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Dermatological Health

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Clinical Efficacy of Cryotherapy for Treating Superficial Skin Lesions: A Case Series

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Abstract: *Objective:* To investigate the clinical efficacy of argon gas cryotherapy for treating superficial skin lesions. *Methods:* Using a cryotherapy device, two patients with superficial skin lesions were treated with argon gas cryotherapy, and the outcomes were observed. *Results:* Both patients achieved ideal results after three sessions of argon gas cryotherapy, with no recurrence observed during a 3-month follow-up period. *Conclusion:* Argon gas cryotherapy is effective for treating superficial skin lesions and holds significant clinical value.

Keywords: Cryotherapy; Superficial skin lesions; Argon gas; Verruca vulgaris; Melanocytic nevus

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1. Introduction

There are various types of superficial skin lesions in clinical practice, such as common warts and melanocytic nevi, with their incidence on the rise in recent years^[1]. These lesions typically occur on the surface layers of the skin, such as the face and neck, and are easily observable due to their superficial location, making early diagnosis and treatment relatively straightforward. Currently, cryotherapy is one of the primary methods for treating superficial skin lesions, offering advantages such as simplicity of operation, high effectiveness, and short treatment cycles^[2]. Cryotherapy works by rapidly freezing the affected tissue at ultra-low temperatures, leading to cell necrosis, while also stimulating a local immune response that further promotes cell apoptosis and tissue destruction^[3]. Compared to other treatment methods, cryotherapy causes less damage to surrounding normal tissues and is less likely to leave significant scars, making it particularly suitable for small, superficial lesions^[4].

2. Animal experiment

Two healthy adult New Zealand White rabbits, weighing 2–3 kg, were purchased from a professional rabbit breeding facility. Prior to the start of the experiment, the rabbits were acclimatized for three days with free access

to food and water.

2.1. Rabbit skin cryotherapy experiment

The rabbits were anesthetized using sodium methohexital. Once fully anesthetized, the surface fur of the rabbits was shaved off using tools, and cryotherapy was administered to the exposed skin (**Figure 1**). The cryotherapy parameters were set at -150°C for 60 seconds. Pathological findings: A sinus tract was observed in the skin tissue, surrounded by an eosinophilic, structureless area with clear boundaries to the surrounding tissue (**Figure 2**).



Figure 1. Cryotherapy was performed on rabbit skin tissue

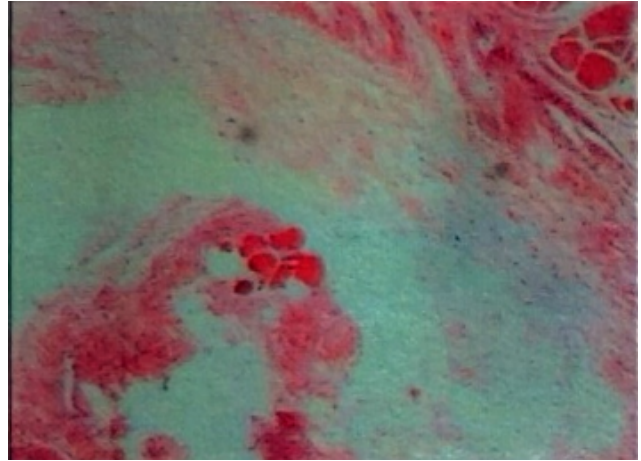


Figure 2. Pathological examination of skin tissue post-cryotherapy

2.2. Rabbit simulated hemorrhoid tissue cryotherapy experiment

The rabbits were anesthetized using sodium methohexital. Lauromacrogol injection was administered into the anal area of the rabbits to simulate hemorrhoid tissue. Cryotherapy was then performed on the simulated hemorrhoid tissue (**Figure 3**). The cryotherapy parameters were set at -150°C for 60 seconds. Pathological findings: A sinus tract was observed within the muscle tissue, surrounded by an eosinophilic, structureless area with clear boundaries to the surrounding tissue (**Figure 4**).



Figure 3. Cryotherapy was performed on simulated hemorrhoid tissue in rabbits

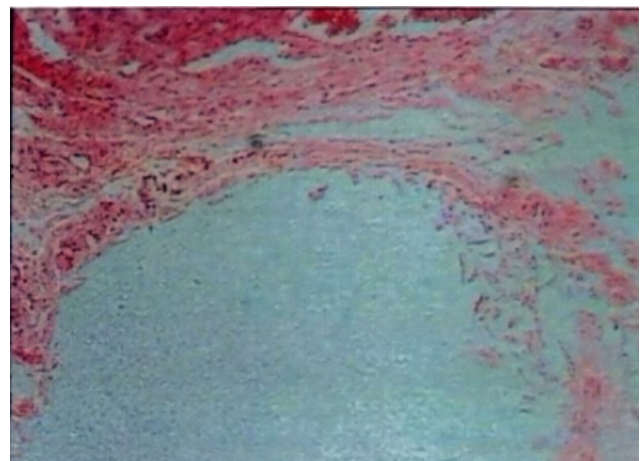


Figure 4. Pathological examination of simulated hemorrhoid tissue post-cryotherapy

After euthanizing the rabbits, tissue sections from the frozen areas were stained and examined to observe tissue necrosis. Statistical analysis revealed that necrosis occurred in all frozen tissue areas. Based on these pathological results, the effectiveness of cryotherapy for treating hemorrhoids and superficial skin conditions can be validated.

