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# Observation and Clinical Evaluation of Traumatic Tibial Osteomyelitis Treated with Antibiotic Bone Cement

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**Abstract:** Objective: To study the therapeutic effect of patients with traumatic tibial osteomyelitis by antibiotic bone cement. Methods: Sixty patients with traumatic tibial osteomyelitis admitted to the hospital between January 2020 and December 2022 were selected and randomly grouped to compare the various therapeutic effects of the two groups of patients. Results: All treatment effects of patients in the observation group were better than those in the control group ($P < 0.05$). Conclusion: The treatment of traumatic tibial osteomyelitis patients by antibiotic bone cement can improve the clinical effect and is worth promoting.

**Keywords:** Traumatic tibial osteomyelitis, Antibiotics, Bone cement, Treatment effect.

## 1. Introduction

Traumatic osteomyelitis is an infection of the bone tissue, mainly in the tibia, involving the periosteum, medullary cavity and soft tissues, which can lead to lifelong disability if not treated promptly[1-3] . The duration of traumatic tibial osteomyelitis is long, the degree of infection is difficult to control, and the recurrence rate is high. With the extensive improvement in clinical techniques, bone cements have been upgraded[4] , and a study found[5] : treatment of patients with traumatic tibial osteomyelitis by antibiotic bone cement enhances clinical outcomes. In this paper, the authors selected 60 patients with traumatic tibial osteomyelitis admitted to the hospital between January 2020 and December 2022, aiming to analyze the effect of the application of antibiotic bone cement, which is described below.

## 2. Materials and Methods

### 2.1. General Information

Sixty patients with traumatic tibial osteomyelitis who were 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 ( $\overline{x} \pm s$) [n (%)

| Group | Number of cases | Age (years) | Average age | Duration of illness (months) | Average duration of illness | Male Patients | Female patients |
|---|---|---|---|---|---|---|---|
| Observation group | 30 | 20-60 | 40.65±8.76 | 8-24 | 15.82±4.13 | 23 | 7 |
| Control group | 30 | 20-60 | 40.31±8.81 | 8-24 | 15.71±4.09 | 21 | 9 |
| $X^2$ /t | - | 0.150 | | 0.104 | | 0.341 | |
| P | - | 0.881 | | 0.918 | | 0.559 | |

Inclusion criteria: (i) consistent with the diagnostic criteria for traumatic tibial osteomyelitis; (ii) informed about this study and agreed to participate.

Exclusion mark: ① with limb dysfunction; ② with severe bone destruction; ③ with bone tumor; ④ with bone tuberculosis.

### 2.2. Methods

Patients in both groups were treated with negative pressure drainage, and wound secretions were extracted for bacterial culture and drug sensitivity testing.

Control group: treated by local instillation of antibiotics: after complete removal of the lesion, the medullary cavity was opened and soaked with hydrogen peroxide and iodophor combined with antibiotic solution and rinsed at least three times, patients with unhealed fractures were treated by autologous bone grafting, then fixed by suturing after negative pressure drainage and antibiotic solution was dripped into the plumbing, and the amount of antibiotics given to patients after surgery was approximately three times the amount of antibiotics given to the patient after surgery, by continuous perfusion for 21 d.

Observation group: treatment by antibiotic bone cement: 40g of polymethyl methacrylate and 2g of antibiotics were added to the bone cement solution, and after the above substances were fully mixed, wire was used for stringing and made into 1cm antibiotic chain beads, and after the lesion was completely removed, the medullary cavity was opened, and the flushing procedure was the same as that of the control group, and after successful flushing, the antibiotic chain beads were fully filled, and after negative pressure drainage followed by suture fixation, after the formation of granulation tissue, the drainage needs to be stopped and the chain beads can be removed and effectively implanted with bone.

### 2.3. Observation indicators

① Disease-related clinical parameters.

