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Study on the application of external fixator and limited internal fixation in combined treatment of limbs fractures.

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Abstract

Objective: This study aims to investigate the application of external fixator and limited internal fixation in combined treatment of limbs fractures.

Methods: From September 14th, 2015 to September 14th, 2016, a total number of 100 limbs fractured patients were collected in our hospital. They were randomly divided into two groups (the observation group and the control group) with 50 patients in each group. Patients in the control group received traditional treatment while patients in the observation group were treated with external fixation combined with limited internal fixation. The effect of the traditional and combined treatment was compared between the observation group and the control group.

Results: In the observation group, the time of fracture healing was 42.45 ± 2.45 days, the recovery rate was 96%, the amount of hemorrhage was 47.55 ± 4.32 ml, the operation time was 68.48 ± 5.39 min, hospitalization time was 10.58 ± 3.65 d, Helfet score was 85.69 ± 5.43 and the incidence of postoperative adverse events was 2%. However, in the control group, the time of fracture healing was 53.96 ± 2.35 d, the recovery rate was 60%, the amount of hemorrhage was 69.81 ± 5.41 ml, the operation time turned out to be 79.62 ± 6.54 min, hospitalization time was 15.96 ± 4.84 d, Helfet score was 74.30 ± 2.31 and the incidence of postoperative adverse events was 24%.

Conclusion: External fixator and limited internal fixation can improve the treatment safety of the patients with limb fracture.

Keywords: External fixator, Limited internal fixation, Limb fractures, Orthopedics.

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Introduction

Limb fracture is one of the most commonly and frequently occurring diseases mainly caused by traffic accidents and falling from height. As to the treatment of the patients in this regard, it is required to strengthen surgical therapy to timely correct fracture site. Limited internal fixation and external fixation are the two commonly used fixation methods in clinical trials with respective advantages [1,2]. However, the combinational effect of these two fixation methods is unknown. Because limited internal fixation can restore the anatomic structure of distal tibia, it has been regarded as a safe surgical procedure with good results. Nonetheless, the extensive dissection of soft tissue might lead to increased complications, such as infection, skin necrosis, and other complications. External fixator has been widely used for limbs fracture in recent years, but results in poor restoration of articular surface and high rates of traumatic arthritis. Each method has its own advantages and disadvantages, and the treatment for limbs fracture remains controversial. In our study, we explored the clinical significance of the combination of external fixator and limited internal fixation in the treatment of limb fractures. The details are described as following.

Materials and Methods

Materials

A total of 100 limb fractures patients enrolled from September 14, 2015 to September 14, 2016 were selected as the objects and randomly divided into two groups (the observation group and the control group) with 50 patients in each group. Patients in the control group received traditional treatment while patients in the observation group were treated with external fixation combined with limited internal fixation.

In the observation group, there were 32 males and 18 females with the average age of 32.45 ± 5.74; associated injury: 1 case with femoral fracture, 2 cases with upper limb fracture, 2 cases with spinal fracture and 2 cases with traumatic brain injury; Custilo Andereon classification: 19 cases with type III B, 15 with type III A and 16 cases with type II.

In the control group, there were 33 males and 17 females with the average age of 32.96 ± 5.51; associated injury: 2 cases with femoral fracture, 3 cases with upper limb fracture, 3cases with spinal fracture and 1 case with traumatic brain injury; Custilo Andereon classification: 17 cases with type III B, 16 with type III A and 17cases with type II.

There was no significant difference in various data of the patients with limb fractures in the two groups (P>0.05).

Methods

The patients in the control group were given traditional surgical treatment. Disinfection and debridement were carried out first to determine the surgical site followed by the performance of incision of the tissue layer by layer. The fracture sites were fully exposed and fixed in use of screws. It was feasible to observe the status of fracture reduction by way of C-arm fluoroscopy when necessary and the sites could be sutured layer by layer if without abnormality. The patients were given conventional antibiotics treatment three days after the surgery.

Patients in the observation group received external fixator combined with limited internal fixation: preoperative X-ray examination was conducted to understand the details of fractures and then develop specific surgical procedures. Firstly, conventional treatment of debridement, disinfection and hemostasis was conducted followed by traction reduction to avoid periosteal stripping. For patients with closed fractures it was proper to place outer set screws (1~2 screws) followed by soft tissue incision (local 5~10 cm). It was required to ensure periosteal stripping of fracture sites and surrounding areas, reset the broken bones and fixate the bones in use of Kirschner wires or screws. Small incision fenestration was conducted for collapse facets with undesirable reduction and the bone round needle and round rods were used to conduct poking reduction with the external fixator placed and tightened. For the patients with transverse fractures, external fixation rod can be used to reach stable pressurization. After operation, the patients were conventionally treated with antibiotic and were guided to strengthen the training of joint function.

