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Original Article

Lateral ankle stabilization with a polyester fiber construct implant as a revision for failed primary lateral ligament reconstruction

Luis Felipe Hermida Galindo[1], Elias Hermida Ochoa[2], Armando Torres Gomez[3]

1. Centro Medico ABC, Campus Santa Fe, Mexico City, Mexico.
2. Hospital de Ortopedia para Niños Germán Diaz Lombardo, Mexico City, Mexico.
3. Centro Medico ABC, Campus Observatorio, Mexico City, Mexico.

Abstract

Objective: The aim of this study is to demonstrate an original technique in which a stable construct is made by fibular and calcaneal bone tunnels producing a figure of 8 with a Polyester implant as revision for failed primary ligament reconstruction.

Methods: This is a retrospective study of 19 patients with persistent lateral ankle instability diagnosis after a primary ligament repair treated between 2011 and 2019. The surgical technique is described in detail in which stabilization of the lateral ankle is performed. 11 men and 8 women with a mean age of 30.94 years (15-53). Follow up was 29.05 months (6-109). Pre and postoperative AOFAS ankle score were used as well as an AVS and a satisfaction questionnaire.

Results: There was a significant improvement in AOFAS score, 76.31 to 91.47 (<0.001). All the patients except one, stated to have a stable ankle and be Very satisfied (16) or satisfied (2) with the procedure. No infection was presented in any patient.

Conclusion: This technique is a reliable alternative in patients in which primary ankle ligaments have failed and no autograft or allograft are wanted to be used.

Level of Evidence V; Therapeutic Study; Expert Opinion.

Keywords: Lateral ligament, ankle/surgery; Lateral ligament, ankle/injuries; Ankle injuries/complications; Joint instability/surgery; Reoperation.

Introduction

Currently, most of the lateral ankle instabilities are treated with an anatomical Broström procedure described in 1966[1] and with all the modifications and augmentations developed since then either open or arthroscopic.

Good to excellent results have been published for this techniques as primary reconstruction of the ankle lateral ligaments[2,3] and no study has proved superiority in between open or arthroscopic conduct, both of them having excellent results[4].

Factors leading to failure of this primary repair include a brand-new trauma, hindfoot varus and also overuse associated with microtrauma and final failure. Also hyperlaxity is considered an important topic for this situation[5].

In this article, we will describe a Surgical Technique in which we produce bone tunnels on the fibula and calcaneus in order to do a construct to stabilize the lateral ankle of 19 patients with a Polyester implant.

Methods

This is a demonstration of the surgical technique and a retrospective study of 19 patients with history of ankle instability that previously had a lateral ankle ligament reconstruction and persisted with such instability that were operated with this technique from January 2011 to January 2019.

None of the patients on this study were professional athletes.

Study performed at the Centro Médico ABC, Campus Santa Fé, Santa Fe, Mexico City, Mexico.

Correspondence: Luis Felipe Hermida Galindo. 154 Carlos Graef Fernandez Av., Mexico City, Mexico, Zip Code: 05330. **E-mail:** drlfhermida@hotmail.com.
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Exclusion criteria: patients with an advanced ankle arthrosis with limited ankle range of motion.

The failure of the primary surgery was determined as follows:

1. Patients claiming to have instability as or near as before the first surgery and not having a reliable ankle for everyday and recreational activities;
2. Physical exam with clinical instability sings (anterior drawer and talar tilt);
3. Evident Positive Ap X rays with stress.

Measurements tools:

1. All of the patients were asked to answer AOFAS Ankle score Pre and Postoperatively as well as Visual Analog Scale (VAS);
2. Satisfactory questionnaire (ranging from Very satisfied – Satisfied - Not so satisfied - Unsatisfied).

42.1% were female [8] and 57.8% were male [11], the age average was 30.9 years old [15-53] at the moment of the revision surgery.

The procedures that the patients had as first intervention were: classical Broström [15], Broström augmented with fiber tape [1], Evans procedure [2] and cadaveric graft [1].

Follow up was of 29.05 months (6-109) in which the AOFAS scale was filled and physical exam was made looking for clinical instability and stress X rays.