3. Clinical data

Our center treated two cases of superficial skin lesions with cryotherapy, achieving confirmed therapeutic outcomes. The details are reported as follows.

3.1. Case 1

A 57-year-old male presented with a common wart on the left cheek. The patient had sustained an injury at the lesion site one year prior, after which the common wart developed and gradually increased in size. The patient attempted self-treatment with medication, but no improvement was observed. Following cryotherapy, the symptoms resolved without recurrence, and the patient reported no significant discomfort.

Physical examination: The lesion was located on the left cheek, measuring approximately 6.5 mm in diameter (**Figure 5**). It appeared grayish-white and papillary, with dry, cracked keratin growth on the surface. The patient reported no discomfort.

Treatment:

- (1) Preparation: The treatment area was cleaned and disinfected.
- (2) Cryotherapy: After the cryotherapy probe was cooled to -150°C , it was applied to the nevus for 30 seconds. Following the 30-second freeze, a rewarming procedure was initiated. Once the temperature reached 0°C , the cryotherapy probe was removed. Ten minutes later, the procedure was repeated for a second round of cryotherapy.
- (3) Postoperative care: The treated area exhibited whitening and swelling postoperatively, but no blisters formed. Antiviral ointment was applied to prevent infection.

Outcome: The cryotreated lesion naturally sloughed off after eight weeks (**Figures 6 and 7**).



Figure 5. Size of the wart before treatment



Figure 6. Significant reduction in the size of the wart three weeks after treatment



Figure 7. Complete disappearance of the wart eight weeks after treatment

3.2. Case 2

A 37-year-old male presented with a melanocytic nevus on the right arm, which had been present since birth. The patient reported no significant discomfort but sought treatment due to cosmetic concerns.

Physical examination: The lesion was located on the wrist of the right arm, measuring approximately 3 mm in diameter (**Figure 8**). It appeared dark brown, and the patient reported no discomfort.

Treatment:

- (1) Preparation: The treatment area was cleaned and disinfected.
- (2) Cryotherapy: After the cryotherapy probe was cooled to -150°C , it was applied to the nevus for 10 seconds. Following the 10-second freeze, a rewarming procedure was initiated. Once the temperature reached 0°C , the cryotherapy probe was removed. Ten minutes later, the procedure was repeated for a second round of cryotherapy.
- (3) Postoperative care: The patient experienced no adverse reactions at the lesion site postoperatively.

Outcome: The cryotreated lesion naturally healed after four weeks (**Figure 9**).



Figure 8. Presence of a melanocytic nevus on the right arm before treatment



Figure 9. Disappearance of the melanocytic nevus after treatment

4. Discussion and conclusion

Superficial skin lesions are typically caused by various factors, including viral infections, endocrine and metabolic factors, and physical or chemical influences. Studies have shown that the immune system plays a dominant role in regulating bacteria residing on the skin's surface. Certain pathogens can not only directly infect skin cells but also influence the clinical treatment of diseases through complex immune responses^[5]. Additionally, some superficial skin lesions occur in areas with a thicker stratum corneum, making drug treatment more challenging and necessitating the use of complementary therapeutic approaches^[6]. Therefore, the clinical management of superficial skin lesions should not only target the lesions but also consider the patient's immune status and skin barrier function to enhance treatment efficacy and reduce recurrence rates.

In the two cases presented in this study, no recurrence or adverse reactions were observed during the 3-month follow-up after cryotherapy. Argon-based cryotherapy demonstrates significant clinical value in treating superficial

skin lesions, as it not only improves clinical manifestations but also reduces recurrence rates. This method is worthy of application and promotion.

Disclosure statement

The authors declare no conflict of interest.

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Review of New Treatment Methods for Psoriasis and Dermatitis

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Abstract: Psoriasis and dermatitis are chronic and troubling skin diseases. To face this challenge, a variety of innovative therapeutic methods came into being. It is necessary to review and summarize the research process of these novel drug therapeutic methods. Local researchers have conducted a comprehensive understanding of the research of traditional medicines, and the research progress of novel therapeutic methods such as biologic drugs and small-molecule targeted drugs has been widely reported. A comprehensive comparison of the new treatments helps to reveal the nuances of each treatment and understand the depth and breadth of its therapeutic effects. New therapeutic approaches, such as cell transplantation, biologic drugs, and small-molecule targeted drugs, are more effective in the treatment of psoriasis and dermatitis than traditional approaches, with minimum side effects. The results of new drug research have opened new possibilities for the treatment of psoriasis and dermatitis, guided the path of future scientific research, and significantly improved the quality of life of patients.

