

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

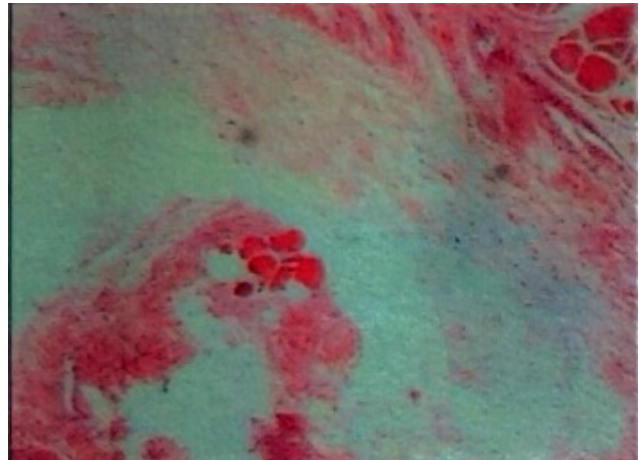


Figure 2. Pathological examination of skin tissue post-cryotherapy

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

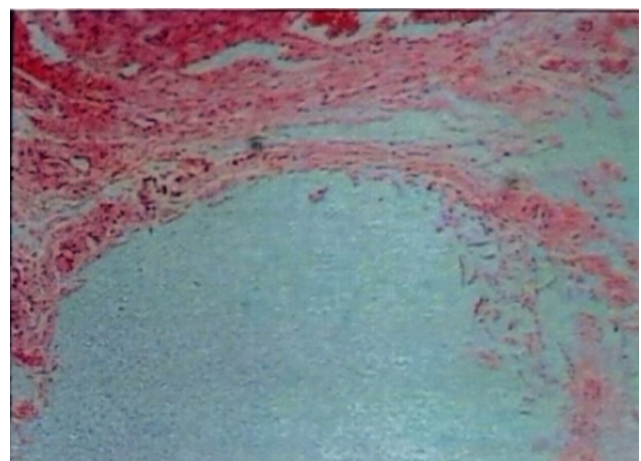


Figure 4. Pathological examination of simulated hemorrhoid tissue post-cryotherapy

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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