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Case Report

Repair of acute injuries of the lateral ligament complex of the ankle by suture anchors

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Abstract: Objective: The objective of this study was to investigate the clinical curative effect of stage I repair of acute injuries of the lateral ligament complex of the ankle by the application of suture anchors. Methods: We retrospectively analyzed 18 cases of III degree acute injuries of the lateral ligament complex of the ankle. Results: There were statistically significant differences in preoperative and last follow-up VAS pain scores and AOFAS ankle hind-foot function scores. The X-ray talus displacement values in the anterior drawer test and pressure anteroposterior X-ray talar tilt in the ankle talar tilt test also showed statistically significant differences. Complications occurred in 2 patients, incision surface infection in one, and postoperative lateral dorsal skin numbness in one. All these cases were cured after symptomatic treatment. At the last follow-up all patients' ankle joint activity recovered to their preinjury function levels. Conclusion: The application of suture anchors for small incision stage I repair of the lateral collateral ligament of ankle joint degree III injury, can effectively restored the stability of ankle joint, and prevent the occurrence of chronic ankle instability complications. It is effective and feasible for the treatment of ankle joint lateral collateral ligament injuries.

Keywords: Lateral collateral ligament of ankle joint, anterior talofibular ligament, suture anchors, repair

Introduction

Sprain of ankle joints is considered the most frequent exercise injuries in human bodies [1], accounting for 25% of the muscular and articular systemic injuries, among which about 40% to 50% are exercise related. It is also one of the most common diseases in orthopedics emergency, accounting for about 10% of the emergent visits. In most occasions, the injured sites are related with ankle joint lateral collateral ligament, especially the anterior talofibular ligament injuries [2]. Improper handling in early stages would lead to variation of load points, unstableness of ankle joints, abrasion of joint surface and ligamentous laxity, etc, further leading to recurrent sprain and pain in the future, and finally causing the permanent complications such as chronic unstableness of ankle joint, traumatic osteoarthrosis, which affect the walking function and the living quality of patients [3, 4]. To investigate whether the incidence of long-term complications can be reduced through early repair of ankle joint lateral collateral ligament and reconstruction of ankle stability, we retrospectively analyzed the results of the application of suture anchors to repair ankle joint lateral collateral ligament injury in 18 cases of III degree from 2010 Mar to 2014 Jun [5, 6], and the overall mid-term effects are satisfied. Presently the details are reported as follows.

Materials and methods

Patient information

All 18 cases were treated by our department from 2010 Mar to 2014 Jun, all with unilateral injury, including 11 males and 7 females, aged from 16 to 42 y/o, 28.6±6.2 on average. Injury causes: 9 cases were sprained during exercise, 4 were sprained during walking or walking up and down stairs, 3 were tumbled, and 2 met traffic accidents. All cases had history of valgus sprain, and about 1/3 cases complained about hearing a sound of 'Pa' while sprain. When they were admitted to the hospital for examination, they revealed swelling, bruises, extensive ten-

Figure 1. The preoperative talar tilt test was 28°.

derness and severe active pain at the lateral ankle, combined with obvious mobility limitation or limitation of standing up. The lateral pain worsened significantly while the ankle was overturned, and the spontaneous activity of ankle decreased greatly or was incapable, and the ligament became lax obviously. All cases received x-ray examination, and the average values of talar displacement after anterior drawer test of ankle on the lateral x-ray radiography were 11 to 16 (13.6±2.1) mm, and the average values of talar tilt angles after talar tilt test on compressed x-ray anterior-posterior radiography were 15 to 32 (21.4±9.1)°, with obviously slant and fronted astragalus (**Figure 1**). 2 cases were found avulsion fracture of lateral ankle points. 8 cases received regular ultrasonic examination, of whom 2 showed tear of anterior talofibular ligament and calcaneofibular ligament, 6 showed tear of talofibular ligament, calcaneofibular ligament and posterior talofibular ligament. All cases met the criteria of III degree of injury and received I stage repair. The average interval between injury and operation were 0.3 to 8 (4.6±3.3) days.