Keywords: Psoriasis; Dermatitis; Novel treatment methods; Biologic products; Small-molecule targeted drugs

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1. Introduction

Psoriasis and dermatitis, the most common skin diseases in the world, have been severely affecting patients' daily lives, causing them to suffer physically and greatly reducing their quality of life. In order to change this situation, many researchers have carried out a series of studies and proposed new therapeutic strategies, including biological products, small-molecule targeted drugs, and cell transplantation. These new treatments not only open up new possibilities for improving patients' quality of life but also point the way for future dermatological treatment. Systematic analysis and summary of these new methods not only allow the understanding of the advantages and disadvantages of each method but also grasp the causes affecting the therapeutic effect, so as to provide a scientific basis for the future treatment strategy of dermatitis and psoriasis.

2. Overview of psoriasis and dermatitis

2.1. Definition and clinical features of psoriasis

Psoriasis is a common skin disease, with its manifestation involving many factors such as immunity, environment, and genetics, which is difficult to define clearly. Its most common description is a skin disease characterized by red scales. Psoriasis vulgaris, the most common form of psoriasis, usually occurs on the scalp, elbows, and knees ^[1]. It is red, swollen, and covered with silvery-white scales. There are many types of psoriasis, such as joint disease, pustular type, erythroderma type, etc., and the clinical manifestations and course of disease differ among the types.

Psoriasis is characterized by intense itching and discomfort, which often cause great distress to patients in their daily lives ^[2]. The severity of the disease fluctuates, and the symptoms worsen in the cold season for some patients. Although psoriasis is not life-threatening, its chronic, relapsing nature makes its management and treatment a long-term challenge.

In terms of pathophysiology, the pathogenesis of psoriasis involves a variety of cells and molecules, including keratinocytes, T lymphocytes, dendritic cells, and various cytokines. These immune cells and inflammatory factors interact, resulting in the abnormal proliferation of epidermal cells and the persistence of inflammatory response, forming the typical pathological features of psoriasis. Researchers have confirmed that a deeper understanding of its causes and pathophysiology has led to the development of a new generation of targeted therapies ^[3]. This significantly expands the diversity of psoriasis treatment and brings more options to patients.

For psoriasis, the difference in skin condition is generally used as the basis for diagnosis, and sometimes it is necessary to perform further skin fluid biological examination for diagnosis ^[4]. However, since psoriasis exhibits varying manifestations, the accurate diagnosis and classification of the condition depend on physicians with strong practical experience and detailed professional knowledge. Treatment strategies may vary based on the types of psoriasis, and efforts are often made to design an individualized treatment plan based on the patient's specific conditions and lifestyle habits.

2.2. Definition and clinical features of dermatitis

Dermatitis is an inflammatory skin reaction caused by various internal and external factors, classified into acute, subacute, and chronic stages. Its clinical features are skin erythema, pruritus, blister, exudation, scab, and scale, accompanied by different degrees of burning and stinging sensation. Acute dermatitis is characterized by obvious swelling and blistering, where exudation is more common, while chronic dermatitis is characterized by dry skin, thickening, and lichenoid lesions ^[5]. Dermatitis can be triggered by many factors, including genetic factors, environmental stimuli, allergic reactions, and autoimmune abnormalities ^[6]. Among them, external allergens such as pollen, animal fur, chemicals, and local stimuli such as friction, scratching, etc., are common triggers. The occurrence of dermatitis may be related to the abnormal immune system response of the individual, and some patients will also have an excessive immune response in the face of minor irritation, resulting in impaired skin barrier function ^[7]. Clinically, dermatitis is classified according to the cause, course, and symptoms, such as contact dermatitis, atopic dermatitis, seborrheic dermatitis, and atopic dermatitis ^[8]. Due to its wide range of incidence groups and variable clinical manifestations, the diagnosis and treatment of dermatitis require a comprehensive analysis of the patient's history, signs, and necessary skin examination results.

2.3. Traditional treatments for psoriasis and dermatitis

Medicine has traditionally focused on three main treatment paths for psoriasis or dermatitis: local therapy,

systemic therapy, and phototherapy^[9]. The treatment goal is merely to relieve the disease, improve the skin quality, and delay the development of the disease. Local therapy is generally the initial treatment option for psoriasis and dermatitis and is most effective in mild to moderate patients^[9]. Topical creams are medications such as corticosteroids, vitamin D derivatives, and tar-like agents, which primarily suppress inflammation and cell overgrowth. Although topical treatments have fewer side effects, long-term use may induce excessive skin atrophy or unpleasant irritation.

