

# Application of Arthroscopic Technology in the Treatment of Traumatic Sports Ankle Arthritis

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**Abstract:** *Objective:* To analyze and explore the clinical value of arthroscopy in traumatic sports ankle arthritis. *Methods:* The study period was from June 2016 to June 2020. A selected sample of 25 patients with traumatic sports ankle arthritis in Qingyang People's Hospital were treated. All patients underwent arthroscopy and the specific treatment effects were analyzed. *Results:* Comparing the preoperative and postoperative ankle-hindfoot scores, the distance of talus advancement, modified Mcguire's ankle scoring system, and visual analog scale (VAS) pain scores, the postoperative results were significantly better than those of the preoperative ( $P < 0.05$ ). *Conclusion:* Arthroscopy in traumatic sports ankle arthritis has a significant effect, with minor trauma and rapid postoperative recovery which improves various discomfort symptoms. It is worthy of promotion and application.

**Keywords:** Arthroscopic technique; Traumatic sports ankle arthritis; Curative effect

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## 1. Introduction

The ankle joint is an important weight-bearing joint of the human body. High-energy impact during exercise may lead to damage of the articular cartilage and its joint structures as well as the loss of biomechanical balance. These results in patients having joint deformities, structural abnormalities, internal soft tissue degenerations, and ultimately restricting the function of their ankle joint.<sup>[1]</sup> In the clinical treatment of ankle joint injuries, conservative treatments such as splinting or plaster are usually used. Such treatments would not improve joint dysfunctions, pain, and other accompanying symptoms. For this reason, the mode of treatment needs to be appropriately adjusted.<sup>[2]</sup> In this study, relevant patients in Qingyang People's Hospital were selected as samples to analyze the application value of arthroscopic technology.

## 2. Materials and methods

### 2.1. General information

The study period was from June 2016 to June 2020. The treatment of 25 patients with traumatic sports ankle arthritis in Qingyang People's Hospital were selected as samples. The basic data of the 25 patients were summarized and analyzed in which out of the 25 patients, there were 16 male patients and 9 female patients, aging from 15 to 42 years old with an average age of  $28.56 \pm 2.44$  years old. It was over a course of 2-8 months with an average of  $5.44 \pm 1.02$  months and all patients had clinical manifestations of restricted movement and pain at the ankle joint after the sports injury in which regional block and physical therapy were ineffective.

## 2.2. Method

All the patients underwent arthroscopy using the 2.7mm, 30°C wide-angle arthroscopic system with specific surgical procedures:

- (1) Patients were placed in a supine position. Then, their anterior tibial tendon, dorsalis pedis artery, medial and lateral malleolus, superficial peroneal nerve branch, third peroneal tendon, and other structures were marked accurately by the surgeon to determine the precise position for anterior medial and anterior lateral approach.
- (2) The anesthesia used was either continuous epidural anesthesia or general anesthesia. For each patient, a puncture was made along the pre-marked approach in which a syringe needle was used to inject 20 ml of normal saline into the patient's joint cavity. This was to confirm that the joint filling effect was good and the needle could be withdrawn without any blood.
- (3) A 3mm hole was then made in the skin of the puncture site and an arthroscopy is placed in the anteromedial area. The position of the tibiotalar space from the anterior area of the tibia to the talus, deltoid ligament, and tibiofibular syndesmotoc ligament were examined and confirmed. The lateral sulcus area was explored to determine if the patient had any abnormalities such as ligament hypertrophy, scarring, tearing, or villi hyperplasia. The joint space was also examined to determine the presence of any loose bodies or osteophytes in addition to any fractures or dislocations of the joint.
- (4) After confirming the location of the lesion, an electric planer was accurately inserted via the pre-set anterolateral hole for the removal of scar tissue, irregular soft tissue of joints, and hyperplastic synovial tissue. An electric grinding head was used to remove hyperplastic osteophytes. After the surgery, loose bodies were then taken out. In consideration of Grade I-III cartilage damage, the patient required trimming of the surface with a radio frequency head and a planer to keep it flat. However, with Grade IV cartilage damage, micro-fracture surgery was required.
- (5) During the surgery, the joint cavity was continuously injected with physiological saline. After the completion of the surgery, the incision was sutured, and a compression bandage was placed. The ankle joint was kept in a neutral position and fixed with a plaster. The patient was then instructed to undergo postoperative rehabilitation training.

