

Treatment effect of modified posterolateral ankle approach combined with medial repositioning and fixation in three ankle fractures

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Abstract: The present research included three patients with ankle fractures to observe the therapeutic efficacy of the modified posterolateral approach to the ankle joint combined with medial reduction and fixation. From 40 cases of the three ankle fracture patients in our hospital, the study was conducted from October 2022 to October 2023, the control group used the traditional posterolateral approach combined with medial reduction and fixation, and the observation group improved the posterolateral ankle approach combined with medial reduction and fixation to evaluate the curative effect. Compared with the control group, the observation group had lower values of operation-related indicators and complications, and higher ankle function score and clinical rehabilitation within 1 to 6 months after surgery ($P < 0.05$). Patients with three ankle fracture combined with modified ankle reduction can shorten the operation time, accelerate fracture healing, good recovery of ankle function, low complication rate and high clinical value.

1. Introduction

Most of the three-ankle fractures occur in the condition of acute violent trauma. The injury sites mainly include the medial malleolus, external malleolus and posterior malleolus. The three ankles jointly maintain the stability of the ankle joint and ensure the normal walking and weight bearing of the human body^[1]. When the three-ankle fracture occurs, the patient's ankle joint is unstable, the fracture site appears redness and swelling, pain, and is unable to move normally, which seriously affects the patient's quality of life. Usually, the three ankle fractures are treated surgically to restore the fracture site and restore the stability of the ankle joint^[2]. But for surgical approach is still some controversy, always traditional surgical approach for the ankle joint posterior joint medial approach, the incision between the posterior edge of the fibula and the Achilles tendon stenosis, can expose the fracture area, but in fact the operation difficulty is high, this area has blood vessels, nerve distribution, intraoperative appear high risk of damage blood vessels, nerve, and prone to limb sensory paralysis complications, is not conducive to the rehabilitation of patients^[3]. In recent years, with the deepening of medical research, the surgical approach has been improved to reduce iatrogenic injury^[4]. In this study, the therapeutic effect of the application of a modified posterolateral approach combined with medial reduction and fixation of the ankle joint was reported

below.

2. Data and methods

2.1 General information

Forty patients with three ankle fracture treated in our hospital were selected and enrolled, and the study was conducted from October 2022 to October 2023, and 20 cases were obtained by envelope method. Data between the two groups met the study requirements, ($P > 0.05$). See Table 1.

Table 1: Compares the two groups of general data [n (%)] ($\pm S\bar{x}$)

divide into groups	Example number	sex (n)		Age (year)	classification of fracture (n)	
		man	woman		After the spin external spin	The spin before the spin
observation group	20	12(60.00)	8(40.00)	67.54 \pm 4.45	15(75.00)	5(25.00)
control group	20	13(65.00)	7(35.00)	67.55 \pm 4.50	14(70.00)	6(30.00)
X^2/t		0.107	0.107	0.007	0.125	0.125
p		0.744	0.744	0.994	0.723	0.723

Inclusion criteria: (1) Those with the diagnosis of three ankle fracture by specialized and auxiliary examination; (2) Those with the indications for surgical treatment; (3) Those with voluntary follow-up and review; (4) Those with informed consent for study; (5) Those with no vascular nerve injury around the fracture.

Exclusion criteria: (1) Those with open and pathological fractures; (2) Those with other serious physical diseases or other injury repair surgery; (3) Those with mental or cognitive impairment, unable to communicate; (4) Those with local tissue necrosis and infection before surgery.

2.2 Methods

All 40 patients in this group received intraspinal anesthesia, and the knee joint was placed as slightly curved, and the feet exceeded the end of the operating table. Disinfection the towel, use the airbag tourniquet to stop bleeding, and start the operation after anesthesia.

Control group: with the traditional posterolateral approach combined with medial reduction fixation, longitudinal incision was made between the lateral malleolus and Achilles tendon, the flexor hallucis was removed, exposed the ankle bone, observed and cleaned the fracture site, took reduction measures, temporary fixed with k-wire, and then through fluoroscopic adjustment, and then fixed with plate or screw. The fibula was pulled from the posteromedial side, and the fibula was exposed after the lateral flap was extended, reduction measures were taken and fixed, and tibiofibular screws were added if necessary. The patient's position was adjusted to supine, and a curved incision was made in the inner ankle to expose the inner ankle. The doctor then chooses plate or screw fixation according to the treatment needs and adjusts the position under fluoroscopy. After confirming that there is no error, the incision is rinsed with saline, a drain is placed, and the incision is closed layer by layer.