For moderate to severe patients, systemic treatment is indispensable. Systemic drugs, such as methotrexate, cyclosporine, and acitretin, mainly suppress the activity of the immune system and reduce the excessive immune response. These systemic drugs can greatly improve symptoms, but long-term use may lead to serious side effects and cause damage to vital organs such as the liver and kidney, so it is necessary to select the treatment carefully under the doctor's guidance.

Phototherapy, another traditional treatment, focuses on applying ultraviolet light to the affected area to reduce cell growth and the inflammatory response. This type of therapy is usually used to treat moderate to severe psoriasis and dermatitis and is especially effective in patients who do not respond to local or systemic therapies. However, it should also be noted that phototherapy may increase the chance of skin cancer, thus it needs to be used with caution, professional execution, and signing.

3. New therapeutic methods and research progress

3.1. Application of biological products in the treatment of psoriasis and dermatitis

Biologic drugs have shown excellent efficacy in the repair process of psoriasis and dermatitis and have rightly received the attention of society^[7]. This class of drugs is mainly based on biotechnology as a means to produce drugs, including monoclonal antibodies, fusion proteins, etc. These drugs can be targeted to alter the disease-associated biological indicators or immune pathways to adjust the body's immune response.

In psoriasis repair, biologic drugs act by inhibiting specific cytokines or their receptors based on tumor necrosis factor (TNF- α), interleukin (IL-17), and IL-23 to restrict the pathological immune response. These drugs include etanercept, adalimumab, secukinumab, and guselkumab. After multiple clinical trials, the functional performance of these biologic products is excellent. They can not only significantly improve the pathologies of psoriasis skin lesions but also reduce the number of disease recurrences to a certain extent, thus greatly improving patients' quality of life^[10]. Biologic products have also achieved significant efficacy in the treatment of dermatitis. For atopic dermatitis and other diseases related to the overreaction of the immune system, biologic products have a significant inflammatory remission effect through the intervention of related cytokine pathways. For example, drugs such as dupilumab, which targets IL-4 and IL-13, are effective in reducing skin lesions and relieving itching, and their safety is better than that of traditional immunosuppressants.

The use of biologics not only optimizes treatment strategies for psoriasis and dermatitis but also provides new options for patients who do not respond well to conventional therapies. Although biologics have shown good efficacy and tolerability, their high cost and potential long-term safety issues need to be further explored and addressed in future studies. Through in-depth studies of the mechanism of action of biologics and their performance in different patient populations, it can provide stronger support for clinical practice and point the way for the development of new drugs.

3.2. Application of small-molecule targeted drugs in the treatment of psoriasis and dermatitis

In recent years, the application of small-molecule targeted drugs in the treatment of psoriasis and dermatitis has attracted extensive attention in the scientific research community. By targeting specific molecules or signaling pathways, this class of drugs has shown excellent potential in the management of therapeutic effects and side effects. In the treatment of psoriasis, small-molecule targeted drugs such as JAK inhibitors, PDE4 inhibitors, etc., have shown significant effects. JAK inhibitors reduce skin inflammation by inhibiting the activity of Janus kinase and blocking cytokine signaling ^[11]. By inhibiting the function of phosphodiesterase 4, PDE4 inhibitors increase the content of cyclic adenosine phosphate in cells and indirectly slow down the inflammatory response. These drugs significantly reduce systemic side effects while relieving symptoms compared to conventional topical or systemic immunosuppressants.

In the treatment of dermatitis, small-molecule targeted drugs also show a good application prospect. Dermatitis usually involves complex inflammatory signaling pathways, and small-molecule drugs can regulate these signaling pathways through highly specific mechanisms to reduce inflammation and skin lesions. Studies have shown that patients using small-molecule targeted drugs have achieved significant improvements in inflammation control and skin recovery, and their efficacy is significantly better than traditional methods.

The above progress indicates that small-molecule targeted drugs in the treatment of psoriasis and dermatitis not only provide a new idea of disease management but also broaden the possibility of clinical application. Further optimization and safety evaluation of these drugs are critical in future studies.

3.3. Application of cell transplantation in the treatment of psoriasis and dermatitis

Cell transplantation has shown significant potential in the treatment of psoriasis and dermatitis. Studies have shown that by transplanting healthy cells, the normal function of the skin can be effectively restored, thereby improving disease symptoms. In the treatment of psoriasis, stem cell transplantation has shown good efficacy by repairing the skin barrier and regulating the immune response, while in the treatment of dermatitis, cell transplantation can reduce the inflammatory response and promote skin healing ^[12]. Although the study has a limited sample size, available clinical trial data point to the potential of cell transplantation to improve treatment outcomes and reduce side effects. The innovation and development of cell transplantation technology are expected to further enhance the breadth and depth of its application in the treatment of skin diseases and provide new ideas and directions for future treatment.