Surgical procedures

Epidural anesthesia and contralateral decubitus position were adopted, and electric balloon

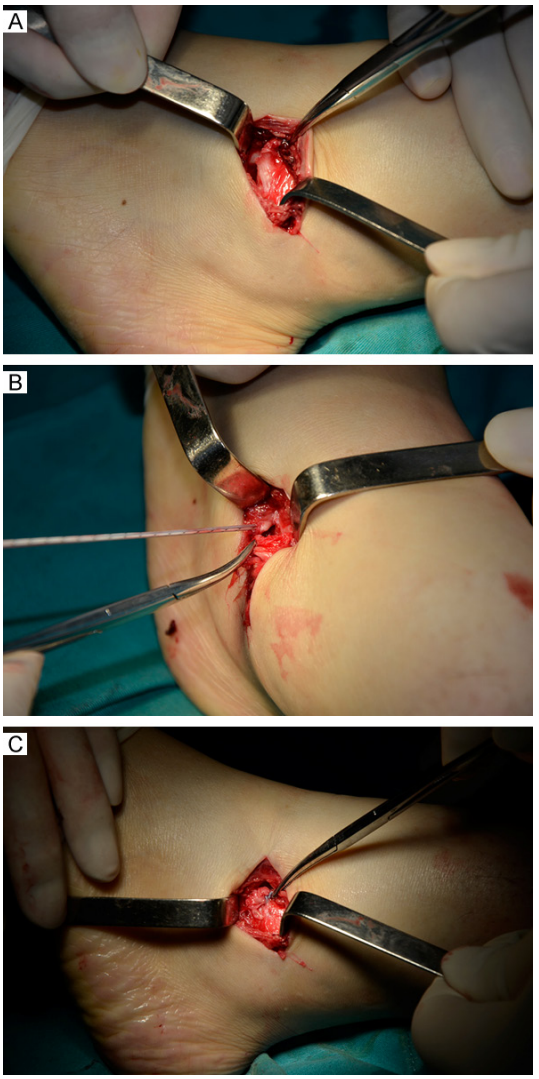

Figure 2. A. The anterior talofibular ligament avulsion position; B. Implant anchor; C. Repair the broken end.

tourniquets were set at the proximal affected thigh. After sterilization and draping, the incision was decided by the probable injured site of anterior talofibular ligament judged by the preoperative physical examination and x-ray, which could be divided into two types: lateral incision (2-3 cm of arch incision started from the distal lateral ankle to the extended talar end point of anterior talofibular ligament) or talar incision (2-3 cm of arch incision started from talar end point of anterior talofibular ligament to distal lateral ankle). If the operative finding was unmatched with the preoperative judgment, the incision could be prolonged to the other end, 5.5 cm in most. Sural nerve and its branches were preserved during exploration. Pe-

Figure 3. The postoperative talar tilt test was 3°.

riosteum and joint capsule were protected when the distal lateral ankle reached. Only anterior talofibular ligament was probed during operation, and the broking ends were cleaned up after fracture position was known, and bone bed was prepared at the anterior talofibular ligament attached point to implant 1 suture anchor. In the neutral and mild varus position of the ankle, the broken anterior talofibular ligament was sutured with suture of suture anchors (Smith and Nephew, 3.5 mm in diameter), while the joint capsule was tightened at the same time and the lateral tenaculum was repaired to strengthen the stability. The repeated anterior drawer test and talar tilt test showed the negative results, without limitation of flexion and extension. The incision was washed with natural saline repeatedly, and then sutured layer by layer, and finally wrapped with sterilized dressing. All 18 cases were proved ligament injury of III degree during operation (**Figure 2**).

