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Exploring the Clinical Efficacy of Closed Negative Pressure Suction Technique (VSD) for Orthopedic Trauma and Infected Wounds Versus Conventional Dressing Changes

Guorui Ding

Department of Orthopedics, Dongsheng People's Hospital, Ordos, Inner Mongolia, 017000, China

Abstract

Objective: To study the therapeutic effect of closed negative pressure suction technique in the treatment of orthopedic trauma as well as infected wounds and conventional dressing changes. Methods: Sixty patients with orthopedic trauma and infected wounds admitted to the hospital between January 2020 and December 2022 were selected and randomly grouped, and the treatment effects of the two groups were compared. Results: The various clinical effects of patients in the observation group were better than those in the control group (P < 0.05). Conclusion: The treatment of orthopedic trauma and infected trauma patients by closed negative pressure suction technology can improve the clinical effect and is worth promoting.

Keywords

Closed Negative Pressure Suction Technique; Orthopedic Trauma; Infected Wounds; Routine Dressing Change; Clinical Effect.

1. Introduction

Orthopedic trauma is a common infectious disease in modern clinical practice, which occurs when the patient's muscles, tendons, nerves, blood vessels and other surrounding soft tissues are damaged, and is often accompanied by serious infections. In recent years, the incidence of orthopedic trauma infection has gradually increased, which seriously affects the quality of life and physical and mental health of patients and their families.[1]. Through previous clinical practice experience, patients are usually treated with conventional dressing exchange, and after the patient's affected area is full of granulation, the patient is treated with skin implantation and suture, and the patient's soft tissue defect at the trauma is serious, the area of trauma is large, or serious infection occurs.[2] , the granulation tissue of the trauma cannot effectively fill the trauma defect through conventional dressing exchange, and flap transfer is needed to fill the trauma, and the practice of conventional dressing exchange is long. The practice of dressing change is longer, the patient will bear greater pain during the dressing change, and the labor intensity of the doctor will also increase [3]. Negative pressure closed drainage is a new drainage method in modern clinics that can promote granulation with significant results [4]. In this paper, the authors selected 60 patients with orthopedic trauma as well as infected wounds admitted to the hospital between January 2020 and December 2022, aiming to analyze the application effect of closed negative pressure suction technique, which is described as follows.

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2. Materials and Methods

2.1 General Information

Sixty patients with orthopedic trauma as well as infected wounds admitted to the hospital between January 2020 and December 2022 were selected and randomly grouped, and the general data are shown in Table 1.

Table 1. Comparison of general information between the two groups of patients ($\bar{x}$ ± s) [n (%)

Group	Number of cases	Age group age	Average age	Male Patients	Female patients
Observation group	30	22-53	37.46±3.16	18	12
Control group	30	22-54	37.51±3.19	16	14
X^2 /t	-	0.061		0.272	
P	-	0.952		0.602	

2.2 Methods

Control group: Routine dressing change: Before routine dressing change, necrotic tissues and pus should be removed from the injured area to further repair the patient's damaged tissues. After the wound is full of buds, the patient will be treated with skin grafting or second-stage suturing.

Observation group: Negative pressure closed drainage: Patients were treated with negative pressure closed drainage by negative pressure closed drainage, first pressed to remove necrotic tissues and pus from the affected area and repair the patient's damaged tissues, then the corresponding negative pressure closed drainage material was reasonably cut according to the actual area and shape of the trauma, foam was placed on the patient's trauma surface to ensure that the trauma surface was fully exposed to foam, and the patient's trauma surface was successfully connected to the material by intermittent suturing technique. The patient's trauma is successfully attached to the material to facilitate fixed closure. Ensure drainage seal by placing silicone drains. If the patient's trauma is large and requires multiple drains, a tee connector is required to connect multiple drains in series. The patient's wounds and surrounding skin are cleared of oil and grease using ethanol, and the bio permeable film is removed to seal the patient's wounds. To prevent obstruction of the line due to clotting, blood is aspirated from the wound by central negative pressure during the procedure, and the patient's wound is drained by negative pressure for 24 hours. After the procedure, the patient is treated with antibiotics to prevent infection. After 7-10 d of placement of the negative pressure closed drainage material, the patient's wound is opened and treated with a skin graft or second stage suture if the granulation is fresh and growing normally, or with a second negative pressure closed drainage if the granulation is not growing well.

2.3 Observation Indicators

1. Total treatment effectiveness.
2. Positive trauma bacterial culture rate before and after hospital admission.
3. VAS scores before and after treatment.
4. Wound healing time, infection rate, and scar healing rate.
5. Inflammatory factors and stress levels.

2.4 Statistical Treatment

SPSS 20.0 statistical software was used, where mean + standard deviation ($\bar{x}$ ± s) was used to represent the measurement data, which was verified by calculating t-values, and rate (%) was used to represent the count data, which was verified by calculating X^2.

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3. Results

3.1 Comparison of the Total Effective Rate of Treatment between the Two Groups of Patients

better in the observation group, as shown in Table 2.