4. Comparison of therapeutic effects and future trends of new therapeutic methods

4.1. Comparison of therapeutic effects between new and traditional treatment methods

The new treatment has shown more significant efficacy than traditional methods in treating psoriasis and dermatitis. Traditional treatments, such as topical glucocorticoids and immunosuppressants, have short-term symptom relief effects, but their long-term use may lead to drug resistance, side effects, and relapse in patients, significantly limiting the durability of the efficacy. In contrast, novel therapeutic approaches such as biologics, small-molecule targeting drugs, and cell transplantation have shown superior therapeutic efficacy.

By precisely interfering with key proteins or immune pathways in the pathological process, biologics can significantly improve patients' symptoms and reduce recurrence rates. Most of these drugs have high selectivity and low systemic side effects, making them safer for long-term use ^[13]. Small-molecule targeted drugs act on the molecular basis of the disease through specific targets, take effect quickly, and can reduce the adverse reactions

brought by traditional drugs in precision treatment. Cell transplantation, in which healthy cells are introduced to repair diseased tissue, offers an effective alternative for some patients who are resistant to drugs.

Clinical studies have shown that these new treatments are superior to traditional therapies in improving skin lesions, reducing inflammation, and lowering recurrence rates, and they also show significant advantages in improving patients' quality of life and prolonging symptom remission. Although the current cost of new treatment options may be higher, their long-term efficacy and potential health benefits undoubtedly provide more possibilities for patients and clinical choices. As novel treatments continue to develop, these technologies are expected to open up new directions for the management of psoriasis and dermatitis.

4.2. Analysis of advantages and disadvantages of new treatment methods

The application of new treatment methods in the treatment of psoriasis and dermatitis has shown higher efficacy and fewer side effects than traditional methods. These new approaches also have their advantages and disadvantages. Biologics are highly specific and can target specific pathological mechanisms for treatment, reducing the impact on healthy cells with relatively few side effects. However, its price is high, and long-term use may lead to adverse reactions such as immune system disorders. The production and storage conditions of biologic products are strict, and the economic burden on patients is large.

Small-molecule targeted drugs have a high therapeutic effect by designing specific molecular structures and accurately acting on specific cell locations to block related signaling pathways. The ease of oral administration of these drugs improves patient compliance. Some small-molecule drugs may cause resistance problems when used for a long time, and some patients may experience side effects such as abnormal liver function. The research and development cycle of small-molecule targeted drugs is long, and the cost is high.

Cell transplantation technology offers a breakthrough approach for the treatment of refractory psoriasis and dermatitis. By transplanting healthy cells, damaged skin tissue can be repaired, providing a long-lasting healing effect. Cell transplantation involves complex ethical and technical issues, such as the acquisition of donor cells and immune rejection after transplantation. Transplantation is inherently risky, limiting its potential for widespread use.

Although these novel therapies show excellent therapeutic potential, their advantages and disadvantages still need to be weighed in practical applications to achieve the best treatment results and patient comfort.

4.3. Development prospects and research direction of novel therapeutic methods

New therapeutic methods show promising prospects in the study of psoriasis and dermatitis. The research and development of biologic products continues to deepen, and more drugs for different targets are developed through improved genetic engineering technology, which is expected to improve the therapeutic effect. Small-molecule targeted drugs are becoming a research hotspot due to their oral convenience and easy mass production. Future research and development will focus on reducing drug costs and optimizing drug mechanisms of action to achieve higher clinical availability. Cell transplantation technology provides a new idea of regenerative therapy, and in-depth study of the long-term survival rate and immune rejection of grafts *in vivo* is the key to its development. At present, the combined treatment strategy combining a variety of new therapies is gradually showing its potential, and improving the overall treatment effect through a synergistic effect will become an important direction of future research. These explorations not only open up new ways to treat diseases but also lay the foundation for the realization of personalized medicine, which is expected to change the traditional treatment landscape and improve patients' quality of life.

5. Conclusion

This paper systematically reviewed and summarized the new treatment methods for psoriasis and dermatitis in detail, from the classical drug treatment to the current biologic products, small-molecule targeted drugs, and the latest cell transplantation and other treatment methods, the main purpose of which is to find a more effective treatment with fewer side effects. The emergence of new therapeutic methods has greatly improved the treatment effect of psoriasis and dermatitis and has far-reaching significance for improving patients' quality of life. However, despite the significant progress in the therapeutic effect of various new therapies, there are still some problems that need to be further solved, such as the long-term efficacy and side effects of new therapeutic drugs. In addition, due to the popularization and promotion of treatment methods taking a certain time, the current promotion degree of new treatment methods and their popularity in the market need to be improved. This also poses new challenges for our future research. In general, the new treatment strategy provides a new idea and direction for the treatment of psoriasis and dermatitis, and the main research direction in the future will tend to solve issues concerning the side effects, long-term effects, and popularization of the new treatment strategy, in order to continuously improve the treatment effect and improve patients' quality of life.

Disclosure statement

The authors declare no conflict of interest.

