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Application of Silver-Containing Mesh Lipid Hydrocolloid Dressing in Tension Blisters Following Extremity Fractures

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Abstract: *Objective:* To evaluate the application value of silver-containing mesh lipid hydrocolloid dressing in tension blisters following extremity fractures. *Methods:* 60 patients with extremity fractures were selected as samples, all of whom had tension blisters. The study period was from September 2022 to September 2023, and they were grouped according to the random number table method. Group A received silver-containing mesh lipid hydrocolloid dressing, while Group B received routine nursing. *Results:* The healing time and operation time of Group A were shorter than those of Group B, and the number of operations was less than that of Group B ($P < 0.05$). The quality of life (SF-36) score of Group A was higher than that of Group B ($P < 0.05$). The skin injury rate of Group A was lower than that of Group B, and the comfort rate was higher than that of Group B ($P < 0.05$). *Conclusion:* The intervention of silver-containing mesh lipid hydrocolloid dressing in patients with extremity fractures can promote the recovery of tension blisters, improve the comfort of patients, and reduce skin lesions, which is efficient and feasible.

Keywords: Extremity fractures; Silver-containing mesh lipid hydrocolloid dressing; Tension blisters

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1. Introduction

In traumatic fractures of the extremities, the soft tissue and vascular intima are severely damaged with vascular embolism and abnormal lymphatic reflux, resulting in increased local capillary permeability, which is manifested by an increase in the amount of fluid exudation in the fracture area. In addition, high-energy trauma of the limbs will increase the risk of tension blisters, resulting in prolonged preoperative waiting time and increased risk of perioperative infection, which is inconducive to the healing of limb fractures [1]. Under the background of the continuous maturity of nursing technology, the concept of wet healing, antibacterial dressings and silver ion dressings have been promoted in orthopedic nursing. Therefore, this paper attempts to apply film dressings to care for blisters following extremity fractures [2]. In this paper, 60 patients with traumatic fractures of the extremities were taken as samples to explore the nursing value of silver-containing mesh lipid hydrocolloid dressing.

2. Information and methods

2.1. Information

A total of 60 patients with traumatic fractures of extremities were selected as samples, all of whom had tension blisters. The study period was from September 2022 to September 2023, and they were grouped according to the random number table method. The data of Group A were compared with Group B, $P > 0.05$, as shown in **Table 1**.

Table 1. Data analysis of patients with traumatic fractures of extremities

Group	*n*	Gender (%)		Age (years)		Fracture site (%)	
		Male	Female	Interval	Mean value	Upper limb	Lower limb
A	30	16	14	46–71	59.62 ± 1.39	12	18
B	30	14	16	47–72	59.59 ± 1.42	11	19
χ^2/t	-	0.2667		0.0827		0.0705	
P	-	0.6056		0.9344		0.7906	

2.2. Eligibility criteria

Inclusion criteria: (1) Imaging diagnosis of limb fractures; (2) Informed consent; (3) Normal cognition.
Exclusion criteria: (1) Patients with local skin defect; (2) Patients with crush injury; (3) Patients with open fracture of limbs; (4) Shock patients.

2.3. Methods

Group A received silver-containing mesh lipid hydrocolloid dressing: (1) Nurses strengthened communication with patients and consulted whether patients have a history of silver ion allergy and sulfonamide allergy. (2) The location of pressure blisters was determined, and 2% povidone-iodine was prepared to disinfect blisters and surrounding areas. (3) After disinfection, sterile saline was prepared to scrub or rinse the blisters and the residual disinfectant around the blisters. (4) Sterile tweezers or scissors were used to cut off the tension blister skin, and then sterile gauze was prepared to absorb the clot and liquid in the blisters, so as to see the local fresh tissue. (5) The appropriate size of silver-containing mesh lipid hydrocolloid dressing was prepared, with the edge of the dressing 1–2 cm beyond the edge of the blister. The area was wrapped with sterile gauze and bandages, with the dressing changed every two days. Additionally, the dressing area was observed for any fluid leakage, and the dressing was replaced promptly if needed. (6) During the dressing change, sterile normal saline was used to clean the wound and the gauze was used to dry the local area. Finally, the dressing and gauze were covered to complete the bandage.