Postoperative treatment

The patients were administered with drugs with the function of promoting blood circulation to remove blood stasis, and eliminating inflammation and analgesic effect per os or via venous dripping for 3 to 5 days postoperatively, without regular antibiotics for prophylaxis. Dressing change in incision was performed every 3 days, and the suture was taken out in 2 weeks. Plaster was used for immobilization for 3 weeks without load bear. After 3 weeks, partial function-recover training started in a removable support protection. The support was removed after 6 weeks, and function recover training was still continued under partial load bear. Full load bear was adopted after 8 weeks, and acclimatization training gradually started for return to daily life and work.

Typical Case: Female, 36 y/o, left ankle joint sprained while running, diagnosis: Injury of left talofibular ligaments of III degree.

Statistical analysis

The statistical analysis was performed using SPSS software (ver 16.0). Measurement data was expressed as mean ± standard deviation (x±s). Wilcoxon rank sum test was adopted for the comparison between ranked data, with the inspection level of α=0.05. The preoperative and last follow-up ankle function score results and pain scores were compared, and P<0.05 was considered statistically significant.

Results

All 18 cases in our group received I stage repair with the average length of incision of 2.3~5.5 (2.7±0.0.6) cm. All cases were followed-up postoperatively, with the average follow-up period of 8~38 (25.4±8.3) months. The Visual Analogue Scale (VAS) pain score in the preoperative and last follow-up were 5~9 (7.6±1.1) and 0~2 (1.2±0.6), respectively (P=0.000); the American Orthopaedic Foot & Ankle Society (AOFAS) ankle-foot function scores in the preoperative and last follow-up was 0~32 (16.1±12.6) and 78~99 (91.2±8.6), respectively (P=0.000), both with significant difference. The talar displacement values of anterior drawer test of ankle revealed on x-ray in the preoperative and last follow-up were 11~16 (13.6±2.1) mm and 1~5 (2.6±1.6) mm, respectively (P=0.000); the talar slant angles of talar tilt test revealed on compressed anterior-posterior x-ray were 15~32 (21.4±9.1)° and 6~18 (10.4±6.1)°, respectively (P=0.032), with sig-

nificant differences (**Figure 3**). None of the cases was found to have complications such as joint infection, screw displacement, repeated sprain, long-term pain, chronic instability, and fracture, etc. 2 cases suffered from complications, of whom, 1 with infection on the surface of the incision, who was given oral antibiotics for 1 week and regular dressing change, at last healed in 18 days after operation; while 1 with numbness of dorsolateral foot skin after operation, who was given additionally oral neurotrophic drugs and the symptoms disappeared 2 months later, which was considered to be caused by the traction of superficial peroneal nerve during operation. The overall incidence of complications was 11.1%. The last follow-up findings indicated that the activity of ankle of all cases recovered to the normal state and the movement level was restored the level prior to the injury.

Discussion

Classification and diagnosis

The ankle is one of the most complicated joints in human body. The lateral collateral ligament of ankle joint includes anterior talofibular ligament, calcaneofibular ligament, and posterior talofibular ligament [7]. The anterior talofibular ligament is the weakest one among the three and injured easily [8], which accounts for 90% of the lateral collateral ligament injury of ankle joint and plays the major role in preventing varus [9]. According to the degree of ligament injury and the post-traumatic stability of ankle, the injury of lateral collateral ligament is classified into three degree, Briefly, I degree is the simple ligament injury without ligament rupture, and joint ia stable; II degree is the partial rupture of ligament, with moderate unstableness of joint; III degree is the completed rupture of ligament, with obvious local swelling, joint laxity and severe unstableness. According to the injured causes, symptoms, signs, x-ray representations and operative findings, all the patients in our group had ligament injury of III degree.