Table 2. Comparison of the total clinical treatment efficiency between the two groups [n (%)

Group	Number of cases	Show effect	Effective	Invalid	Total efficiency
Observation group	30	19	9	2	28 (93.3)
Control group	30	9	12	9	21 (70.0)
X^2	-	-	-	-	5.455
P	-	-	-	-	0.020

3.2 Positive Trauma Bacterial Culture Rate Before and after Hospital Admission

lower in the observation group, as shown in Table 3.

Table 3. Comparison of positive trauma bacterial culture rates at admission and after treatment [n (%)

Group	Number of cases	At the time of admission	After treatment
Observation group	30	25 (83.3)	2 (6.67)
Control group	30	24 (80.0)	18 (60.0)
X^2		0.040	16.000
P		0.841	0.000

3.3 VAS Scores before and after Treatment

lower in the observation group, as shown in Table 4.

Table 4. VAS scores before and after treatment ($\bar{x}$ ±s) (points)

Group	Number of cases	Before treatment	After treatment
Observation group	30	5.43±2.15	1.16±0.52
Control group	30	5.46±2.20	3.59±1.16
t		0.053	10.470
P		0.958	0.000

3.4 Wound Healing Time, Infection Rate, and Scar Healing Rate

better in the observation group, as shown in Table 5.

Table 5. Comparison of wound healing time, infection rate, and scar healing rate [n (%)] ($\bar{x}$ ± s)

Group	Number of cases	Wound healing time	Infection rate	Scarring rate
Observation group	30	18.88±1.88	1 (3.3)	3 (10.0)
Control group	30	27.82±3.63	6 (20.0)	10 (33.3)
X^2 /t	-	11.978	4.043	4.812
P	-	0.000	0.044	0.029

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3.5 Inflammatory Factors and Stress Levels

better in the observation group, as shown in Table 6.

Table 6. Inflammatory factors and stress levels ($\bar{x}$ ±s)

Group	Number of cases	IL-1 (μg/L)	TNF-α (μg/L)	E (ng/ml)	NE (ng/ml)	R (pg/ml)
Observation group	30	46.88±1.26	3.81±0.42	102.62±13.41	98.82±13.56	3.10±0.36
Control group	30	67.46±3.69	7.64±1.12	179.65±16.79	172.72±16.84	6.27±0.59
t	-	28.909	17.538	19.635	18.721	25.121
P	-	0.000	0.000	0.000	0.000	0.000

4. Discussion

With the gradual development of modern society and economy, the life form of the nation is becoming more and more diversified, and the incidence of diseases and accidents is increasing year by year, which, to some extent, makes the incidence of orthopedic trauma higher and higher. Orthopedic trauma patients have a certain risk of infection after the onset of the disease, mainly because the patients cannot effectively resist the pathogenic bacteria and the immune function of the body is obviously reduced.[5]. Orthopedic trauma infection will not only enhance the pain of patients, but also make the treatment cost increase greatly and aggravate the economic burden of patients. Therefore, it is important to implement safe, effective and convenient treatment for patients with orthopedic trauma infection. [6]

In the traditional clinical practice, the patient is treated by conventional removal and cleaning of the wound, followed by dressing change and administration of sensitive antibiotics to control the infection rate of the patient. This treatment mode can improve the growth rate of the granulation of the patient's wound, but it will cause damage to the patient's periosteal blood supply soft tissue and affect the postoperative recovery effect of the patient. At the same time, the conventional treatment mode, the treatment period is long, during which the patient needs to change the medicine several times, which will cause serious impact on the patient's normal life and work, and the patient will also suffer unnecessary pain [7-8] .

The treatment principle of negative pressure closed drainage is to combine the patient's trauma and dressing, connect the drainage tube to the edge of the patient's normal tissue trauma, keep the trauma under negative pressure [9] , and thus close the trauma, implement continuous and complete drainage of the trauma, which can effectively promote the efficiency of the patient's trauma edema elimination, and to some extent, keep the patient's trauma sufficiently clean. In addition, the odorous gases and water vapor in the wound and on the surface of the skin can be properly exuded outside the skin through the monobloc semi-permeable membrane to avoid pathogenic bacteria, thus reducing the incidence of infection. Single bio-permeable membranes are very important during the implementation of negative pressure closed drainage. [10-11]

The advantages of negative pressure closed drainage are: 1. Ensure that the wound surface is under negative pressure closed state, which can improve the microcirculation and local blood flow supply of the wound surface, fast regeneration of normal tissue, effective reduction of edema rate, and rapid healing[12] ; 2. The main system of wound infection is Gram-positive bacteria, negative pressure closed drainage can significantly improve the resistance of the tissue to infection, effectively prevent the wound surface from contacting the outside, and reduce the infection rate; 3. negative pressure (3) negative pressure closed drainage can stimulate the expression of repair factors in traumatic tissues, enhance the level of repair factors, increase the release of enzymes and activators of the body, and

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effectively protect the traumatic surface; (4) the application of negative pressure closed drainage can reduce the number of drug changes and reduce the pain of drug changes [13-14] .