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The Relationship Between Neutrophil-to-Lymphocyte Ratio and Platelet-to-Lymphocyte Ratio in Psoriasis Curative Effect Treated with Apremilast: A Retrospective Analysis

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Abstract: In this study, the changes of neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) in patients with psoriasis were retrospectively analyzed based on the treatment of apremilast. By screening patients with psoriasis before and after treatment with apremilast, relevant blood routine indicators were collected, and NLR and PLR were calculated. The results showed that both NLR and PLR were significantly reduced after treatment with apremilast. This suggests that the inflammatory response is improved in patients with psoriasis and that apremilast may have an inhibitory effect on white blood cell platelet activation. These results suggest that NLR and PLR may be useful indicators to evaluate the condition of psoriasis and the therapeutic effect of apremilast. This provides a new reference index and treatment strategy for the clinic and has positive practical guiding significance for the prevention and treatment of psoriasis.

Keywords: Apremilast; Psoriasis; Neutrophil-to-lymphocyte ratio; Platelet-to-lymphocyte; Disease assessment

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1. Introduction

According to the World Health Organization, about 1–3% of the global population is affected by psoriasis. As a chronic non-infectious skin disease, psoriasis not only affects patients physically but also poses a serious threat to their mental health. Typical psoriasis features include redness, itching, and desquamation of the skin, and there is no definitive treatment that can completely cure the disease. In recent years, as a new drug for the treatment of psoriasis, apremilast has shown remarkable clinical efficacy, but its specific mechanism of action and influencing factors remain to be further studied. Based on the above background, we retrospectively analyzed the changes of neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) in the clinical data of patients with

psoriasis treated with apremilast. In recent years, NLR and PLR have been widely used to evaluate inflammatory response and immune status in a variety of diseases. We expect that this study will provide clinicians with a more accurate assessment of the disease and individualized treatment strategies to effectively improve treatment outcomes and quality of life for patients with psoriasis.

2. Overview of the treatment of psoriasis with apremilast

2.1. Pathophysiological mechanism of psoriasis

Psoriasis is a common skin disease characterized by chronic inflammation and complex pathogenesis involving multiple immune and inflammatory responses. The main characteristics are abnormal proliferation of keratinocytes and inhibition of death, accompanied by increased subdermal blood vessels and a large number of inflammatory cells. In this disease, the role of T cells is crucial, especially the increased activation of Th1 and Th17 cells, which leads to the overproduction of tumor necrosis factor- α (TNF- α), interleukin-17 (IL-17), and IL-23, which together drive the pathological process. This deviation from the normal immune response breaks down the skin barrier, causing abnormal skin hyperplasia and scale formation. Environmental factors, genetic predisposition, and psychological stress are the main factors that trigger psoriasis ^[1-3]. A deeper understanding of pathophysiological mechanisms provides the basis for the development of novel therapies, especially the application of immunomodulatory therapy in practice, which demonstrates its effective therapeutic potential ^[4].

2.2. The role of apremilast in the treatment of psoriasis

Apremilast is a selective phosphodiesterase 4 (PDE4) inhibitor that plays an important role in the treatment of psoriasis. It regulates immune and inflammatory responses by inhibiting PDE4 activity and increasing intracellular cyclic adenosine phosphate (cAMP) levels. Elevated levels of cAMP are linked in part to anti-inflammatory cytokines, including TNF- α , IL-17, and IL-23. These cytokines play a central role in the pathogenesis of psoriasis. Apremilast has been shown to significantly improve skin damage and symptoms in patients with psoriasis. Its oral administration makes it highly convenient, thereby enhancing patient compliance with treatment. However, it is not without side effects, including gastrointestinal discomfort and weight loss. Nevertheless, its overall safety profile remains acceptable. Therefore, apremilast offers a feasible and safe option for the treatment of psoriasis ^[5,6].

2.3. Pharmacological properties and mechanism of action of apremilast

The efficacy of apremilast is mainly due to its specific inhibition of PDE4. Its mechanism of action is to restrict the activity of PDE4, thus slowing down the degradation of cAMP, and inhibit the production of TNF- α , IL-17, and IL-23 that cause inflammation. This mechanism helps to regulate the body's immune response and concentrate the severity of inflammation, so as to improve the skin problems and actual conditions of psoriasis patients. Apremilast is highly valuable in bottom-facing applications due to its excellent oral bioavailability ^[7,8].

3. Neutrophil-to-lymphocyte and platelet-to-lymphocyte ratios as indicators of inflammation

3.1. Neutrophil-to-lymphocyte ratio and inflammatory response

Neutrophil-to-lymphocyte ratio (NLR) has recently been widely recognized as a key indicator of inflammatory status. In the human immune response, neutrophils are an important component of the innate immune system,

and their increase in acute and chronic inflammation is observed. Changes in the value of platelets, which are the main players in stopping bleeding and promoting inflammation, can interpret the activity level of the inflammatory process. The rise in NLR is clearly associated with the activity of many inflammatory diseases, including autoimmune diseases, cardiovascular diseases, and various malignancies. For chronic inflammatory diseases such as psoriasis, an increase in NLR usually means an enhanced inflammatory response, which may indicate that the condition is worsening or in an active phase. The decrease in NLR associated with medication, such as apremilast, may indicate that an anti-inflammatory effect has occurred, which is a clear sign of improvement in the inflammatory state of the disease. NLR not only has the ability to serve as an effective biomarker of inflammatory response but also has the possibility of evaluating treatment effectiveness and prognosis^[9,10].

