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## Retrospective analysis of Modified Brostrom repair for Anterior Talo-fibular Ligament (ATFL) tear in chronic lateral ankle instability

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### Abstract

**Background:** Sports injuries causing ankle sprain is the most common cause of isolated tear of anterior talo fibular ligament (ATFL). Present study retrospectively analyses the results of surgical management of ATFL tear by modified Brostrom technique. **Materials and Method:** 15 patients who had chronic ankle instability and underwent surgical repair of ATFL were included in the retrospective analysis study, follow up was done for two years. Diagnosis was made on the basis of clinical and radiological (Talar Tilt Stress xrays and MRI) examination. **Results:** Modified Brostrom-Gould repair technique was used in surgery. Mean follow-up duration was two years (range 1.5 – 2.5), mean foot and ankle outcome score was 94 (range 88-100). **Conclusion:** Results of this study support that surgical repair of ATFL done with Brostrom (Gould Modification) technique has high rate of success and good patient satisfaction. We recommend using it in high grade complete ATFL tear patients to re-establish the lateral ankle stability.

**Keywords:** Ankle Sprain, Instability, Ligament repair, ATFL, Brostrom, Imbrication, Gould Modification.

### INTRODUCTION

Hind foot injuries are very common among all sports injuries, around 10-30% sports injuries include ankle injuries [1] and 73% of ankle sprains are associated with the anterior talo-fibular ligament Injury (Rupture or Tear) [2].

Anterior Talo-Fibular Ligament (ATFL) is part of the lateral ligament complex of ankle along with Calcaneofibular ligament (CFL) and posterior talo-fibular ligament (PTFL). ATFL originates from the anterior border of lateral malleolus and inserts on body of talus. The ligament is 12-20 mm long, 5-8 mm wide and 2 mm thick band like structure [3].

The ATFL is the primary restraint to inversion of the ankle throughout its arc of motion. Strain of the ATFL increases progressively as the ankle moves into plantar flexion and inversion. As a result, the ATFL is usually torn in inversion, plantar flexion, and internal rotation [4,5]. Grade three (Complete) ATFL tear persisting for long time contributes to chronic lateral instability of ankle[6].

Patients with chronic lateral ligament instability presented with complains of pain, focal swelling and instability, history of repeated ankle sprain and not able to walk properly. On clinical assessment Anterior Drawer test was found positive (Anterior translation > 5 mm), tenderness was present at joint line with effusion, stress xrays showed tilt angle more than 15 degree and MRI showed grade three anterior talo-fibular ligament tear. (FIG. 1 and FIG. 2)

Despite various treatment methods available there is still no clear consensus to opt for surgical repair, in present study we propose a protocol for lateral ankle injuries management, this study discusses results of surgical repair of ATFL in failed conservative management of grade three tear cases progressing to chronic ankle instability.

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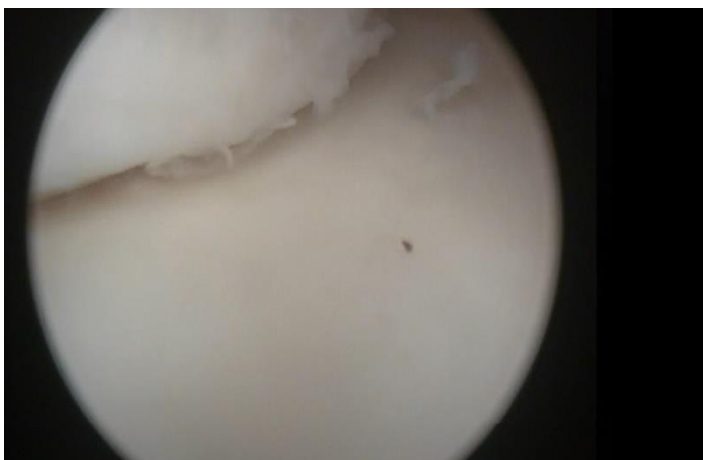
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**Figure 1:** Demonstrating Anterior Drawer Test for Ankle Instability (Translation > 5 mm denotes positive test)



**Figure 2:** Intra-Operative Picture showing Arthroscopic Examination of the Ankle Joint

**MATERIALS AND METHOD**

Fifteen patients with grade three ankle sprain who were treated by surgical intervention repair of ATFL by brostrom (modified gould)[7,8] technique was included in the study, retrospective analysis of two years post-operative period was done.