Surgical technique

With the patient in prone position, sedation and popliteal block on the affected limb are completed. Also, a thigh tourniquet was applied.

An incision is made starting 2cms above the tip of the fibula on the center of it down to the sinus tarsi until 1cm of the anterior calcaneus process is seen.

When there was a procedure different than classic Broström, the tissue or implant (native Peroneal brevis, tendon graft or fiber tape) was removed.

A bone tunnel with a 3.5mm drill is done 1.0 to 1.5cms above de tip of the fibula from anterior to posterior in a horizontal line (Figure 1), care is taken to protect peroneal tendons. Then, dissection is carried down passing the sinus tarsi to the anterior aspect of the subtalar joint and the calcaneus is exposed in a way we can see the dorsal anterior tuberosity without exposing the calcaneocuboid joint (CC joint).

The second tunnel is produced on the most posterior aspect of the anterior tuberosity just anterior to the subtalar joint which must be protected at all the time.

5 to 7mm below the upper border of the tuberosity perpendicular to the lateral wall and a second perforation is done with the drill in a vertical position from dorsal to plantar in line with the first tunnel, this begins 1 or 2mm medial to the upper border of the calcaneus (Figure 2).

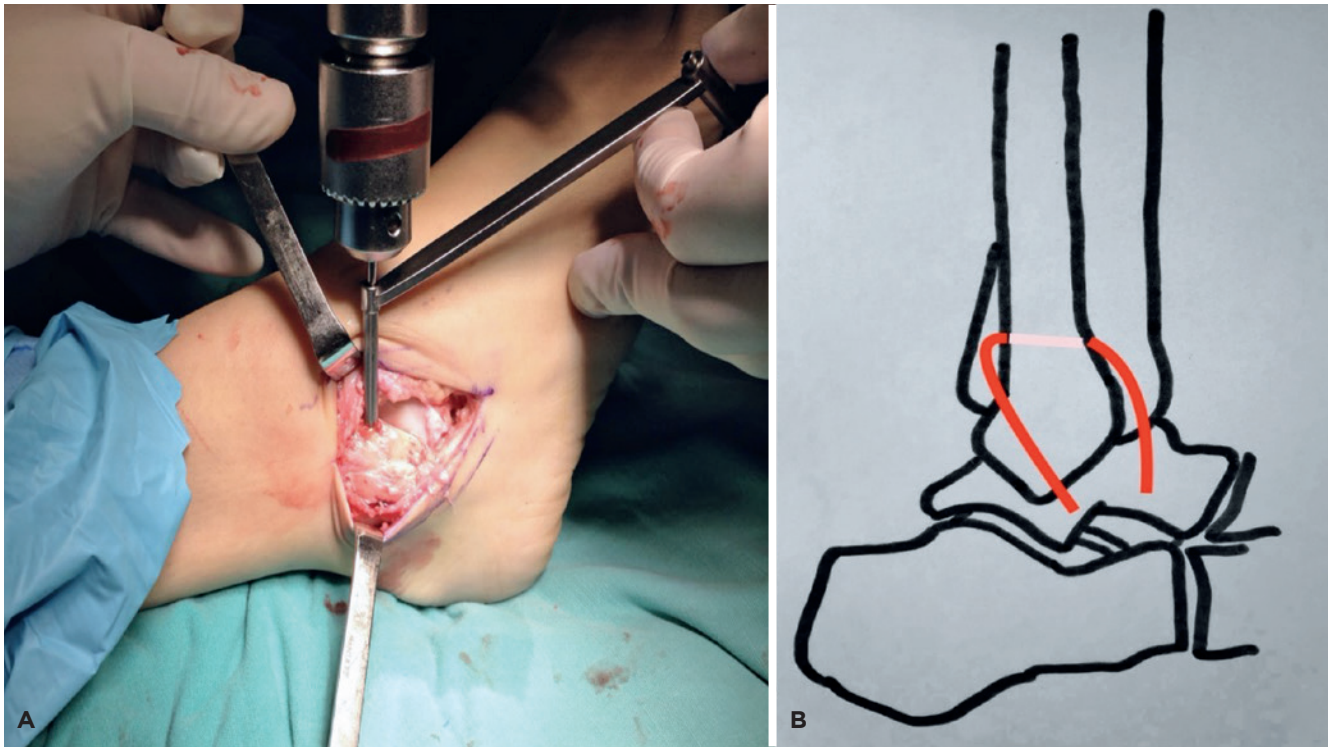

Figure 1. A. Fibular tunnel. B. The Implant is passed through fibular tunnel.