②Total effective rate of treatment: Total effective rate of treatment = (effective+effective)/total number of cases between groups. Effective: the general symptoms and local pain and swelling disappeared completely, the wound surface healed successfully, and the limb function returned to normal, and no dead space was observed by X-ray; Effective: the general symptoms, local pain and swelling improved, the wound surface healed well, the limb function improved significantly, and the recovery efficiency of bone tissue was excellent by X-ray; Ineffective: the above effects were obtained.

(iii) WBC counts and hs-CRP levels.

④ VAS scores, HHS scores, and Baird-Jackson scores.

⑤ Quality of life score.

## 2.4. Statistical treatment

SPSS 20.0 statistical software was used, where mean + standard deviation ( $\overline{x}$ ± 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]

# 3. Results

## 3.1. Comparison of disease-related clinical parameters

See Table 2.

**Table 2.** Comparison of disease-related clinical parameters ( $\overline{x}$ ± s) [n (%)

| General Information | Observation group (n=30) | Control group (n=30) | X2/t | P |
|---|---|---|---|---|
| Bacterial culture turnaround time (d) | 14.02±2.03 | 17.35±2.41 | 5.788 | 0.000 |
| Wound healing time (d) | 26.13±4.62 | 30.76±4.12 | 4.097 | 0.000 |
| Number of drug changes (times) | 5.62±0.76 | 7.69±1.06 | 8.693 | 0.000 |
| Length of hospitalization (d) | 29.16±4.02 | 33.85±4.61 | 4.200 | 0.000 |
| Trauma infection control rate (%) | 30 (100.0) | 25 (83.3) | 5.455 | 0.020 |
| Recurrence rate (%) | 2 (6.7) | 4 (13.3) | 0.741 | 0.389 |

## 3.2. Comparison of total treatment efficiency

See Table 3.

**Table 3.** Comparison of total treatment effectiveness [n (%)

| Group | Number of cases | Show effect | Effective | Invalid | Total efficiency |
|---|---|---|---|---|---|
| Observation group | 30 | 25 | 5 | 0 | 30 (100.0) |
| Control group | 30 | 20 | 4 | 6 | 24 (80.0) |
| $X^2$ | - | - | - | - | 6.667 |
| P | - | - | - | - | 0.010 |

## 3.3. Comparison of WBC counts and hs-CRP levels

See Table 4.

**Table 4.** Comparison of WBC counts as well as hs-CRP levels ( $\overline{x}$ ±s)

| Group | Number of cases | WBC count (×109 /L) | | hs-CRP (mg/L) | |
|---|---|---|---|---|---|
| | | Before treatment | After treatment | Before treatment | After treatment |
| Observation group | 30 | 13.32±1.32 | 8.26±0.56 | 26.09±5.13 | 2.01±0.43 |
| Control group | 30 | 13.41±1.40 | 9.79±0.79 | 25.99±5.34 | 3.31±0.65 |
| t | - | 0.256 | 8.654 | 0.102 | 9.136 |
| P | - | 0.799 | 0.000 | 0.919 | 0.000 |

## 3.4. Comparison of VAS scores, HHS scores, and Baird-Jackson scores

See Table 5.

**Table 5.** Comparison of VAS scores, HHS scores, and Baird-Jackson scores ( $\overline{x}$ ± s) (points)

| Group | Number of cases | VAS score | | HHS Score | | Baird-Jackson Rating | |
|---|---|---|---|---|---|---|---|
| | | Before treatment | After treatment | Before treatment | After treatment | Before treatment | After treatment |
| Observation group | 30 | 2.43±0.36 | 1.26±0.20 | 61.26±8.32 | 89.64±7.52 | 62.35±7.86 | 84.65±6.96 |
| Control group | 30 | 2.35±0.41 | 1.99±0.36 | 61.52±8.19 | 71.16±7.26 | 62.40±7.79 | 71.02±6.35 |
| t | - | 0.803 | 9.709 | 0.122 | 9.684 | 0.025 | 7.924 |
| P | - | 0.425 | 0.000 | 0.903 | 0.000 | 0.980 | 0.000 |

### 3.5. Comparison of quality-of-life scores

See Table 6.