Inclusion criteria: patients with grade three tear (complete tear) having history of traumatic event were included in the study. Patients with positive clinical examination i.e. Anterior drawer test having more than 5 mm translation. Patients Having radiological evidence i.e. MRI showing isolated complete tear of ATFL. Exclusion criteria consisted of Patients with no clear history about the injury. Patients having incomplete follow-up data records. Otherwise physically or psychologically unfit patients for surgery or research.

Initial management of acute sprains included rest, ice, compression and elevation [9].

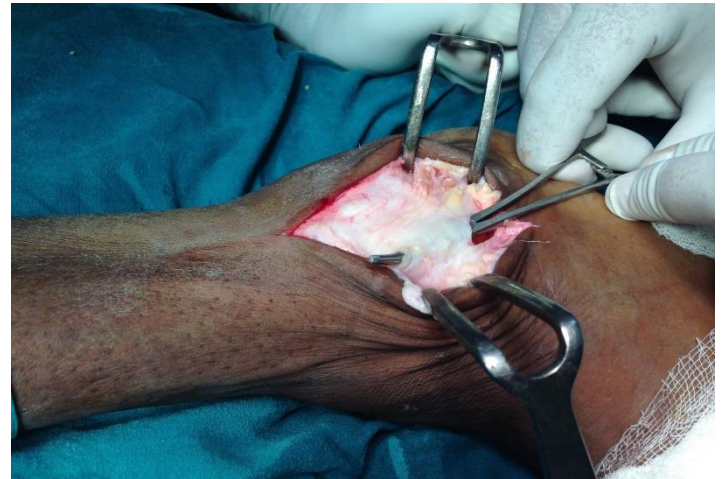
Grade one sprain did not generally required immobilization but were prescribed elastic bandages while grade two sprains were prescribed with 2-3 weeks of immobilization with below knee cast [10,11].

For grade one and two patient’s rehabilitation was started when swelling and pain decreased, usually 3-6 week after injury, ankle was protected for some time with ankle bracing to avoid recurrence, various methods like motion exercises, alphabet exercises were used for return to normal function. Braces and elastic bandages were given to reduce swelling during rehabilitation [9,12].

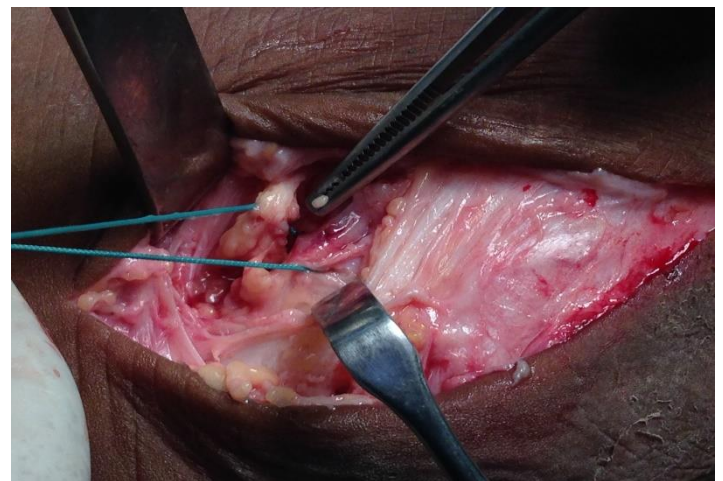
Surgery was not recommended for acute ligament injuries, a conservative trial was given to all the patients, surgery was advised for cases which did not respond to conservative treatment and presented with chronic ankle instability [13,14].