Observation group: with a modified posterolateral ankle approach combined with medial reduction and fixation, a curved incision was made 1cm at the posterior edge of the tibia, starting from the fibula fracture, and the end point was 0.5cm at the proximal end of the calcaneal nodule. The subcutaneous tissue was opened layer by layer, and attention was paid to protect the sural nerve

and small saphenous vein. After observing the fibular muscle, the fibular muscle were pulled back, exposed to the distal fibula, and fixed with a steel plate after reduction measures. The flexor pollicis longus was separated under the periosteum, the posterior malleolus was used as a fulcrum, and the flexor pollicis longus was pulled inward with a Hoffmann pull hook, and the posterior ankle was exposed and fixed with a plate after reduction. The knee joint was bent, and the ankle and the fracture areas were exposed layer by layer. After reduction, the position was adjusted under fluoroscopy, washed with normal saline after error, and the drainage tube was placed, and the incision was closed layer by layer.

Postoperative treatment: postoperative routine anti-infection, detumescence, analgesia measures, and timely replacement of dressing. Raise the affected limb, if the drainage rate is less than 20ml 1d after surgery, the drainage device can be removed, and ankle training can be performed as soon as possible when the condition allows. Check regularly and observe the X-ray examination results until the fracture is healed.

2.3 Observed indicators

(1) Comparison of surgery-related indicators.

(2) Comparison of ankle function score, refer to the American Foot and Ankle Association Ankle and hindfoot Function score Scale (AOFAS), covering three dimensions of function, pain and alignment, a total of 100 points, high score is better.

(3) Comparison of the complication rate.

(4) Comparison of excellent and excellent clinical rehabilitation rate, referring to Burwell-Charnley radiographic standard evaluation 6 months after surgery, including ankle stability, walking ability, ankle activity, X-ray results, working ability, movement, pain, a total of 100 points, excellent: 96 points, good: 81~95 points, 80 points difference.

2.4 Statistical approach

apply SPSS.21 The software calculates, including measurement data by ($\pm S$), t-test, and count data by (%) and X^2 Test, the difference was statistically significant, ($P < 0.05$).

3. Results

3.1 Comparing the operating-related indicators between the two groups

Lower values compared to the control group ($P < 0.05$). See Table 2.

Table 2: Compares surgery-related indicators ($\pm S$ in the two groups)

divide into groups	Example number	Time of surgery (min)	Time operative postoperative time (d)	Fracture healing time (months)
observation group	20	95.12 \pm 11.45	6.21 \pm 1.48	3.49 \pm 0.33
control group	20	112.39 \pm 15.45	12.44 \pm 4.19	4.12 \pm 0.65
<i>t</i>		4.787	12.385	3.865
<i>p</i>		0.000	0.000	0.000

3.2 Contrast the two groups

Compared with the control group, the ankle function scores were higher at 1 to 6 months in the observation group ($P < 0.05$). See Table 3.

Table 3: Compares the two groups with ankle function scores ($\pm S$, score) \bar{x}

divide into groups	Example number	One week after surgery	One month after surgery	Three months after surgery	Six months after surgery
observation group	20	41.32 \pm 4.66	51.32 \pm 8.49	63.39 \pm 10.46	80.19 \pm 8.44
control group	20	40.22 \pm 4.16	44.12 \pm 7.11	53.19 \pm 7.69	67.32 \pm 7.45
<i>t</i>		0.788	2.908	3.514	5.113
<i>p</i>		0.436	0.006	0.001	0.000

3.3 Compare the complication rates between the two groups

The complication rate was lower in the observation group compared to the control group ($P < 0.05$). See Table 4.