Then we use a ligament prosthesis manufactured out of polyester yarn in the form of bands with lateral edges rolled inside with a 3mm of width.

So, this "new ligament" is passed through the tunnels in a figure of 8 as show in Figure 3.

Just before tightening the knot, the ankle is placed in neutral position with no valgus or varus at all. Then we do 2 simple knots and use cyanoacrylate glue to fuse it.

Before closing the wound, remaining tissue around the anterior fibula is closed, we never used anchors at this stage. In most of the cases the Anterior talo-fibular ligament (ATFL) is not touched and just let it in place as it was.

We close the wound deep and superficial with absorbable suture and skin with non-absorbable.

A suropodalic splint is left for 2 weeks with non-weight bearing and then the patient can walk with a boot for 3 weeks

Figure 2. A and B. Calcaneal tunnel. C. Second tunnel passing.

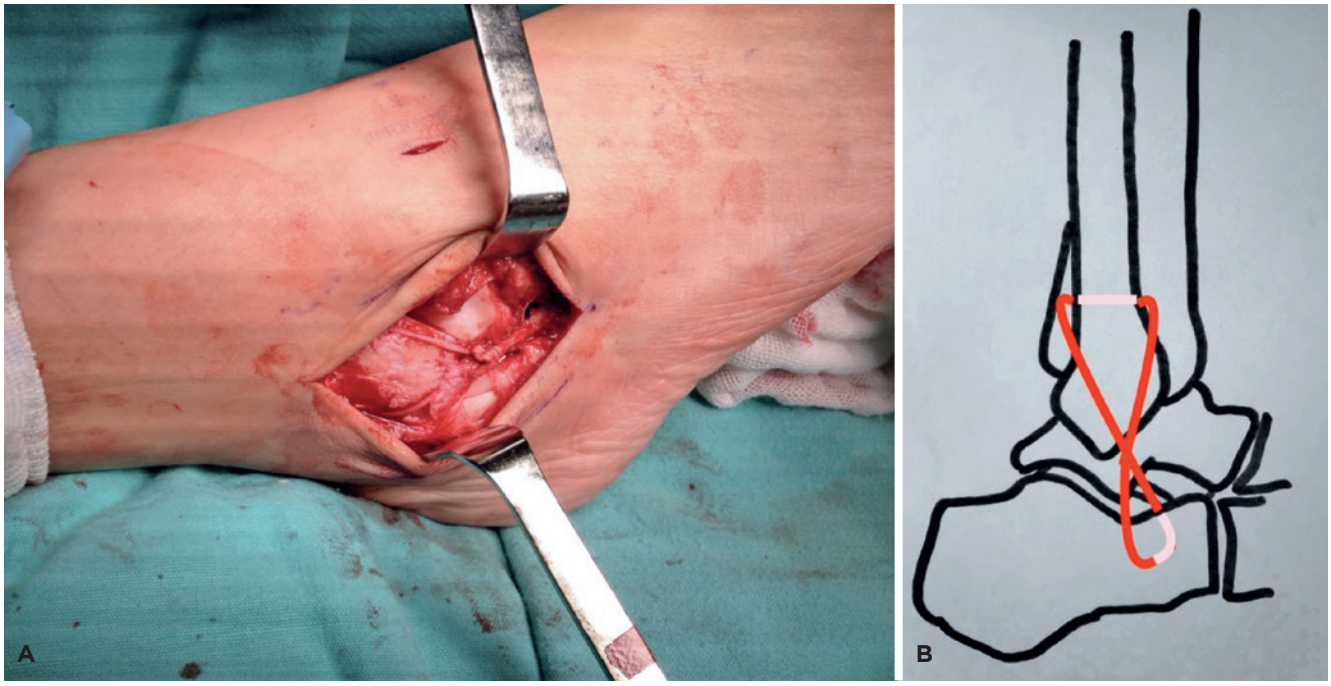

Figure 3. A. Figure of 8 with Polyester implant. B. Final result with a figure of 8 and a double knot.

so at 5 weeks postoperative he or she can walk with no orthopedic device.