**Operative Procedure**

Procedure was started with a diagnostic ankle arthroscopy specially to identify intraarticular cartilage pathology if any present. After that a curvilinear incision is taken over the lateral aspect, starting one cm proximal to distal fibula end and curving anteriorly in line with the ATFL ligament fibers, this incision also provided access to Peroneal tendon sheath, after layer by layer dissection of skin and subcutaneous tissue, inferior extensor retinaculum and lateral ligament complex was exposed. (FIG. 3 and FIG. 4)



**Figure 3:** Intra-Operative Picture showing Incision and Lateral Extensor Retinaculum



**Figure 4:** Intra-Operative picture showing ATFL tear

Peroneous brevis and longus tendons were explored to rule out any pathology. The ATFL tear was then identified and repaired using 5-0 ethibond suture by ‘vests over pants’ technique which constitutes mobilization and reattachment of the lateral portion of the extensor retinaculum to the tip of the fibula over repair of ATFL (Imbrication). (FIG. 5 and FIG. 6)

We made sure of decent spread of the suture threads in the tissue, approximately 8-mm to 12-mm apart. Ankle was reduced to the neutral position and sutures were then tied completing the modified Broström-Gould procedure. (FIG. 7 and FIG. 8)

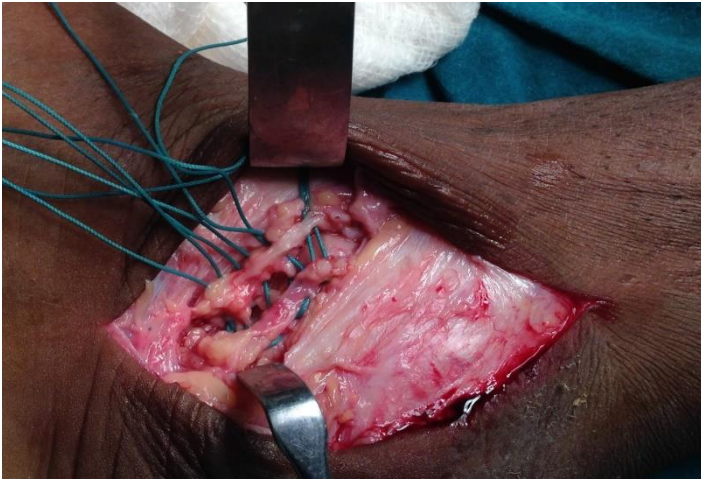


Figure 5: Intra-Operative Picture showing Brostrom Repair A



Figure 8: Intra-Operative Picture showing Gould Modification "VESTS-OVER-PANTS" Repair



Figure 6: Intra-Operative Picture showing Brostrom Repair B



Figure 7: Intra-Operative Picture showing Gould Modification Repair of Extensor Retinaculum over ATFL Repair

**Post-Operative protocol**

Initially Crutches were given to support for first 4 to 7 days, until swelling subsided and then a short-leg nonwalking cast was applied with the ankle in neutral position. cast was removed at 4 weeks. At 4-6 weeks after surgery, gentle range-of-motion exercises and isometric peroneal strengthening were begun. At 6-8 weeks protected weight bearing was allowed and at 8 to 12 weeks after surgery, patients were encouraged to return to normal activities.

**RESULTS**

18 patients with grade three isolated ATFL tear having complete follow up record were initially studied retrospectively.

15 out of 18 patients with grade three tear and chronic lateral ankle instability required the surgical repair with modified Brostrom-Gould technique and showed good results in this study.

All of the patients sustained the injury via plantar flexion and inversion mechanism of ankle sprain.

Nine patients were male and six patients were female. Mean age of patients was 31 (range 22-40).

Mean follow-up duration was two years (range 1.5 – 2.5), at two years mean foot and ankle outcome score was 94 (range 88-100). (Fig. 9)

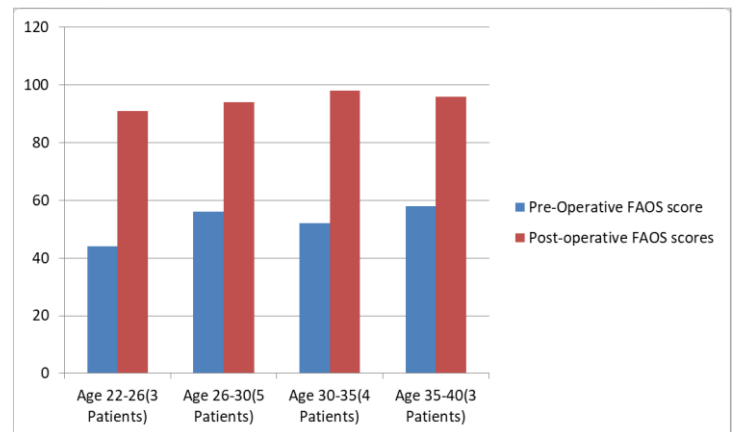


Figure 9: Graphical representation of results at two-year follow-up, Pre-op and Post-op mean FAOS scores sub-grouped according to age of patients, showing good improvement in symptoms.