## 2.3. Evaluation

The ankle-hindfoot scores (AOFAS scoring system) of the 25 patients were evaluated before and 6 months after the surgery. In the same manner, x-ray examinations were done before and 6 months after the surgery to assess the distance of talus advancement. The scores of the modified Mcguire's ankle scoring system and VAS were also compared before and after the surgery among the 25 patients.

## 2.4. Statistical analysis

Statistical Package for the Social Sciences (SPSS) version 23.0 software was used to analyze various data. In this study, the measurement data were ( $\bar{x}\pm s$ ), the count data were (%), and the test methods were t-test and chi-square ( $X^2$ ).  $P < 0.05$  indicated a difference between the groups.

## 3. Results

### 3.1. Comparison of preoperative and postoperative ankle-hindfoot scores and talus advancement distance

Twenty-five patients were examined by arthroscopy. Ten patients had impingement syndrome caused by fibrous tissue hyperplasia and synovitis, nine patients had talar and tibial cartilage damage, and six patients had uncomplicated synovitis. After 6 months of follow-up, the range of motion of the joint returned to

normal whereby 16 patients returned to their pre-injury state, seven patients had no restrictions to their daily activities but were unable to exercise up to a distance, and two patients had ankle joint swelling, pain, and other symptoms when they walked more than 3km.

Comparing the preoperative and postoperative ankle-hindfoot scores as well as the distance of talus advancement, the postoperative results were significantly better than those of the preoperative ones ( $P < 0.05$ ).

**Table 1.** Comparison of preoperative and postoperative ankle-hindfoot scores as well as the talus advancement distance ( $\bar{x}\pm s$ )

Group	Ankle-hindfoot score	Distance of talus advancement (mm)
Before surgery (n=25)	52.77±5.94	14.52±2.67
6 months after surgery (n=25)	84.28±3.56	3.85±0.44
t value	22.750	19.175
P value	0.000	0.000

### 3.2. Comparison of the modified Mcguire's ankle scoring system scores and VAS before and after surgery

Comparing the scores of the modified Mcguire's ankle scoring system and VAS before and after surgery, the scores after surgery were significantly better than those before it ( $P < 0.05$ ).

**Table 2.** Scores of the modified Mcguire's ankle scoring system and VAS before and after surgery ( $\bar{x}\pm s$ )

Group	Modified Mcguire's ankle scoring system score	VAS score
Before surgery (n=25)	58.32±2.66	6.85±1.02
6 months after surgery (n=25)	81.57±2.48	1.97±0.77
t value	31.965	19.092
P value	0.000	0.000

## 4. Discussion

Ankle joint sports injury is a clinical multiple bone and joint disease which can cause excessive weight bearing, abnormal biomechanical relationship, and wearing of the joint.<sup>[3]</sup> Most patients with ankle joint injuries would be able to achieve effective recovery with restoration of the joint to its anatomical position through fixations and other symptomatic treatments. However, some patients have limited motor functions and experience pain after surgery. Therefore, it is necessary to select appropriate treatment based on the clinical symptoms of the patients.

The application of arthroscopic technology includes patients with ankle impingement syndrome, ankle synovitis, ankle cartilage injuries, purulent ankle arthritis, unexplained ankle pain and swelling, removal of loose bodies, etc. This technology is a minimally invasive surgery. The incision is short with a small scar area over the skin and is well tolerated by patients. The arthroscopic technique enables patients to recover quickly and rehabilitation training can be carried out in the early postoperative period which helps to shorten the recovery period of the joint function. At the same time, arthroscopic technology can help in the accurate diagnosis of Grade I-III cartilage damage making up for the defects of conventional diagnostic imaging technologies. In addition, the arthroscopic technology uses a micro planer which enables surgeries to be completed in a narrow space, accurately removes lesions, and protects normal tissues to avoid damage to

nerves and blood vessels.<sup>[4]</sup> Arthroscopic ankle arthrodesis involves a clear field of vision, good cleaning effect, less intraoperative blood loss, and no serious postoperative complications.