Sutures are removed at 3 weeks postoperative and physical therapy is started at 6 weeks.

Results

AOFAS Ankle Score improved from pre-op 76.31 to 91.47 and this was statistically significant (<0.001) (Table 1, 2 and Figure 4).

Table 1. AOFAS pre and postoperative

Patient	AOFAS pre	AOFAS postoperative
1	82	100
2	63	87
3	82	100
4	79	90
5	79	100
6	79	90
7	79	95
8	79	100
9	63	100
10	63	95
11	82	95
12	82	95
13	82	90
14	82	90
15	82	90
16	72	90
17	61	64
18	64	82
19	62	85
TOTAL	**76.31**	**91.47**

Table 2. Change in AOFAS

Variable	Preoperative	Postoperative	Change	p*
AOFAS	79 (18.5, 61-82)	90 (7.5, 64-100)	11	<0.001

Values are: Median (IQR, min – max). *Wilcoxon signed rank test.

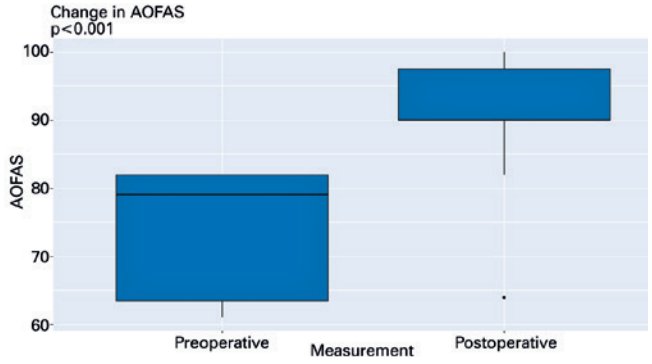

Figure 4. Change in AOFAS.

Patients were followed for an average of 60.15 months (96 to 12) and were asked to fill the AOFAS scale on the final follow up (January 2020).

AVS was 4.3 preop and 0.5 postoperative, this could be explained because pain was not the main symptom on this group of patients but was improved as well anyway.

Also, X rays with varus stress were taken postoperative to compare with the initial one, in all patients there was an evident difference on the talar tilt.

Clinically there was a very stable ankle on the physical exam and patients expressed security during uneven surfaces as well as stability during recreational sports and long-distance walking.

Regarding satisfaction questionnaire we had 16/19 very satisfied patients, 2/19 Satisfied and 1 unsatisfied.

Concomitant procedures were: 9 ankle arthroscopies of which 4 had microfractures done.

Complications included: wound delayed healing in 2 cases that finally healed in 8 weeks with no infection. Scar hypersensitivity was present for 3 months in 5 of the 19 patients that eventually disappeared.

1 patient had a rupture of the implant at 18 months of surgery that required a second revision where we could document the implant rupture at the level of the calcaneal tunnel. Her very first surgery was a Broström with Fiber tape, she also had poor bone quality due to intense smoking habit and severe peroneal brevis tendon weakness which we think it led to a more sever instability, an Evans Procedure was done in this case with a mediocre outcome.

Disscusion

The kind of construct used in this article is an original idea but is clearly influenced by the Chrisman Snook/Watson Jones fashion[6,7].

Non anatomic procedures like this tend to be discarded because of over tightening subtalar motion[5]. In none of our patients at the time for follow up, we had this kind of claim, in the other way they confirmed to have a very stable ankle and no ankle joint deterioration was seen in x rays.

Also, it is important to report that in 6 patients of this group, there was an intraoperative gross subtalar instability that could be the cause of the persistent instability sensation and this was clearly improved postoperative.