Group B received routine nursing: A 2% povidone-iodine cotton ball was prepared to sterilize the skin of the tension blister and surrounding areas. In a sterile environment, the fluid from the blister was punctured and extracted using a syringe until fully drained. A sterile cotton swab was prepared and gently pressed from the top to the bottom of the blister, ensuring the blister skin adhered closely to the underlying skin layer without being removed. The area was covered with sterile gauze and secured with adhesive tape. The dressing was changed once every day.

2.4. Observation indexes

(1) Evaluation index: The healing time, operation time, number of operations, and so on were recorded.
(2) Quality of life: SF-36 score was positively correlated with the quality of life of patients with extremity fractures, 0–100 points.
(3) Skin injury rate and comfort rate: Skin injuries such as redness, subcutaneous petechiae, and blisters were

recorded. The number of comfortable patients was recorded, and the patients cooperated to complete various medical operations. Patients without severe pain and irritability were recorded as comfortable.

2.5. Statistical analysis

SPSS21.0 was used for data processing, χ^2 for verification and % for the description of counting data; t for verification and mean ± standard deviation (SD) for the description of measurement data. When $P < 0.05$, there was a statistically significant difference.

3. Results

3.1. Evaluation index

The healing time and operation time of Group A were shorter than those of Group B, and the number of operations was less than that of Group B, $P < 0.05$, as shown in **Table 2**.

Table 2. Comparison of evaluation indexes (mean ± SD)

Group	Healing time (d)	Operation time (min)	Number of operations (times)
A (n = 30)	6.36 ± 0.51	19.68 ± 0.48	2.36 ± 0.42
B (n = 30)	11.43 ± 1.21	166.25 ± 18.44	18.05 ± 3.25
t	21.1483	43.5209	26.2243
P	0.0000	0.0000	0.0000

3.2. Quality of life index

After intervention, the SF-36 score of Group A was higher than that of Group B, $P < 0.05$, as shown in **Table 3**.

Table 3. Comparison of quality of life index (mean ± SD)

Group	Physical health (points)		Mental health (points)		Physiological function (points)		Social function (points)	
	Before	After	Before	After	Before	After	Before	After
A (n = 30)	61.29 ± 2.81	84.33 ± 3.52	62.42 ± 2.74	85.06 ± 3.61	61.22 ± 2.75	85.14 ± 3.61	62.06 ± 2.74	85.06 ± 3.42
B (n = 30)	61.31 ± 2.79	76.36 ± 3.31	62.38 ± 2.76	76.41 ± 3.42	61.26 ± 2.74	75.11 ± 3.42	62.11 ± 2.73	76.13 ± 3.06
t	0.0277	9.0346	0.0563	9.5275	0.0564	11.0475	0.0708	10.6582
P	0.9780	0.0000	0.9553	0.0000	0.9552	0.0000	0.9438	0.0000

3.3. Skin injury rate and comfort rate

The skin injury rate of Group A was lower than that of Group B, and the comfort rate was higher than that of Group B, $P < 0.05$, as shown in **Table 4**.

Table 4. Comparison of skin injury rate and comfort rate [n (%)]

Group	Redness	Subcutaneous petechiae	Blister	Skin injury rate	Comfort rate
A (n = 30)	1 (3.33)	0 (0.00)	0 (0.00)	1 (3.33)	28 (93.33)
B (n = 30)	3 (10.00)	2 (6.67)	1 (3.33)	6 (20.00)	22 (73.33)
χ^2	-	-	-	4.0431	4.3200
P	-	-	-	0.0444	0.0377