Treatments

For the patients with I or II degree of injury, through conservative treatment, that is early RICE (Rest, Ice, Compression and Elevation) treatment for 3-5 days, mid-term plaster (bandage) immobilization for about 2 weeks, and combined with the rehabilitation and functional training in late period, most of them can achieve good clinical effects. As for the patients with the III degree of ligament injury, however, there is a controversy to select the conservative treatment or the surgery. Recently, most researchers advocate the surgery, and the emergent operation can achieve better results [10].

Kerkhoffs et al. [4] reviewed 2562 cases and also found that the emergent operation had an effective rate of 90% to 95%, which is obviously advantageous in restoring movement level to the pre-injury state, preventing chronic pain, repeated sprain, and subjective and functional unstableness compared with the conservative treatments. Some researchers find that the chronic unstableness of ankle is often accompanied by obvious ankle lesions through reconstruction with the help of ankle arthroscopy or observation of chronic ankle unstableness. Specifically, about 90% of the patients suffer from joint lesions such as articular cartilage abrasion, synovitis, joint body, and ligament atrophy, etc, which manifest as long-term joint pain and repeated sprain of joints [11]. For those sprain of ankle with broken posterior talofibular ligament or avulsion fracture, the conservative treatments have been proved to have bad effect [12, 13]. So we believe that for the III degree of acute injury of ankle, I stage repair can reconstruct the stability of ankle in early stage and reduce the incidence of long-term complications caused by chronic unstableness of ankle, thus achieving a good clinical efficacy. But for some complications (damage of articular cartilage), further clinical research is still needed to confirm whether they have occurred at the time of injury or is caused by repeated abrasion due to chronic unstableness.

The operational methods can be classified into anatomical reconstruction and non-anatomical reconstruction. The latter often use autologous peroneal tendon for ligament reconstruction, such as Waston-Jones, Christman-Snook, and Evans operations; the former can be divided into two types, one is the modified Broström and Karlsson operation, and the other one is the anatomical tendon transplantation of the lateral collateral ligament reconstruction oper-

ation, such as Christman-Snook and Evans operations. These operations can treat the ankle unstableness caused by ankle lateral collateral injury to some degree, and have their respective indications. For those with long-term unstableness or repeated sprains, their injured tendon might have shortcomings and can't keep the joints stable, so autologous, allosome or even artificial ligament replacement is needed [4, 14, 15].

With fast and convenient features, repair of the lateral collateral ligament injury of the ankle with the suture anchors can combine with the ligament injury sites preliminarily judged preoperatively to directly perform the surgery in the quite small incision, which brings little trauma and certain effect. Through biomechanical study in cadavers, Viens et al. [16, 17] proved that the simple application of suture anchors or suture anchors combined with Broström method was more effective than Broström method alone, with more powerful biomechanical strength and tenacity. The biomechanical comparative research by Waldrop et al. [18] provided the similar conclusion. In the present study, we reconstructed the ligament end points with suture anchors. Because all patients were young, received I stage repair and had good strength and tenacity of ligaments, the joint capsule contracture and ligament atrophy caused by chronic unstableness of ankle could be avoided to completely achieve anatomical repair and stability of ankle. In the present study, we used suture anchors for repairing the anterior talofibular ligament to reconstruct the stability of ankle and combined with postoperative immobilization and functional training, thereby, not only reducing the operative trauma and complications, but also achieving a good clinical efficacy.

Conclusion

The present study adopts suture anchors for stage I repair of III degree of acute injury of ankle lateral collateral ligament in these 18 cases and applies small incision for direct anatomy and repair causes little operative trauma. This method effectively restores the stability of ankle joint and has a good postoperative function recovery. Meanwhile, occurrence of many chronic ankle instability complications is avoided, and a good clinical effect is achieved. Therefore, it is a feasible and effective treatment of ankle joint lateral collateral ligament injury. However, for some complications (damage of articular cartilage), further clinical research is still needed to confirm whether it has occurred at the time of injury or is caused by repeated abrasion due to chronic unstableness.

Disclosure of conflict of interest

None.

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