Regarding this topic, there are publications that believe that the sinus tarsi is a very important proprioceptive zone, due to sinus tarsi biopsy, Morsy and Filler[8] found that histological examination revealed the presence of large amount of neural elements (mechanoreceptors) together with abundant elastic fibers in all of the excised subtalar tissues.

Cho et al.[9] have done revision of failed Broström with a new augmented Broström with a fiber tape with very good results having only one failed case after this second surgery requiring a 3rd surgery where they used an allograft.

This numbers are very similar to the ones of this study in which we only had 1 patient failing due to implant rupture.

It is recommended to do non anatomic surgery (allograft or autograft) in a previously failed anatomic reconstruction because it is a poor prognosis to repeat it.

We think that not using patient´s healthy tissue like a peroneal, plantaris tendons, etc., or using cadaveric graft is an advantage because of the morbidity associated with it.

There was never a biological reaction to the implant or deep infection that required medical or surgical treatment.

The limitations of the study are a not very large patient population and despite the good results we don't really know what happens in a biological level with the implant and its bio-integration to bone.

Having a failed Broström procedure should always make us think about a new and more aggressive surgical act, allograft or autografts are very accepted conducts with very good results[5], but not free of donor site morbidity and possible immunological reaction or deep infection.

Conclusion

The present technique is an alternative for the revision surgery for lateral ankle stabilization due to strong construct, no biological reaction.

Authors' contributions: Each author contributed individually and significantly to the development of this article: LFHG *(https://orcid.org/0000-0001-9016-6167) conceived and planned the activities that led to the study, performed the surgeries, clinical examination, data collection, bibliographic review and approved the final version; EHO *(https://orcid.org/0000-0002-1637-8134) conceived the technique used in this study, clinical examination, interpreted the results of the study and approved the final version; ATG *(https://orcid.org/0000-0003-2441-0904) interpreted the results of the study, participated in the review process, statistical analysis and approved the final version. *ORCID (Open Researcher and Contributor ID).

References

1. Broström L. Sprained ankles. VI. Surgical treatment of chronic ligament ruptures. Acta Chir Scand. 1966;132(5):551-65.
2. Gómez-Carlín LA, Ramírez-Gómez VJ, Torres-Ortega AE, Contreras-Navarro AM, Ortega-Orozco R. Clinical and functional results of the Broström-Gould technique for lateral ankle instability: evaluation with three scales. Acta Ortop Mex. 2018;32(2):93-7.
3. Ramírez-Gómez VJ, Gómez-Carlín LA, Ortega-Orozco R, Zazueta-Arnaud CA, Patiño-Fernández JP. Clinical and functional results of Broström-Gould procedure with suture tape augmentation: an evaluation using three scales. J Foot Ankle Surg. 2020 Mar 31.
4. Guelfi M, Zamperetti M, Pantalone A, Usuelli FG, Salini V, Oliva XM. Open and arthroscopic lateral ligament repair for treatment of chronic ankle instability: a systematic review. Foot Ankle Surg. 2018;24(1):11-18.
5. O'Neil JT, Guyton GP. Revision of surgical lateral ankle ligament stabilization. Foot Ankle Clin. 2018;23(4):605-24.
6. Chrisman OD, Snook GA. Reconstruction of lateral ligament tears of the ankle. An experimental study and clinical evaluation of seven patients treated by a new modification of the Elmslie procedure. J Bone Joint Surg Am. 1969;51(5):904-12.
7. Snook GA, Chrisman OD, Wilson TC. Long-term results of the Chrisman-Snook operation for reconstruction of the lateral ligaments of the ankle. J Bone Joint Surg Am. 1985;67(1):1-7.
8. Morsy MG, Filler TJ. Sinus tarsi: a proprioceptive organ? Egypt Orthop J. 2017;52(4): 278-81.
9. Cho BK, Kim YM, Choi SM, Park HW, SooHoo NF. Revision anatomical reconstruction of the lateral ligaments of the ankle augmented with suture tape for patients with a failed Broström procedure**.** Bone Joint J. 2017;99(9):1183-9.