3.2. Platelet-to-lymphocyte ratio and inflammatory response

Platelet-to-lymphocyte ratio (PLR), as a biomarker reflecting the inflammatory state of the organism, has been widely used in many diseases in recent years. Fluctuations in the PLR may indicate an interaction between the immune system and the clotting system. During the inflammatory experience, the number of lymphocytes often decreases, while platelets may increase in response to their participation in the inflammatory response, which may lead to a increase in PLR, and this difference can be a marker of inflammatory activity. In patients with psoriasis, inflammation is often chronic or systemic, and changes in PLR at this time may reflect the severity of the disease and the degree of inflammatory activity. Fluctuations in PLR have potential value in evaluating the response of psoriasis patients to treatment and can help clinicians develop individualized treatment plans. A detailed analysis of PLR will support a further understanding of the mechanisms of inflammation in psoriasis^[11].

3.3. Significance of NLR and PLR in the assessment of psoriasis

NLR and PLR, as important indicators of inflammation, have the special ability to reveal the dynamics of psoriasis. In patients with psoriasis, these changes are a powerful indicator of the severity of the inflammatory response and the response to treatment. After treatment with apremilast, a significant decrease in these values was seen, indicating an improvement in the inflammatory response. The role of NLR and PLR in the evaluation of psoriasis is particularly important, contributing extremely valuable reference points, giving physicians a better guidance in developing improved treatment strategies adapted for each patient, and improving the accuracy of the evaluation of treatment effects^[12].

4. Patient screening and data collection methods

4.1. Screening criteria and methods for psoriasis patients

In the process of screening patients, it is necessary to set clear criteria for intervention and exclusion, in order to ensure the homogeneity of the samples in the study and the authenticity of the study effect. The criteria for admission were patients diagnosed with psoriasis who had been treated with apremilast for at least three months. Patients with a complete record of routine blood tests were included, which can be used to calculate NLR and PLR. Exclusion criteria included co-existing conditions that affect the results of routine blood tests, such as infectious conditions, diseases of the blood system, and patients receiving other immunomodulatory treatments. In order to avoid bias in the sample data, pregnant women and minors were not accepted. Furthermore, an electronic medical record system was used to retrieve and screen the data, which was reviewed by medical professionals to ensure the accuracy of the screening and the integrity of the data. This screening scheme helps to find representative

researchers, which provides a solid basis for subsequent data analysis ^[13].

4.2. Collection and processing of blood routine indexes

During the collection and processing of blood routine indicators, standardized blood samples were taken from all patients with psoriasis enrolled in the study. The sampling time was arranged at specific time points before and after treatment with apremilast to ensure comparability and scientific data. Blood samples were tested using a fully automated blood analyzer to obtain neutrophils, lymphocytes, and platelets. To ensure the accuracy and consistency of the data, the testing process followed strict laboratory operating standards. In order to further analyze the NLR and PLR of the patient, the calculation was carried out according to the predetermined calculation formula based on the obtained test results of each item. The whole process emphasized data quality control, and the abnormal data were screened and processed to ensure the reliability and validity of the research results ^[14].

4.3. Calculation and comparison of NLR and PLR

In the study, neutrophil, lymphocyte, and platelet counts were obtained from the blood routine data of patients. NLR is calculated by dividing the absolute number of neutrophils by the absolute number of lymphocytes, and PLR is calculated by dividing the absolute number of platelets by the absolute number of lymphocytes. The purpose of the calculation was to determine the changes in the inflammatory response of patients before and after treatment with apremilast to compare the treatment effect. On the basis of the calculated results, statistical methods were used to analyze whether the changes of NLR and PLR were significant, so as to provide a reference for evaluating the condition and treatment of psoriasis ^[15].

5. Analysis of the influence of apremilast on NLR and PLR

5.1. Changes in NLR and LPR before and after treatment with apremilast

Both NLR and PLR showed significant changes before and after treatment with apremilast. Compared with the blood routine indexes before treatment, NLR and PLR were significantly reduced after treatment, which reflected the improvement of the inflammatory state in patients. The decrease of NLR may be related to neutropenia or the increase of lymphocytopenia, while the decrease of PLR is mainly due to the increase of lymphocytes or the decrease of platelets. This observation suggests that apremilast may reduce the burden of inflammation in patients with psoriasis by regulating the activation of white blood cells and platelets. These changes not only illustrate the therapeutic effect of apremilast but also provide a new indicator for the clinical evaluation of inflammation. By comparing NLR and PLR before and after treatment, the anti-inflammatory effects of apremilast in patients with psoriasis can be more comprehensively evaluated, providing an important experimental basis and direction for follow-up studies.