Table 4: Compares the complication rates between the two groups [n (%)]

divide into groups	Example number	infection of incisional wound	nerve damage	other	incidence
observation group	20	1(5.00)	0(0.00)	0(0.00)	1(5.00)
control group	20	2(10.00)	1(5.00)	3(15.00)	6(30.00)
χ^2		0.360	1.026	3.243	4.329
<i>p</i>		0.548	0.311	0.072	0.037

3.4 Compare the excellent clinical rehabilitation rate between the two groups

Compared with the control group, the observation group had a higher rate of excellent clinical rehabilitation ($P < 0.05$). See Table 5.

Table 5: Compares the two groups and the excellent rate of clinical rehabilitation [n (%)]

divide into groups	Example number	ample	good people	difference	Good rate
observation group	20	10(50.00)	9(45.00)	1(5.00)	19(95.00)
control group	20	3(15.00)	11(55.00)	6(30.00)	14(70.00)
χ^2		5.584	0.400	4.329	4.329
<i>p</i>		0.08	0.527	0.037	0.037

4. Discussion

Three ankle fractures account for nearly 10% of the body fractures, which are usually caused by violent events such as falls and traffic accidents. The continuity and integrity of the ankle joint are destroyed, and symptoms such as limited movement, pain and swelling occur, and effective

treatment measures need to be taken in time to avoid disability or other poor prognosis^[5]. For three ankle fractures, fracture healing can be achieved through conservative treatment and surgical treatment, but conservative treatment has adverse phenomena such as poor fracture healing and ankle instability, and the recovery cycle is long, and the chance of complications is higher. Therefore, it is often recommended that those who meet the indications for surgery receive surgical treatment^[6]. At present, the research focus on three-ankle surgery focuses on the surgical approach, which can reduce iatrogenic injuries and accelerate the recovery of patients^[7]. Patients with large posterior ankle bone mass and difficult to move can choose indirect reduction and screw fixation. However, biomechanical studies found that the fixation effect of the plate is better, and the indirect reduction effect is usually not ideal, and the risk of inflammation in the later stage is high, while both reduction and fixation need to choose the appropriate surgical approach. The previous traditional surgical approach produced large trauma and had a high probability of postoperative complications. Therefore, further improvements are needed. In this study, different surgical approaches were adopted for the patients, in which the observation group was improved posterolateral ankle approach combined with medial reduction fixation. After data comparison, the group showed that the lower surgical index could shorten the operation time and faster postoperative recovery; the higher, which showed the better ankle joint function under the procedure, and the better clinical rehabilitation rate, indicating that the operation was effective. The reason analysis is that the improved posterolateral approach of the ankle was combined with medial reduction and fixation at the posterior edge of the fibula, and the incision was relatively more external, parallel blood vessels and nerve direction, avoiding injury to the sural nerve and small saphenous vein, and reducing the stimulation of the nerve^[8]. The intraoperative traction of the soft tissue is less, which can reduce the damage to the soft tissue, and the ankle function rehabilitation effect is better in the later period. At the same time, the surgical approach has a good effect on the exposure of the surgical field, convenient for the operators to probe and operate, can reduce the damage to the surrounding tissues, and lower the incidence of postoperative complications. In Huang Lixin et al^[9]In the study, Dennis-Weber type (type B), the test group with the modified posterolateral incision combined with medial approach surgical treatment, the control group traditional approach, after comparison, the two groups of surgery related indicators, but the ankle function score is higher, lower complication rate, indicating that the improved posterior lateral incision combined with medial approach surgery is helpful to the recovery of ankle function, and the complication probability is low, the clinical application value is higher. In their study, Zhang Hao et al^[10] compared the efficacy of traditional approach internal fixation (traditional approach group) with modified posterior lateral approach and medial approach incision and reduction internal fixation of the ankle (modified approach group). Upon comparison, it was found that there was no significance in the fracture healing time between the two groups, and the modified approach group had lower VAS scores, higher ankle posterior extension mobility, and no numbness of the affected limb or necrosis of the traumatized skin at 1 week after surgery. It indicates that this therapy is useful for patients, who have postoperative pain relief, fewer complications, and good recovery of ankle joint function.

In conclusion, patients with posterior ankle fracture combined with modified ankle reduction can shorten the operation time and accelerate fracture healing, with good recovery of ankle function and few complications, which is worth promotion.

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