**Table 6.** Comparison of quality of life scores ( $\overline{x}$ ± s) (points)

| Group | Number of cases | Mobility | | Mental state | |
|---|---|---|---|---|---|
| | | Before Care | Aftercare | Before Care | Aftercare |
| Observation group | 30 | 67.53±3.84 | 86.32±4.79 | 73.56±4.25 | 87.68±6.89 |
| Control group | 30 | 67.94±3.96 | 71.52±4.36 | 72.98±4.16 | 80.13±6.23 |
| t | - | 0.407 | 12.515 | 0.534 | 4.452 |
| P | - | 0.685 | 0.000 | 0.595 | 0.000 |

**Table 6.** (continued)

| Group | Number of cases | Social competence | | Physiological functions | |
|---|---|---|---|---|---|
| | | Before Care | After Care | Before Care | After Care |
| Observation group | 30 | 69.82±4.53 | 89.82±5.03 | 71.56±3.98 | 92.65±4.18 |
| Control group | 30 | 69.13±4.58 | 79.68±4.98 | 71.03±4.16 | 83.35±4.12 |
| t | - | 0.587 | 7.846 | 0.504 | 8.679 |
| P | - | 0.560 | 0.000 | 0.616 | 0.000 |

## 4. Discussion

According to epidemiological studies[6] : With the rapid development of transportation and industry in China, the incidence of open fractures of the extremities has increased significantly, leading to a rapid increase in the incidence of traumatic osteomyelitis, which occurs mainly in young and middle-aged men, and the most common area of osteomyelitis is the tibia, which is the most serious traumatic infection in clinical practice and[7-8] . The main causative agent of traumatic osteomyelitis is Staphylococcus aureus, which secretes localized purulent material and causes inflammatory reactions in the limb or partial hyperpigmentation, resulting in adhesive scarring of the sinus tract and bone, resulting in sunken edema and pressure pain[9] and systemic infection. The long duration of traumatic osteomyelitis, the high level of pain, the difficulty in controlling the infection, and the relatively high rate of postoperative recurrence require effective control of the infection in patients with traumatic osteomyelitis to improve the clinical outcome and thereby improve the function of the limb. [10-11]

The treatment of patients with traumatic osteomyelitis is usually performed surgically. Through surgery, sinus tracts, dead bone, dead cavities, scarring and inflammatory granulation tissue can be effectively removed, and the pathogenic bacteria, necrotic tissue and inflammatory exudative reaction can be continuously removed through negative pressure drainage, and the efficiency of toxin absorption by the body can be significantly reduced, so that the problems of wound obstruction and poor drainage can be effectively solved, which is a new anti-infection technique in orthopedics for soft tissue patients with fractures[12-13] . Local antibiotic irrigation is the main method of comprehensive control of infection, which can control the reaction of pathogenic bacteria in the perioperative period to a certain extent, but its therapeutic effect does not correspond to the expected effect. Antibiotic bone cement belongs to the product of advanced technology in modern society, as the name implies, antibiotic bone cement is made of antibiotics and polymethyl methacrylate, which can play the role of filling as well as scaffolding, providing convenience for later bone implantation, and also can be completely placed into the lesion during the treatment process, which can obtain relatively stable antibacterial effect, and at the same time, it will not lead to immune reaction of patients, so antibiotic bone Cement is widely used in the treatment of patients with traumatic osteomyelitis[14-15] .

The results of this paper showed that all treatment effects of patients in the observation group were better than those in the control group. It can be seen that patients with traumatic osteomyelitis treated with antibiotic bone cement had significantly shorter operation time, effectively reduced trauma severity, controlled inflammatory damage, reduced pain, significantly improved limb joint function, significantly improved clinical efficacy, and low recurrence rate, with good long-term therapeutic effects.

In conclusion, the treatment of patients with traumatic tibial osteomyelitis by antibiotic bone cement is clinically effective, safe, and can obtain effective long-term results, and is worth promoting.

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