown in **Table 1**.

Table 1. Comparison of analgesic effects between groups (mean ± SD)

Group	Resting NRS score			Activity NRS score		
	3 hours after surgery	12 hours after surgery	24 hours after surgery	3 hours after surgery	12 hours after surgery	24 hours after surgery
Study group ($n = 25$)	0.72 ± 0.52	1.78 ± 0.67	1.54 ± 0.64	2.41 ± 0.72	2.68 ± 0.68	2.14 ± 0.61
Control group ($n = 25$)	0.73 ± 0.58	2.24 ± 0.72	2.58 ± 0.67	2.43 ± 0.75	3.75 ± 0.96	4.15 ± 0.74
t-value	0.0641	2.3385	5.6122	0.0961	4.5476	10.4795
P-value	0.9491	0.0236	0.0000	0.9238	0.0000	0.0000

3.2. Comparison of hemodynamic indexes

Before treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes were compared between the groups, and the difference was not statistically significant ($P > 0.05$). After treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes of the study group were significantly better than those of the control group, and the difference was statistically significant ($P < 0.05$). The results are presented in **Table 2**.

Table 2. Comparison of hemodynamic indices between groups (mean ± SD)

Group	Output per beat (ml)		Cardiac output (l/min)		Cardiac index (l/min·m)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Study group ($n = 25$)	43.21 ± 3.25	62.58 ± 4.53	3.16 ± 0.25	5.87 ± 0.29	2.51 ± 0.16	5.68 ± 0.34
Control group ($n = 25$)	43.26 ± 3.28	53.87 ± 3.59	3.19 ± 0.27	4.35 ± 0.52	2.53 ± 0.19	3.75 ± 0.41
t-value	0.0541	7.5345	0.4076	12.7645	0.4025	18.1174
P-value	0.9570	0.0000	0.6853	0.0000	0.6890	0.0000

4. Discussion

The knee joint is the largest joint in the body and the most important weight-bearing joint, it is very prone to injury under the influence of external factors, and the incidence of knee arthropathy has continued to rise in recent years [5]. Knee joint diseases include meniscus injury, rheumatoid arthritis, osteoarthritis of the knee and other diseases, usually given conservative treatment first, and then surgical treatment if conservative treatment is ineffective, the surgical treatment modality is total knee arthroplasty [6]. Total knee arthroplasty is the placement of artificial prosthesis to replace the knee joint function, the surgery involves removing the damaged knee joint, thus it is very damaging with a certain impact on the bones and tissues. Moreover, the patient's postoperative pain is very intense and intolerable, it not only affects the patient's life and sleep, but it is also not conducive to postoperative rehabilitation [7]. Therefore, it is necessary to take pain relief measures for patients in advance to reduce the postoperative pain. Ultrasound-guided retractor tube block is a kind of sedative and analgesic measure, which can effectively reduce the postoperative pain level of patients [8]. Ropivacaine is a commonly used analgesic drug in surgery belonging to the class of local anesthetics, which is widely used in the fields of local tissue anesthesia, epidural anesthesia, and postoperative analgesia [9]. The drug can block the mobility of sodium ions, preventing

them from flowing into the nerve cells to conduct impulses, thus resulting in a reversible block. The drug has a dual effect, including anesthetic and analgesic effects, a large dose of the drug can be used to exert the effect of anesthesia, while a small dose of the drug is usually used for analgesia [10]. During the analgesic application of ropivacaine in postoperative patients, the dosage of the drug is repeatedly increased in order to reduce pain, at this time, the sympathetic excitability is very strong, and it has a certain effect on the hemodynamics of patients [11]. Based on the application of ropivacaine, dexmedetomidine is added to strengthen the effect of sedation and analgesia, and improve the pain relief of patients [12]. Dexmedetomidine, a sedative drug for intubation and ventilator use, is an α2-adrenergic receptor agonist which can be absorbed in a short period of time after injection, peaks at about 60 minutes, and is metabolized and eliminated through urine [13]. The drug is well tolerated and generally does not cause adverse effects [14]. Dexmedetomidine inhibits sensory nerves and nerve signals, and also acts directly on monoaminergic neurons, reducing the release of catecholamine transmitters, decreasing the excitability of the sympathetic nervous system, and thus inhibiting the onset of the stress response [15]. Dexmedetomidine combined with ropivacaine can shorten the onset of block and prolong the recovery time of nerve conduction, and generally does not cause adverse reactions, and the safety of sedation is ideal.

The results of the experiment are as follows. 3 hours after the operation, the analgesic effects of resting NRS score and activity NRS score were compared between the groups, the difference was not statistically significant ($P > 0.05$). 12 hours and 24 hours after the operation, the resting NRS score and activity NRS score of the study group were significantly better than that of the control group, the difference was statistically significant ($P < 0.05$). Implementing the block in the retractor muscle canal can comprehensively block the nociceptive nerve conduction around the knee joint, and can exert a good sedative effect. These two drugs will not affect the quadriceps muscle, dexmedetomidine can reduce the absorption of ropivacaine, reduce the addition of the analgesic drug, make up for the limitations of ropivacaine. Before treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes were compared between the groups, the difference was not statistically significant ($P > 0.05$). After treatment, hemodynamic indexes such as output per beat, cardiac output, cardiac index, and other hemodynamic indexes of the study group were significantly better than those of the control group, the difference was statistically significant ($P < 0.05$). The retractor tube block is performed under ultrasound guidance, the operation process is more precise, and multiple nerves can be blocked. Dexmedetomidine can reduce the release of norepinephrine, cut off the conduction of pain signals, and stabilize the hemodynamics of patients.

In conclusion, the analgesic effect of dexmedetomidine combined with ropivacaine retractor tube block after total knee arthroplasty is ideal, the pain level of the patient is significantly reduced, and the hemodynamic indexes are not greatly affected, thus this anesthesia protocol has certain clinical application value.