4. Discussion

The limbs are at a higher risk of crush or violent injuries. After a fracture, the limbs may experience blocked local blood circulation and increased internal pressure in the fracture area, potentially leading to compartment syndrome. In addition, there is less soft tissue in the limb area, the skin tension is high after fracture, and it is prone to tension blisters. The typical sign of the early stage of the disease is swelling. Based on the physiological and anatomical structure, the causes of tension blisters after limb fractures were analyzed, which were related to traumatic stimulation, resulting in the periosteum and bone marrow damage and local soft tissue vascular rupture, causing limb swelling and tension blisters. It is also related to the uneven pressure of local soft tissue, resulting in tension blisters [3]. In tension blisters, the local skin will be damaged, increasing the risk of infection and affecting the surgical treatment of fractures. At present, silver-containing mesh lipid hydrocolloid dressings are mostly used to treat tension blisters in clinics, which are composed of water gel particles, silver sulfadiazine, Vaseline, and other components. After contact with the exudate wound, the sodium carboxymethyl cellulose component in the hydrocolloid particles can form a gel, which can also interact with Vaseline to form a lipid-hydrocolloid interface and maintain a moist environment in the blister area. Among the components of silver sulfadiazine, sulfadiazine has anti-inflammatory and antibacterial effects, while silver has astringent effects [4]. The use of silver-containing mesh lipid hydrocolloid dressings can promote local granulation and shorten wound healing time.

Based on the results in this paper, the healing time and operation time of Group A were shorter than those of Group B, and the number of operations was less than that of Group B, $P < 0.05$. This shows that the intervention of silver-containing mesh lipid hydrocolloid dressing can promote the recovery of patients. The reason is that after removing the skin of tension blisters, the external application of silver-containing mesh lipid hydrocolloid dressing has the following advantages: the grid-patterned dressing has excellent permeability, covered with sterile gauze on the outer layer, capable of continuously absorbing exudate from the affected limb, promoting the elimination of excess fluid within the swollen limb, and thereby shortening the absorption time of limb swelling; sodium carboxymethyl cellulose reacts with local exudate to form a gel, creating a moist environment that accelerates wound healing time [5]. Another set of data showed that the SF-36 score of Group A was higher than that of Group B, $P < 0.05$. It shows that the intervention of silver-containing mesh lipid hydrocolloid dressing can optimize the quality of life of patients with extremity fractures. This is due to the use of carboxymethyl cellulose as a gel, which can closely adhere to the edge of tension blisters, with heat preservation, anti-bacterial, and waterproof effects, but also maintain local humidity, creating a micro-acid and low-oxygen environment conducive to wound healing, and no residue during the replacement of dressings, which can reduce pain and avoid secondary mechanical damage [6]. In addition, silver sulfadiazine is an organic compound, including silver nitrate, sulfadiazine, and other components, after contact with the exudate tissue, continuously and slowly releasing sulfadiazine and silver, increasing the concentration of tissue fluid and inhibiting the growth and reproduction of bacteria [7]. The practical application of dressings in the treatment of tension blisters can not only protect the wound and prevent infection but also promote wound healing, so the quality of life of patients is higher. The last set of data showed that the skin injury rate of Group A was lower than that of Group B, and the comfort rate was higher than that of Group B, $P < 0.05$. It shows that silver-containing mesh lipid hydrocolloid dressing can reduce skin injury and improve limb comfort. The reason is that the hydrocolloid dressing is soft, which can prevent the chemical burn of the disinfectant to the tension blister area. In addition, the hydrocolloid dressing is smooth, which can generate a protective cover in the local skin area and reduce the pressure per unit area. The hydrocolloid dressing fully contacts the patient's skin, which can reduce local wrinkles and friction. Therefore, there are fewer postoperative skin injuries and high patient comfort [8].

5. Conclusion

In conclusion, the application of silver-containing mesh lipid hydrocolloid dressing in the treatment of patients with tension blisters following extremity fractures can promote wound healing, optimize the quality of life of patients, reduce skin injury, and improve patient comfort, which is worthy of promotion.

Disclosure statement

The authors declare no conflict of interest.

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