Chronic Lateral Ankle Instability: Results of Anatomic Repair with Polyester Tape Augmentation.

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Abstract

Background: Ankle sprains are one of the most common injuries both in athletes and general population. A major problem accompanying ankle injury is the high rate of recurrence with About 20% of acute ankle sprain patients developing chronic ankle instability. Unlike acute ankle sprain, chronic ankle instability usually needs surgical intervention. Various anatomic reconstruction techniques using the ruptured ends of the ligaments to restore stability have gained popularity. The Purpose of this study is to evaluate the functional results of the treatment of chronic lateral ankle instability with anatomic repair of the injured ligaments and reinforcement with polyester tape. Methods: A case series study of 30 consecutive patients who underwent anatomic reconstruction of the lateral ligaments using trans osseous suturing and augmentation using polyester tape done at a single centre by a single surgeon from 2016 to 2017. All patients were assessed preoperatively and postoperatively at 6 weeks, 3, 6 and 12 months. The American Orthopaedic Foot and Ankle Score (AOFAS) and Free Online Foot and Ankle Ability Measure (FAAM) were recorded and used for results analysis. Results: At 12 months follow-up, the AOFAS Improved from mean 52.47 ± 2.06 to 91.0 ± 6.03 (p<0.001). The FAAM score mean improved from mean 55.21± 1.9 to 90.43 ± 4.02. Conclusions: The ankle ligament reconstruction with addition of polyester tape augmentation is an effective technique in treating chronic ankle instability with satisfactory surgical outcome.

Keywords: Ankle, Instability, Reconstruction, Internal bracing.

Introduction

Ankle inversion injury is one of the most common injuries in the general population and is seen even more frequently in athletes with ankle sprain accounting for up to 40% of all athletic injuries specially in those participating in basketball, soccer, running, and ballet [1,2]. With an inversion trauma the anterolateral ankle ligament is strained and in severe cases ruptured. The anterior talofibular Ligament (ATFL) is the most frequently ruptured, followed by the calcaneofibular Ligament (CFL). Rarely the posterior talo- fibular Ligament (PTFL) is completely torn [3]. A major problem accompanying ankle injury is the high rate of recurrence associated with chronic ankle instability. The resultant abnormal loading, changes in contact stress and distribution have also been linked to the development of post-traumatic osteoarthritis [4].

Chronic ankle instability (CAI) is considered when the injury is too resistant to recover over the first 6-8 weeks and the ankle cannot retain its mechanical and functional stability with symptoms of recurrent sprains, pain, swelling and avoidance of provoking activities. It is generally classified into two components; mechanical instability and functional instability. Mechanical instability is defined as ankle movement beyond the physiologic limit of the ankle's range of motion which could be result of ligament injury or laxity. Functional ankle instability is caused by postural control deficits, neuromuscular deficits,
muscle weakness and proprioceptive deficits with subjective feeling of ankle instability or recurrent sprains without actual anatomical damage to the ligaments [1,5].

Comparative stress radiographs using the anterior drawer test and talar tilt test may be used to assist in clinical examination, but MRI is more useful in assessing degree of ligament injury. Also, associated causes of ankle pain can be visualized including chondral injury, subchondral oedema, occult fractures, tendon tears, and impingement syndrome [6,7]. Management for CAI are usually two-pronged utilizing both functional strategies and surgical reconstructions. Indications for lateral ligamentous reconstruction include persistent symptomatic mechanical instability and failed functional rehabilitation [8].

Several surgical procedures have been described for chronic lateral ankle instability, and these procedures can be divided into three categories: the anatomic repair, anatomic reconstruction and non- anatomic reconstruction [9]. The anatomic repair restores anatomy, preserves joint mechanics and subtal motion, keeps gait unchanged, and results in minimal donor site morbidity but in patient with poor quality ligament tissues or high demand activity these repairs can stretch out with time and reconstruction or augmentation procedure might be indicated. usually these augmentations have utilized autologous peroneal tendons grafts, donor allograft and internal brace ligament augmentation repair [9,10]. The non-anatomic reconstruction using biologic or synthetic graft material offers more secure repair at the expense of altering the ankle and subtalar joint biomechanics with higher risk of stiffness.