Disclosure statement

The author declares no conflict of interest.

References

[1] Shang P, Liu X, Chen Y, et al., 2023, Analysis of the Application Effect of Femoral Nerve Block Anesthesia Combined with Infiltration Anesthesia under Ultrasound Localization in Total Knee Arthroplasty and its Influence on the Quality of Postoperative Awakening. Heilongjiang Medicine, 47(11): 1306–1308.

[2] Jie B, Ji X, Jiang L, 2023, Effect of Ultrasound-Guided Femoral Nerve Block Combined with Infiltration Anesthesia on Th1/Th2 Balance in Elderly Patients Undergoing Total Knee Arthroplasty. Chinese Journal of Gerontology,

43(11): 2638–2641.

[3] Zhang K, Wu K, Li S, et al., 2023, A Randomized Controlled Study of Ultrasound-Guided Retractor Tube Block Combined with Lateral Femoral Cutaneous Nerve Block for Postoperative Analgesia in Patients Undergoing Total Knee Arthroplasty. World Composite Medicine, 9(02): 1–4 + 9.

[4] Yang X, Shi X, Zhang X, et al., 2022, Comparison of Analgesic Effects of Saphenous Nerve Block in the Retractor Canal and Saphenous Nerve Block in the Femoral Triangle Approach for Total Knee Arthroplasty. Ningxia Medical Journal, 44(09): 783–785.

[5] Xia Z, 2022, Comparison of the Application Effect of Combined Lumbar Epidural Anesthesia with Ropivacaine and Continuous Epidural Anesthesia in Artificial Total Knee Arthroplasty in Elderly Patients. Zhongguo Niankang Medicine, 34(17): 144–146 + 150.

[6] Liu Y, Tu Y, Huang B, 2022, Effects of Ultrasound-Guided Nerve Block Combined with General Anesthesia on Analgesia and Hemodynamics in Patients Undergoing Total Knee Arthroplasty. China Contemporary Medicine, 29(18): 115–118 + 122.

[7] Lv W, Lu H, Cai Y, et al., 2022, Effect of Ultrasound-Guided Popliteal Fossa Sciatic Nerve Combined with Femoral Nerve Block on Analgesia and Stress Response after Total Knee Arthroplasty. Shandong Medicine, 62(07): 53–56.

[8] Zhang N, Wang J, 2022, Effects of Ultrasound-Guided Femoral Nerve Block Combined with Infiltration Anesthesia on the Balance of Helper T-Cell 1/Helper T-Cell 2 and Tolerance of Functional Exercise in Elderly Patients Undergoing Total Knee Arthroplasty. Shanxi Medical Journal, 51(01): 67–72.

[9] Liu R, Yang M, Yang Y, et al., 2022, Observation on the Analgesic Effect of Popliteal Artery and Knee Capsule Posterior Interspace Block Combined with Retractor Tube Block after Total Knee Arthroplasty. Beijing Medicine, 44(01): 81–83 + 86. http://doi.org/10.15932/j.0253-9713.2022.01.019

[10] Li Z, Zhou X, Wu Y, et al., 2021, Ultrasound-Guided Retractor Tube Block and Posterior Knee Capsular Gap Block Combined with Mixed Analgesic Drugs in Total Knee Arthroplasty. Chinese Journal of Bone and Joint Injury, 36(12): 1304–1306.

[11] Hu X, Li J, Jin Y, et al., 2021, Clinical Study on the Effect of Transcutaneous Electrical Stimulation of Acupoints on Hyperalgesia in the Anesthesia of Primary Total Knee Arthroplasty for Osteoarthritis in the Elderly. Shandong Journal of Traditional Chinese Medicine, 40(07): 724–728.

[12] Wang F, 2021, Effect of Ultrasound-Guided Continuous Femoral Nerve Block on Postoperative Analgesia in Elderly Patients Undergoing Total Knee Arthroplasty and its Impact on Patients' Hemodynamics. China Medical Innovation, 18(18): 139–142.

[13] Wei N, Wang B, 2020, Effects of Ultrasound-Guided Nerve Block Combined with General Anesthesia on Analgesic Effect and Hemodynamics of Elderly Total Knee Arthroplasty Patients. China Coal Industry Medical Journal, 23(06): 663–666.

[14] Zhang J, Guo M, Wang G, 2019, Effect of Ultrasound-Guided Continuous Retractor Tube Block Combined with Periarticular Infiltration Analgesia on Postoperative Immune Cells in Patients Undergoing Total Knee Arthroplasty. Chinese Journal of Clinical Physicians (Electronic Edition), 13(12): 898–901.

[15] Lei Z, Xia L, Fang X, 2018, Effects of Single Femoral-Sciatic Nerve Block Nerve Block Anesthesia and Epidural Block Anesthesia on Hemodynamics, VAS Score and Adverse Reactions in Patients Undergoing Total Knee Arthroplasty. Chinese Community Physician, 34(33): 64–65 + 67.

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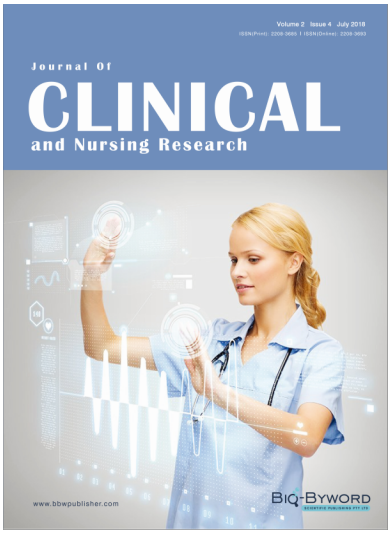
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