5.2. Changes in the activation status of leukocytes and platelets in psoriasis patients treated with apremilast

The use of apremilast in patients with psoriasis showed a significant change in the activation status of white blood cells and platelets. Significant reductions in NLR and PLR were observed after treatment, suggesting a reduction in levels of inflammatory mediators in the patient. White blood cells and platelets are caught in the task of inflammatory counterattack and immune vigilance, and the activation of apremilast envoys drops to a low point. In fact, because of the clever interference of apremilast, the signal transmission pathway is blocked, the

release of pro-inflammatory cytokines is reduced, and the vitality of white blood cells and platelets is impaired. Phosphodiesterase 4 is a key enzyme in regulating inflammation and immune response, and the influence of apremilast on its activity is evident. Apremilast can not only deal with the symptoms of skin psoriasis but also stabilize the vitality of white blood cells and platelets and alleviate the systemic inflammatory response.

5.3. Effects of apremilast on the assessment of psoriasis

Studies have shown a significant reduction in NLR and PLR in patients with psoriasis after treatment with apremilast, suggesting it is effective in improving the inflammatory response. This reduction may reflect the modulating effect of apremilast on the immune system, which relieves the symptoms and condition of psoriasis. In clinical practice, the changes of NLR and PLR can be used as an important reference index to evaluate the efficacy of apremilast, which can help clinicians more accurately judge the changes of the disease, optimize the treatment plan, and improve the individualization and precision of treatment. This provides a critical scientific basis for the management of psoriasis.

6. Research conclusion and prospects

6.1. Research results and conclusion

The results showed that the NLR and PLR were significantly reduced in patients with psoriasis after treatment with apremilast. The decrease in NLR and PLR hinted at an improvement in the inflammatory response, which revealed a quantifiable biomarker change that showed the exact therapeutic effect of apremilast on psoriasis. The study further revealed that apremilast may alleviate inflammation by inhibiting the activation of white blood cells and platelets, which not only helps to reduce the clinical symptoms of psoriasis but also provides a new perspective on its pharmacological mechanism of action. NLR and PLR are considered to be potential indicators for evaluating the change of the disease and the treatment effect in patients with psoriasis. This study lays a foundation for further exploration of the therapeutic strategy and application of apremilast in inflammatory diseases and provides a new reference for clinical treatment.

6.2. Application of NLR and PLR in the evaluation of psoriasis and the therapeutic effect of apremilast

NLR and PLR have great potential for evaluating the effects of apremilast on psoriasis. Studies have shown that NLR and PLR are significantly reduced in patients with psoriasis after treatment with apremilast, suggesting that these ratios are closely related to the inflammatory response. In general medical operations, NLR and PLR can be used as sensitive response elements to help the medical staff to control the inflammation of the patient and study the steps of treatment. Periodic speculations and attempts to analyze NLR and PLR can more quickly detect changes in the disease, which can help to study efficacy and improve the treatment plan for individuals. This can improve the scientific nature of diagnosis and treatment and provide patients with the most accurate treatment strategy, so that the personalized management of psoriasis is more effective. Analysis of NLR and PLR can enhance the overall evaluation of psoriasis, promote the adjustment and improvement of treatment plans, and enhance the integrated outcome of patients.

6.3. New strategies and future research directions for the treatment of psoriasis with apremilast

The new treatment strategy for psoriasis with apremilast can focus on the development of a personalized treatment

regimen that combines the patient's genetic background and immune status and optimizes dosage and duration of administration to improve efficacy and reduce adverse effects. Future research directions include exploring the specific mechanisms of action of the drug on different subtypes of psoriasis, as well as its effects on other inflammatory markers. Combined with biomarkers such as NLR and PLR, large-scale clinical trials verifying their usefulness in disease monitoring and treatment adjustment will provide strong support for precision medicine for psoriasis.

7. Conclusion

In this study, we retrospectively analyzed the changes of NLR and PLR in psoriasis patients treated with apremilast. The study found that the NLR and PLR values of patients were significantly reduced after treatment with apremilast, which proved that the drug inhibited the activation of white blood cells and platelets, the inflammatory response was improved, and the physical health of patients was enhanced. This provides a new reference index and treatment strategy for the clinic and has positive practical guiding significance for the prevention and treatment of psoriasis. However, it is worth noting that although apremilast has obvious therapeutic effect on psoriasis, its mechanism of action is not completely clear, so in future studies, we need to closely observe the changes of NLR and PLR values in psoriasis patients during the treatment of apremilast on a regular basis to better evaluate its efficacy and safety. In general, NLR and PLR have potential as indicators for the assessment of psoriasis and the evaluation of the therapeutic effect of apremilast and are worthy of further clinical research and practice.

Disclosure statement

The authors declare no conflict of interest.

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