Clinical examination was satisfactory as Anterior translation and internal rotation reduced significantly following surgical management, and patients were able to return to their normal lifestyles with good satisfaction.

two patients complained of mild pain while brisk walking and running, but no degenerative changes were evident on follow-up x-rays. Rest all other patients did not had any significant complaints at 2 years follow-up.

**Table 1:** Data table of results from which graph (Figure 9) was prepared

	Pre-Operative FAOS score	Post-operative FAOS scores At two years
Age 22-26(3 Patients)	44	91
Age 26-30(5 Patients)	56	94
Age 30-35(4 Patients)	52	98
Age 35-40(3 Patients)	58	96

## DISCUSSION

As per literature about 40 % of patients having hindfoot sprain develop chronic ankle instability and they require surgical intervention [15].

Lateral ankle instability causes deranged biomechanics of ankle joint and thus chronic pain and swelling [16]. Proper functioning of the joint and restoration of normal joint biomechanics is an important factor without which there might be improper loading of cartilage and resultantly early development of degenerative osteoarthritic changes [17].

Many surgical techniques have been proposed to restore the stability of ankle [18].

Effects of all other procedures are not clearly understood but ATFL repair using modified Brostrom-Gould anatomic repair procedure has shown good results over the time for lateral ankle instability and has restored normal functioning.

This has been evident in various studies done for in vivo kinematics of tibio-talar joint under normal loading [19].

Gould Modification has increased efficacy of the Brostrom procedure. There have been many studies to evaluate the efficacy of technique, Prisk *et. al.* performed cadaveric study to see effects of Brostrom repair with and without Gould modification. Gould modification provided better anterior translational stability and restoration of center of pressure [20,21].

Present study uses FAOS scale to measure outcome of ligament repair, Roos *et. al.* devised Foot and Ankle Outcome Score (FAOS) to measure outcome after ankle ligament reconstruction, this incorporates five subscales (Pain, Other Symptoms, Activities of Daily Living, Sport and Recreation Function, Foot- and Ankle-Related Quality of Life) [22].

On the basis of results, it is recommended to go for modified Brostrom-Gould repair procedure for patients who need a stable ankle with a full range of plantar flexion and dorsiflexion and normal peroneal function. Modified Broström procedure gives good results in patients with moderate or severe instability.

In the present study, reduced anterior translation and internal rotation of the talus after brostrom-gould repair contributed to the excellent clinical result. Future studies are needed to evaluate the effects of other repair techniques on lateral ankle instability, as well as long term follow up of these patients to evaluate the degenerative changes in the joint.

## CONCLUSION

Anatomic repair and imbrication of the lateral ligament complex with the Gould modification has an 85% to 95% success rate, and the risk of complications is low. This approach provides increased stability by reinforcing local host tissue, preserving subtalar and talocrural motion, eliminating the comorbidity associated with tendon-graft harvest, and offering a quicker functional recovery. It is suggested that a modified Broström lateral-ligament repair should be considered the first choice for persistent ankle instability refractory to a functional ankle-rehabilitation treatment. Ankle reconstruction with tendon

augmentation should be reserved for patients with generalized ligamentous laxity or long-standing ligamentous insufficiency or as a salvage procedure in a patient with a failed modified Broström lateral-ligament repair.

## Conflicts of interest

There are no conflicts of interest.

## Source of funding

None declared.

