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Re-Operation Rates Following Brostrom Repair

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Abstract

Aim: Brostrom repair is used to restore function in unstable ankles post anterior talo-fibula ligament injury. Data on residual function and reoperation rates following this procedure is scarce and we conducted a study to investigate this in patients who had this procedure following chronic ankle instability.

Methods: The hospital's computerised archiving system was searched for Brostrom repairs done by a single surgeon over the past 6 years with a minimum follow up of 6 months. Their level of function and residual disability if any was obtained from clinical visits.

Results: 20 eligible patients were studied. The mean age of the patients at operation was 30.3 months and mean time between injury and repair was 41 months. All patients had good stability post procedure. Three patients had repeat operations (15%), all for on-going pain: One had ankle arthrodesis and the other two underwent arthroscopy and scar exploration.

Conclusion: Brostrom repair is an operation that provides good stability. Re-operation is mainly due to pain and patients should be warned of this. 85% of patients studied were able to return to normal function.

INTRODUCTION

Ankle sprains are a common source of morbidity in both the sporting and the general public, accounting for up to 40% of all athletic injuries [1,2], and a reported incidence of 30,000 ankle sprains a day in the United States alone [3]. Ankle sprains account for 3% of Accident and Emergency department visits [4], and although most ankle sprains settle with conservative treatment but up to 25% can go on to develop a level of instability that interferes with activities of daily living [5]. The anterior talo-fibula ligament (ATFL) is the most commonly affected ligament in ankle sprains as it has been shown biomechanically to be the weakest component of the lateral ligamentous complex [6].

Ankle instability lasting six months post injury is termed chronic, and it is important that this is addressed as continued loading of a laterally unstable ankle can lead to degenerative changes on the medial side of the ankle joint [7]. Numerous surgical techniques have been described to restore stability under the umbrella terms non-anatomic repair [8-11], where neighbouring tissue, not related to the zone of injury, is used to augment the repair [5,12-14], which directly apposes and sutures the injured ligament, first described by Brostrom.

The Gould modification of the Brostrom procedure involves a slip of inferior extensor retinaculum to augment the repair, and it is this technique that is used in our unit. There is little in the literature regarding re-operation rates post this procedure [15-17], and the aim of our study was to determine whether stability of the ankle was restored post the above procedure, and explore complications that led to further operations.

MATERIAL AND METHODS

Over a 6 year period, from 2008 – 2013 (inclusive) 21 patients underwent ankle ligament repair, 10 male and 11 were female. The mean age of the patients at time of operation was 30years (range 17 – 48). The mean follow up was 3.6 years (range 1 – 6.2). Average time between initial injury and procedure was 3.5years (range 0.4 – 12.8). A single surgeon performed all the procedures using the Gould modification of Brostrom technique.

Surgical procedure and anatomy

With the patient in a lateral position and a thigh tourniquet inflated, a longitudinal incision is made just posterior to the fibula and curved anteriorly distally. Care is taken not to injure the sural nerve. A flap is raised once the fascia has been reached before the fascia is divided to reveal the ankle capsule. The ATFL is a discrete thickening of this capsule running 25° to the horizontal from the anterior aspect of the distal fibula to the talus and as it is the primary constraint against internal rotation in plantar flexion, having the foot and ankle adopt this position stretches the scar tissue that has formed making it easy to identify. After debridement of weak tissue, the ligament is then assessed for feasibility of direct repair with Ethibond™ suture. If too close to

one end of the bone then anchor sutures are employed, and the sutures tied with the ankle in dorsiflexion and eversion. A slip of inferior extensor retinaculum is then released and swung from its medial base inferiorly and attached on the anterior aspect of the fibula to augment the repair again using Ethibond™ suture.

Post operatively, the protocol was cast immobilisation and non-weight bearing for 6 weeks with the ankle in plantigrade position before allowing weight bearing in a Melleoloc™ splint and gentle range of motion exercises under the care of the physical therapists. From the hospital database, patient clinical data was collected and compiled using Microsoft Excel™.

RESULTS

There were no complaints of instability post procedure at final follow up. Three patients had debilitating ankle pain despite the restoration of stability and they underwent further surgical procedures –scar exploration and EDL tendon release, scar exploration and superficial peroneal nerve release, and an ankle arthrodesis. Unfortunately, despite these two procedures, they continued to experience antero-lateral ankle pain.

DISCUSSION

In our series, 14% of patients required re-operation following the Brostrom procedure, with all the re-operations being performed due to ongoing pain. In 2 patients this pain was thought to be 'superficial' (subcutaneous nerve entrapment) but in 1 case it was due to ankle post traumatic degeneration necessitating arthrodesis. None of the patients in our series suffered from further instability.

After an inversion injury to the lateral ligamentous complex of the ankle, instability persists in up to 25% of patients [15]. Failure of conservative treatment in the form of recurrent 'sprains' or subjective instability after a period of immobility is the indication of lateral ligament reconstruction.