The results of this paper showed that all treatment effects of patients in the observation group were better than those in the control group ($P < 0.05$). It is evident that the treatment of patients with orthopedic trauma infection by negative pressure closed drainage can promote the postoperative recovery of patients, further reduce the pain level of patients, improve the clinical efficacy, accelerate the early recovery of patients, and effectively restore the function of the affected area. The reasons are: closed negative pressure drainage can significantly reduce the level of free bacteria in the wound, thus inhibiting the proliferation and transmission of bacteria, and drainage can also improve the blood supply to the wound, providing an environment for wound repair and further enhancing the body's immunocidal ability [15].

In conclusion, the treatment of patients with orthopedic trauma infection by negative pressure closed drainage has precise efficacy and more comfortable treatment, which is worth promoting.

References

[1] Li Fei, Song Jiao. Exploring the clinical efficacy of closed negative pressure suction technique (VSD) for orthopedic trauma and infected wounds versus conventional dressing exchange[J]. China Health Care Nutrition, 2018, 028(004):97.

[2] Cui Quanzhang. Evaluation of the efficacy of closed negative pressure suction technique (VSD) for orthopedic trauma and infected wounds and the clinical efficacy compared with conventional dressing changes[J]. World abstract of the latest medical information, 2019(A1):116-117.

[3] Li Q, Song S F, Zhang W, et al. [Clinical study on negative pressure closed drainage combined with vancomycin loaded calcium sulfate and autogenous bone in the treatment of chronic osteomyelitis] [J]. Zhongguo Gu Shang, 2018, 5(1):1059-1062.

[4] Shi Libiao. Analysis of the clinical effect of applying closed negative pressure suction technique (VSD) in the treatment of orthopedic trauma and infected wounds [J]. Chinese Science and Technology Journal Database (full text version) Medicine and Health, 2021(7):246-247.

[5] Yang Wu, Zhang Xigang, Wang Dapeng. Clinical efficacy analysis of negative pressure closed drainage technique (VSD) in the treatment of traumatic soft tissue injury of bone trauma [J]. Frontiers of Medicine, 2018, 8(22);24-25.

[6] Chen Yiying, Ming Li, Yuan Songbai, et al. Exploring the clinical efficacy of closed negative pressure suction technique (VSD) in the treatment of orthopedic trauma and infected wounds with conventional dressing exchange [J]. International Journal of Infection (electronic version), 2018, 007(003) :P.4-6.

[7] Dong J Y, Song F, Qing C, et al. Histomorphological observation of surgical debridement combined with negative pressure therapy in the treatment of diabetic foot[J]. Chinese Journal of Traumatology[J] Chinese Journal of trauma, English edition, 2017, 20(004):202-206.

[8] Xu Xiaoping, Tang Guofu. Clinical efficacy of applying negative pressure drainage (VSD) technique to orthopedic trauma and infected wounds[J]. China Disability Medicine, 2019, 27(14):53-55.

[9] Jain N, Horn C B, Andrade E G, et al. Combination of Girdlestone Pseudoarthroplasty and Negative Pressure Wound Therapy with Instillation and Dwell in the Treatment of Invasive Osteomyelitis of the Proximal Femur[J]. Cureus, 2018, 10(11): e3552.

[10] Zhang Tianpeng, Yin Cuiming. Clinical application effect analysis of continuous closed negative pressure drainage technique in chronic wound repair[J]. Modern medicine and health, 2017, 33(013):2039-2040.

[11] Wen Qi, Chen Zhiquan, Chen Xinfeng, et al. Clinical effect of modified closed negative pressure drainage (VSD) technique in the treatment of deep tissue infection after limb fracture surgery[J]. Modern Diagnosis and Therapy, 2020, 31(17):2751-2752.

[12] Li Guiping. Research on VSD closed negative pressure suction for the treatment of refractory wounds and new progress in nursing care [J]. Chinese Science and Technology Journal Database (Digest Edition) Medicine and Health, 2022(5):159-161.

ISSN: 2414-1895 DOI: 10.6919/ICJE.202305_9(5).0024

[13] Xu Jianjun, Li Linhui, Zhang Peng, et al. Clinical efficacy of thin scabbing and well net scratching combined with closed negative pressure drainage technique for early small and medium-sized deep II-degree wounds[J]. China Modern Doctor, 2018, 56(8):7-11.

[14] Zhou Yanhong, Gou Lingjiao. Care of VSD negative pressure closed drainage technology in the clinical application of traumatic orthopedics [J]. Chinese Science and Technology Journal Database (full text version) Medicine and Health, 2022(4):5-8.

[15] Zhao Guibin, Ma Renji. Analysis of the effect of VSD negative pressure closed drainage technique in orthopedic open wounds and infected wounds[J]. Frontiers of Medicine, 2018, 8(26):64-65.