The use of the polyester tape as an alternative to tendon augmentation appears to have worked well and does not immediately highlight any limitations. The braided polyester tapes are non-absorbable suture made from continuous filament high strength polyester yarns. The tapes have very good handling characteristics and coated with silicone to minimize tissue adhesion and facilitate their ease of use. The tapes exhibit high strength, low stretch, smooth surface, good flexibility without being too limp. The ultimate tensile load of the five mm wide polyester tapes is 301.78 +/- 16.92 N. with corresponding stiffness is 21.63 +/- 2.19 N/mm [11]. It Avoids the issues with donor site morbidity and risk of disease transmission with autologous and allogenic grafts respectively. This material has long been used in many procedures such as vascular surgery, spinal Sublaminar fusion, ACL graft fixation and tendoachilis reconstruction and is widely accepted as inert and safe for use in the body [12,13,14].

Methods

Between 2016 and 2017 a total of 30 patients (30 ankles) who were diagnosed with chronic lateral ankle instability underwent anatomical lateral ligament repair plus polyester tape augmentation. Inclusion criteria: 1) More than 3 months of continued pain after a history of ankle sprain; 2) Sense of giving way or instability when walking on uneven ground or during sport activity; 3)Failure of conservative treatment for at least three months; 4) Positive finding of ruptured ATFL and/or CFL on MRI arthrogram of the ankle. Exclusion criteria: 1) Fixed hind foot varus deformity and cavovarus foot; 2) Generalized ligamentous laxity; 3) Peripheral neuropathy (diabetic neuropathy); 4) Peripheral vascular disease (chronic ischaemia). The mean age of the patients was 27 years. The youngest patient was 19 years and the eldest one was 42 years old. Male patients were 22 (73.3%), while females were 8 patients (26.7%). Patients who performed high demand work were 21 (70%). Low demand work patients were 9 (30%) (Table1). The mean time from initial injury to surgery was 5.5 months (range 3-8 months). Preoperative MRI was done to every patient to exclude associated conditions like impingement, occult fracture and chondral injuries. A manual anterior drawer test and inversion tests were also performed in all patients.

The surgery was performed under spinal anaesthesia in all patients. Examination after anaesthesia with anterior drawer and varus tilt tests performed to confirm ankle instability. The patients were placed in the semi lateral position with the operated ankle up. A tourniquet was applied at the thigh level. Routine ankle arthroscopy was performed first, and any associated intraarticular pathologies are addressed first. A two-inch curvilinear incision is made just over the distal lateral malleolus curving from the tip forward in a J shaped manner. Care is taken to identify and avoid the sural nerve. The proximal edge of the inferior extensor retinaculum was then identified, carefully dissected and mobilized. The lateral ankle capsule was then identified along with the remnants of the anterior talofibular ligament (ATFL). The calcaneofibular ligament (CFL) can be identified at the tip of the distal fibula with inferior retraction of the peroneal tendons.

A 2.5 mm drill bit was used to make two drill holes at point of attachment of the ATFL and CFL in the fibula. Then, trans osseous suturing was done
securing the distal stump of the ligaments (Figure 1). A number 2 Vicryl suture was used. Trans-osseous sutures were tied down with subtalar joint in slight everted position. A third 2.5 mm drill bit was used to make a drill hole in the fibula. It is situated 2 centimeter above the tip of the lateral malleolus at the level of syndesmosis away from the footprint of ATFL and CFL. The direction is from posterior to anterior to avoid damaging the peroneal tendons. A polyester tape (5mm mersilene tape white 1 stripx12", Ethicon) was used. It was passed through the drill hole (Figure 2), then through and underneath inferior extensor retinaculum then back to the proximal end (Figure 3 and 4). A knot was made with eversion of the hind foot, tension is adjusted in comparison with the other foot to make the sound tension and prevent over tightening (Figure 5).

Postoperatively, the ankle was secured in a hinged ankle brace with full range of plantar and dorsiflexion allowed for first 3 weeks under physiotherapy supervision with both isometric contraction exercise and weight bearing starting from day one postoperative. At three weeks the passive stretch exercises movement were allowed. At 6 weeks, weight bearing without the brace was allowed. Heavy work and sport activity were allowed after 6 months. The patients were clinically evaluated before and after the operation using the American Orthopaedic Foot and Ankle Society (AOFAS) score. The manual anterior drawer test and inversion tests were also repeated post operatively in all patients. Paired-sample t tests were used for statistical analysis. The significance level was defined as P<0.05.