## REFERENCES

- Fong DT, Hong Y, Chan LK, Yung PS, Chan KM. A systematic review on ankle injury and ankle sprain in sports. *Sports Med* 2007;37:73-94.
- Woods C, Hawkins R, Hulse M, Hodson A. The Football Association Medical Research Programme: an audit of injuries in professional football: an analysis of ankle sprains. *Br J Sports Med* 2003;37:233-238.
- Pau Golanó, 1 Jordi Vega,3 Peter A. J. de Leeuw. Anatomy of the ankle ligaments: a pictorial essay. *Knee Surg Sports Traumatol Arthrosc.* 2010 May; 18(5): 557–569.
- Clanton TO, Paul P. Syndesmosis injuries in athletes. *Foot Ankle Clin N Am.* 2002;7:529–549. doi: 10.1016/S1083-7515(02)00045-1.
- Renstrom FH, Lynch SA. Acute injuries of the ankle. *Foot Ankle Clin.* 1999;4:697–711.
- Clanton TO. Athletic injuries to the soft tissues of the foot and ankle. *Surgery of the foot and ankle.* 7th ed. St Louis: Mosby; 1999:1101-1106.
- Broström L. Sprained ankles. VI. Surgical treatment of "chronic" ligament ruptures. *Acta Chir Scand.* 1966 Nov;132(5):551-65.
- Gould N, Seligson D, Gassman J. Early and late repair of lateral ligament of the ankle. *Foot Ankle.* 1980 Sep;1(2):84-9.
- Wolfe MW, Uhl TL, Mattacola CG, McCluskey LC. Management of ankle sprains. *Am Fam Physician*2001;63:93-104.
- Seah R, Mani-Babu S. Managing ankle sprains in primary care: what is best practice? A systematic review of the last 10 years of evidence. *Br Med Bull* 2011;97:105-135.
- Lamb SE, Marsh JL, Hutton JL, Nakash R, Cooke MW; Collaborative Ankle Support Trial (CAST Group). Mechanical supports for acute, severe ankle sprain: a pragmatic, multicentre, randomised controlled trial. *Lancet* 2009;373:575-581
- Refshauge KM, Raymond J, Kilbreath SL, Pengel L, Heijnen I. The effect of ankle taping on detection of inversion-eversion movements in participants with recurrent ankle sprain. *Am J Sports Med*2009;37:371-375.
- Omar A. Al-Mohrej ,Nader S. Al-Kenani. Acute ankle sprain: conservative or surgical approach? 2016 Feb 29. doi: 10.1302/2058-5241.1.000010
- Chaudhry H, Simunovic N, Petrison B. Cochrane in CORR ®: surgical versus conservative treatment for acute injuries of the lateral ligament complex of the ankle in adults (review). *Clin Orthop Relat Res*2015;473:17-22.
- Knupp M1, Lang TH2, Zwicky L2, Löttscher P2, Hintermann B2. Chronic Ankle Instability (Medial and Lateral). *Clin Sports Med.* 2015 Oct;34(4):679-88.
- Omori G, Kawakami K, Sakamoto M, Hara T, Koga Y. The effect of an ankle brace on the 3-dimensional kinematics and tibio-talar contact condition for lateral ankle sprains. *Knee Surg Sports Traumatol Arthrosc.* 2004 Sep;12(5):457–462.
- Hintermann B, Boss A, Schafer D. Arthroscopic findings in patients with chronic ankle instability. *The American journal of sports medicine.* 2002 May-Jun;30(3):402–409
- Bischof JE, Spritzer CE, Caputo AM, Easley ME, DeOrto JK, Nunley JA, 2nd, DeFrate LE. In vivo cartilage contact strains in patients with lateral ankle instability. *Journal of biomechanics.* 2010 Sep 17;43(13):2561–2566.
- Caputo AM, Lee JY, Spritzer CE, Easley ME, DeOrto JK, Nunley JA, 2nd, DeFrate LE. In vivo kinematics of the tibiotalar joint after lateral ankle instability. *The American journal of sports medicine.* 2009 Nov;37(11):2241–2248.

20. Ng ZD, Das De S. Modified Brostrom-Evans-Gould technique for recurrent lateral ankle ligament instability. *Journal of orthopaedic surgery*. 2007 Dec;15(3):306–310.
21. Prisk VR, Imhauser CW, O'Loughlin PF, Kennedy JG. Lateral ligament repair and reconstruction restore neither contact mechanics of the ankle joint nor motion patterns of the hindfoot. *J Bone Joint Surg Am*. 2010 Oct 20;92(14):2375–2386.
22. Roos EM, Brandsson S, Karlsson J. *Foot & Ankle Int* 2001; 22(10):788-794.