Observation index

The hospitalization time, Helfet score, fracture healing time, recovery rate, incidence of postoperative adverse events, operation time and intraoperative blood loss were compared between the two groups.

Helfet score: The score was rated as per the patient's physical activity, the higher the score is, the better the patient recover.

Diagnostic criteria of good recovery: The patients enable to conduct free movement and normal gait without abnormal swelling of the limbs and with normal bone healing under the technique detection of imaging.

Statistical processing

SPSS22.0 software was used for statistical processing of statistical significance, P<0.05.

Results

The combined treatment enables to shorten the hospitalization time, decrease intraoperative blood loss and improve the safety of operation (P<0.05) as shown in Table 1.

Table 1. *Comparison of the results of surgery in the two groups.*

Group	Case (n)	Operation time (min)	Amount of intraoperative blood loss (ml)
Observation	50	68.48 ± 5.39	47.55 ± 4.32
Control	50	79.62 ± 6.54	69.81 ± 5.41

The Helfet score of the observation group after treatment was higher than that of the control group (P<0.05), as shown in Table 2.

Table 2. *The comparison of Helfet score in the two groups.*

Group	Case (n)	Before treatment	After treatment
Observation	50	61.86 ± 2.41	85.69 ± 5.43
Control	50	61.71 ± 2.63	74.30 ± 2.31

The good recovery rate of the observation group was higher, the incidence of adverse events was lower compared with the control group and the healing time and hospitalization time of the observation group were better than those of the control group (P<0.05), as shown in Table 3.

Table 3. *Comparison of treatment effects in the two groups.*

Group	Case (n)	Incidence of adverse events	Hospitalization time (d)	Healing time (d)	Good recovery rate (%)
Observation	50	1	10.58 ± 3.65	42.45 ± 2.45	96
Control	50	12	15.96 ± 4.84	53.96 ± 2.35	60

Discussion

Treatment plan for traumatic limbs fractures commonly includes limited internal fixation combined with external fixation, external fixation, manipulative reduction to supinate and open reduction and internal fixation [3,4]. Research has shown the implementation of open reduction and internal fixation may lead to many kinds of complications, including such several most common ones as traumatic arthritis, bone healing insufficiency, malunion, joint stiffness, infection and difficult wound healing [4]. All these can affect the prognosis of patients by prolonging the hospitalization time, increasing nosocomial infection rate, thus forming a vicious spiral [5].

Main advantages of limited internal fixation: it can avoid wound infection and skin necrosis, reduce the incidence of nonunion, improve bone healing and wound healing, sustain blood supply, increase the stability of the fracture end after reduction and help to maintain steadiness of contraposition line of the fracture end [6,7]. Main advantages of external fixation: with the function of periosteum retraction, it can increase cartilage nutrition, stimulate callus improvement and shaping, avoid osteoarthritis, maintain ankle joint of force line and ankle joint space and help to reconstruct the function of ligament and joint capsule [8,9]. The joint treatment of external fixator and limited internal fixation combines their respective advantages and makes up for each other's deficiencies [10] with the main application value being: (1) the joint treatment can be conducive to fracture healing, maintain fracture stability, reduce wound pollution and reduce operation risks [11-13]; (2) the joint treatment can shorten operation time, reduce intraoperative blood loss, repair neurovascular, accelerate the recovery of fractures, and accurately determine and fixate the specific fracture site through Kirschner wires and screws [14], has advantages of high safety and simple operation, applicable to such fracture types as neurovascular injury, skin defect and soft tissue damage [15,16]; (3) joint treatment can form a strong framework with the fixation of the fracture sites to ensure the body balance and repair ligament, more suitable for fracture mechanics [17,18]. Besides it also enables to avoid the occurrence of postoperative osteoarthritis, restore the anatomical length of limbs and achieve traction reduction with bone grafting through small incision, thus brings a moderately significant treatment effect [19,20].

In a word, the joint treatment of external fixator and limited internal fixation has the advantages of simple operation, good prognosis and low risk. The application of external fixator combined with limited internal fixation can accelerate the recovery of limbs and shorten the hospitalization time in the treatment of limb fractures.

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