Non-anatomic reconstructions of the lateral ankle ligamentous complex were perhaps the first to be widely used as treatment for ankle instability, with Elmslie describing the use of fascia lata to reconstruct the lateral ligaments [8]. The use of peroneal tendons was then popularised by Watson Jones, who re-routed the peroneal brevis tendon through the fibula and attached it to the talar neck [9]. The Evans modification of this procedure is a similar but simpler technique of peroneal tendon re-routing – the proximal end of the tendon is transected and the musculo tendinous junction sutured to the peroneus longus tendon and the remaining tendon re-directed through a drill hole in the fibula [10]. The Chrisman-Snook variation of the Elmsie procedure split the peroneus brevis tendon and passed the split portion through the fibula and calcaneus. The authors thought that an advantage of this procedure was retention of part of the peroneal brevis tendon, which offered reconstruction of the calcaneo-fibula ligament – a feature not addressed by the other operations [11]. Though a long term result of stability with non-anatomic repairs has been mixed [18,19], one common thread with the non-anatomic repairs is that they restrict sub-talar motion and lead to non-physiological kinematics of the ankle joint [20,21].

Anatomical repairs offer the advantages of preserving the native anatomy and subtalar motion, though in patients with poor quality tissue, cavovarus foot, or a previous repair the procedure can be challenging. The Brostrom procedure [5] involves anatomical repair of the anterior talo-fibular ligament for chronic ankle lateral ligamentous complex ruptures. Initial results were promising (58 out of his 60 patients had 'good' results) and this led to further similar studies [12] which showed equally encouraging results. The long term results of the Brostrom repair have been well documented, with the longest follow up to date showing excellent function at 26 years in a study of 32 patients [14]. The Gould modification [13] involves the use of a slip of inferior extensor retinaculum to augment the Brostrom repair and it has also been shown to have excellent outcome at an average of 64 months post op in a study of 28 ankles [15] and more recently in 2011 by Lee et al., who followed up his patients for an average of 10.6 years and 28 out of 30 returned to pre-injury levels of activity. The largest series was by Tourne et al. [22], who retrospectively reviewed 150 anatomical ankle ligament reconstructions and satisfaction at a mean follow up of 11 years was 93%, with 4.8% of ankles exhibiting residual instability. In this series though, the calcaneofibular ligament was addressed as well as a number of associated procedures (resection of bony avulsion and soft tissue impingement, suture of fissured peroneal tendons and cartilaginous lesions, osteochondral graft) that it is difficult to tell which conferred more benefit on the patient, the primary or the secondary procedures. Our study specifically addressed post-operative stability and re-operation rates following the modified Brostrom repair to determine whether it was a curative procedure, as in theory there is a chance of the repair failing, and delayed lateral ligament reconstruction anecdotally means that the unstable ankle is undergoing insult for a longer period, in particular ankle joint degeneration, reducing the chances of a successful outcome.

None of the patients who had the procedure complained of instability afterwards, so the primary aim in all our cases was achieved. This however was eclipsed by continued pain in three patients. In two of these cases, the pain was felt to be superficial and involving the subcutaneous structures so after a period of failed conservative treatment they both had scar exploration and nerve/tendon release. In the case of superficial peroneal nerve entrapment, the repeat operation did confer some benefit, but in the presumed tendon entrapment surgery was not of any benefit and at the time of writing is still under investigation. In one case, damage to the articular surface was too severe and after arthroscopy ended up having an ankle arthrodesis. This patient went onto have an ankle arthroscopy 6 months after the primary procedure, and eventually went on to have an ankle arthrodesis 9 months after this arthroscopy (a total of 15 months after the initial operation). Despite this the patient still continues to be in pain and is currently being investigated for a non-union.

It is encouraging that at an average time of 41 months post injury at time of operation and an average follow up of 43 months, all the ankles were subjectively stable and only 1 patient required a procedure to address possible chondral damage. We acknowledge the relatively small number of patients and the attendant risk that one aberrant case could potentially skew or mask valid findings. Also, there is a relatively short follow up in

absolute terms, and the lack of pre and post-operative functional scores makes it difficult to quantify the clinical improvement. However, this retrospective study drawback is mitigated by the secondary outcome and which does not require scores – does the patient feel that their ankle is stable?

In a study with 21 subjects and a significance level of 0.05 (5% chance of incorrectly rejecting the null hypothesis, in this case the null hypothesis being that there is no difference in stability before or after the operation),we calculated the power of this study to be 86.7%.

CONCLUSION

From our study, the Gould modification of the Brostrom technique is an excellent method of restoring stability in chronically unstable ankles, but patients must be warned on the risks of ongoing pain, either due to the initial trauma or iatrogenic, which may diminish their satisfaction with the procedure.

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