Results

At 12 months follow up the mean preoperative AOFAS score improved from 52.47 ± 2.06 preoperatively to 91.0 ± 6.03 postoperatively. (p<0.001) (Table 2). The results of the patient were excellent (AOFAS score >90). The mean FAAM improved from mean 55.21± 1.9 to 90.43 ± 4.02. Manual stress testing showed that 28 patients were stable in both the anterior drawer and the inversion tests and two patients showed residual positive anterior drawer test. Both patients scored good on the AOFAS score. In this study, the polyester tape had no reaction in the studied patients although it was buried subcutaneously, and it was completely inert, and the skin incision healed well in all patients. No neurovascular complication occurred during or after the operation in any of the patients. There was no statistically significant impact of the age of patients and the duration of symptoms on the postoperative AOFAS score.

Discussion

Surgical management is usually needed when chronic ankle instability is persistent and not responding to non-operative measures. Research trials had been in favour of the surgical treatment regarding return to pre-injury level of sports; ankle sprain recurrence; long-term pain; subjective or functional instability [15]. Operative procedures of chronically unstable ankles fall into: Anatomic repair, anatomic reconstruction, and non-anatomic reconstruction. Anatomic repairs revealed good and excellent results at 85% of patients. However, patients who had poor quality residual ligament tissues, long-standing ankle instability and ligamentous laxity shows less satisfactory results success [16,17], therefore anatomic or non-anatomic procedures of reconstruction should be considered. Long-term outcomes of non-anatomic reconstructions are hindered by alterations in ankle and hind foot kinematics and often, resultant loss of subtalar motion. Non-anatomic tenodesis lead to decreased function, increased pain, limited range of motion, instability, increased need for revision procedures, and greater degrees of osteoarthritis compared to anatomic reconstructions [16,18].

In anatomic reconstruction, the injured ligaments repair is augmented by applying tendon grafts usually peroneal tendons or local tissues such as extensor retinaculum. Avoiding sacrifice of the peroneus brevis tendon is important because it has a role in the dynamic stability of the ankle. It functions to plantarflex, evert, and abduct the tarsal joints. It also helps to plantarflex the ankle. Therefore, leaving this tendon intact is preferable to maximize ankle function [4,18]. Other alternative is using allografts or the Internal Brace™ Ligament Augmentation Repair.

The use of the polyester graft alternative to tendon augmentation appears to have worked well and does not immediately highlight any limitations. This material has long been used in many procedures such as vascular surgery, tendoachilis repair, ACL graft fixation, spinal sublaminar fusion and is widely accepted as inert and safe for use in the body [12,13,14]. In this study the ligament repair was done using trans osseous sutures with addition of polyester tape to augment the anatomical reconstruction. The augmentation was in the form of O figure, connecting from a drill hole over the distal fibula and the inferior extensor retinaculum. We are not aware of similar study using polyester tape in lateral ligament augmentation. It has the advantage of avoiding the associated morbidity of using tendon autografts and cost and risk of associated with using allografts.
Figure (1): Operating on left ankle. Sutures are passed through the distal stumps of ATFL and CFL and another transosseous sutures passed proximally through the distal fibula. 1- Fibula, 2-ATFL, 3-CFL.

Figure (2): After tying down ligament repair the polyester tape was passed through separate transverse tunnel placed 2 cm proximal to tip of lateral malleolus.

Figure (3): The tape is passed through the inferior retinaculum

Figure (4): Illustration of the augmentation

Figure (5): The polyester tape is tied over the posterior edge of the fibula
Also, the outcome in our study is similar to the reported outcome of using the Internal Brace™ Ligament Augmentation Repair in the review study by Coetzee et al. [19] Also the use of trans osseous sutures for ligament repair has reduced the cost of the operation in comparison to using the more commonly used anchor fixation technique. Cho et al compared trans osseous fixation of ligaments with suture anchors. There were no significant differences in the clinical and functional outcomes between the two techniques for ligament reattachment [20].

Conclusions

The use of Polyester tape for augmenting lateral ankle ligament repair shows satisfactory outcome and is a viable alternative for using autograft, allograft and Internal brace augmentation. The good functional outcomes in this study, which was evaluated according to the AOFAS and FAAM are attributed to the correct diagnosis of the patients, proper indication for surgery and the restoration of the ligaments anatomy and ankle biomechanics whilst securing the repair with the Polyester tape.

Conflict of interests

None

References