Through the analysis in this study, it can be seen that the pathogenesis of traumatic sports ankle arthritis is related to factors such as trauma-induced synovial and articular cartilage damage, fibrous tissue hyperplasia, synovial hyperplasia, etc. which may lead to joint limitations and pain. Relevant studies have shown that most patients with ankle impingement syndrome have no significant abnormalities in their x-ray examinations. In the diagnosis of this syndrome, doctors would gather a detailed medical history and perform impingement tests with magnetic resonance imaging which would significantly increase the positive rate of the diagnosis. This diagnosis requires wide clinical experience and excellent subjective judgment ability of the doctor. However, the diagnosis results are not completely reliable. Ankle arthroscopy under direct vision often achieves accurate diagnosis of ankle joint injuries. It can effectively treat tibial cartilage and talus injuries caused by joint impingement syndrome through operation modes such as microscopic needles. This can significantly improve the recovery rate as well as the diagnostic accuracy. The ankle arthroscopy procedure is simple. In order to improve the success rate, the preoperative doctor needs to comprehensively understand the patient's clinical data and perform physical examinations as well as making interpretations in a standardized manner. A reasonable surgical approach should be established during the operation. Priority should be given to the completion of ankle arthroscopic diagnostic examination, determining the exact location of the patient's impact, and assessing the association with soft tissue injuries. At the same time, detailed examination of the tibia, talus osteophytes, and intra-articular loose bodies are required. Intraoperative treatment of articular cartilage injuries, cleaning of synovial membranes and osteophytes, removal of loose bodies, etc. follows the conventional arthroscopic procedure. The main cause of anterior ankle impact injuries are the osteophyte structures at the anterior tibia. There is a need to use an electric grinding head to effectively grind those structures away.

At the same time, patients with traumatic sports arthritis of the ankle joint usually have injuries to their ligaments. In treating these patients, arthroscopy is required to diagnose the injured area and for specific therapeutic interventions to improve the treatment effect. At the same time, related studies have summarized the treatment plan for anterior talofibular ligament injury. It is believed that the anterior drawer stress test of the ankle joint greater than 4mm can be used as the main diagnostic criteria. In regard to its clinical treatment, it is necessary to repair the peri-ankle ligament in one stage. Fixation with suture anchors can be used to ensure the fixed structures are tightly connected with the ligament or tendon, thereby promoting the improvement of the treatment effect.

In addition to that, in the treatment of traumatic sports arthritis of the ankle joint, the doctors should understand the main points of the surgery which are restoring joint stability, adjusting the structure of the tibiofibular joint and tibiotalar joint, repairing ligament tissues, as well as realizing the functional and mechanical stability of the ankle joint. It is also necessary to properly handle the associated lesions such as hematoma, cartilage fragments, and soft tissues within the joint. The edema state of the synovial tissue also needs to be effectively treated to avoid complications such as adhesions after the surgery.

To summarize this study, the postoperative ankle-hindfoot score, talus advancement distance, modified Mcguire's ankle scoring system score, and VAS pain score of the 25 patients were better than those before the surgery in addition to good recovery of joint mobility. It can be considered that the arthroscopic technique used in arthroscopy has remarkable effect in the treatment of traumatic sports ankle arthritis.

In summary, the arthroscopic technique for traumatic sports ankle arthritis has a significant curative effect with minor trauma and rapid postoperative recovery which can improve a variety of discomfort symptoms. It is worthy of promotion and application. However, the total number of patients included in this study is small, there is a lack of comparative research on the same type of data, the research period is short, and the process design is not complete or systematic. Related issues still need to be continuously

evaluated and explored in regard to the use of arthroscopy in the treatment of traumatic sports ankle arthritis.

### **Disclosure statement**

The author declares no conflict of interest.

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