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Hemi-Castaing Ligamentoplasty for Chronic Lateral Ankle Instability: A Retrospective Series of 10 Cases

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Abstract **Case Series**

***Introduction*:** Chronic lateral ankle instability is a frequent complication of poorly managed sprains, accounting for up to 30% of cases. When functional treatment fails, surgical management is indicated. Hemi-Castaing ligamentoplasty using short brevis is an extra-anatomical technique that is frequently used, particularly in France, due to its technical simplicity and reliable results. ***Objective*:** To evaluate the clinical and functional results of the Hémicastaing technique in the treatment of chronic lateral ankle instability. ***Methods*:** This was a single-centre retrospective study conducted in Trauma Department Orthopaedics A, enrolling 10 patients operated on between January 2018 and December 2022. Inclusion criteria included lateral instability documented clinically and by imaging, resistant to well-conducted functional management. The mean follow-up was 18 months. Assessment was based on the AOFAS, Karlsson and Tegner scores. All patients underwent standardised surgical and rehabilitation protocol. ***Results*:** Functional scores improved significantly after surgery, with high overall satisfaction. The average AOFAS score rose from 58 to 89 points, and the Karlsson score from 52 to 88 points. 8 out of 10 patients were able to return to sport an average of 4.5 months after the operation. No recurrence of instability was observed. The post-operative course was uneventful, with only one minor complication (transient algodystrophy). Eversion of the foot and muscle function were preserved. ***Conclusion*:** Hemi-Castaing ligamentoplasty is a reliable surgical option for chronic lateral ankle instability, with good functional results, a low complication rate and a satisfactory return to sport. These results confirm the data in the literature, despite a small number of patients.

Keywords: Chronic lateral ankle instability, Hemi-Castaing ligamentoplasty, Surgical management, Functional outcomes, Return to sport.

INTRODUCTION

Chronic lateral ankle instability is a frequent outcome of poorly managed acute sprains, accounting for 10-30% of functional sequelae [1]. It is manifested by disabling discomfort, a sensation of the joint giving way and a limitation especially during sport activities. If well-managed functional treatment fails, surgery is required. Among the options available, ligamentoplasty using the fibularis brevis tendon according to the technique described by Hemi-Castaing (adaptation of Castaing's technique) is widely used in France [6]. Its technical simplicity, reproducibility and convincing functional results make it the surgical solution of choice in recurrent or complex forms.

PATIENTS AND METHODS

This was a single-centre retrospective study conducted at the Orthopaedic Trauma Department A on 10 patients operated on between January 2018 and December 2022 for chronic lateral ankle instability refractory to functional treatment. Inclusion criteria included persistent instability documented clinically and by MRI, failure of conservative treatment for more than 6 months, and post-operative follow-up of more than 12 months. Exclusion criterias included medial instability, ankle osteoarthritis, and neurological disorders. Pre- and post-operative evaluation was performed using the AOFAS (American Orthopaedic Foot and Ankle Society) (Table 1), Karlsson (Table 2) and Tegner (Table 3) scores. A standardised rehabilitation protocol was applied to all patients.

Table 1: AOFAS (American Orthopaedic Foot and Ankle Society) score (1)

Components	Description	Points Range	Interpretation
Pain	Evaluates the intensity of pain during daily activities.	0 to 40 points	The higher the score, the less pain.
Function	Evaluates the ability to walk, daily function, and general mobility.	0 to 50 points	A high score indicates better function.
Alignment	Measures the alignment of the ankle.	0 to 10 points	A high score indicates good alignment.
Flexibility	Evaluates the joint mobility of the ankle, particularly dorsiflexion.	0 to 10 points	The higher the score, the better the mobility.
Stability	Evaluates the lateral and anterior stability of the ankle.	0 to 10 points	A high score indicates a stable ankle.

Interpretation:

- 85 to 100 : Excellent to good results
- 70 to 84: average results
- < 70: Insufficient results

Table 2: Karlsson score (2)

Components	Description	Point Range	Interpretation
Pain	Evaluates the intensity of pain during daily and sports activities.	0 to 30 points	The higher the score, the less pain.
Function	Evaluates the general function of the ankle, the ability to perform functional movements.	0 to 30 points	A high score indicates better function.
Stability	Assesses the stability of the ankle, particularly after sports activities or during dynamic movements.	0 to 30 points	A high score indicates better stability.
Return to Sports Activities	Evaluates the return to physical and sports activities after surgery.	0 to 10 points	A high score indicates a good return to sports.

Total Karlsson: 0 to 100 points

Interpretation:

- 85 to 100: Excellent to good results
- 70 to 84: average results
- < 70: Insufficient results

Table 3: Tegner score (15)

Components	Description	Point Range	Interpretation
Physical Activity Level	Measures the intensity of physical activities before and after surgery, ranging from no activity to a high-level athlete.	0 to 10 points	A high score indicates a high level of activity (competitions, intense sports).
Activities Corresponding to the Score	0: No activity, 1-3: Daily activities and walking, 4-6: Recreational sports (low-intensity running), 7-10: Competitive sports (football, basketball, etc.)	0 to 10 points	The higher the score, the more intense the sports activity.

Interpretation:

- 0 to 3: Low or moderate level of activity (daily activities, walking)
- 4 to 6: Medium level of activity (recreational sports)
- 7 to 10: High level of activity (intense sports, competitions)

RESULTS

1. Patient characteristics:

The study included 10 patients operated on for chronic lateral ankle instability. Of these patients, 6 were men and 4 were women, with a mean age of 28.5 years (range:21 to 41 years). The patients were mainly young adults who played contact or endurance sports before the onset of instability symptoms. Football (4 patients) and basketball (2 patients) were the most common sports, followed by running (2 patients), handball, dancing, and hiking. All patients were evaluated for chronic instability documented by clinical signs (Figure 1) and MRI, with a duration of instability greater than 12 months despite adequate conservative treatment.

Figure 1: Clinical assessment of lateral ligament laxity

2. Preoperative functional scores:

- + AOFAS score: The mean preoperative score was 58 ± 2.3 (range: 54 to 62), reflecting limited function of the ankle, with significant difficulty in walking and practising sports.
- + Karlsson score: The mean score before surgery was 52 ± 2.6 (range: 50 to 55), indicating moderate to severe functional impairment, with limitations in daily activities and sports.
- + Tegnér score: The mean preoperative score was 3.4, corresponding to significant restriction of sporting activity.

3. Surgical details:

All patients underwent ligamentoplasty using the Hemi Castaing technique. The average operating time was 75 ± 10 minutes (range: 60 to 90 minutes), with longitudinal incisions of 5 to 6 cm behind the lateral malleolus (Figure 2). The procedure was performed under spinal or general anaesthesia, in the supine position, with a pneumatic tourniquet. Dissection of the fibularis brevis allowed hemisection of the tendon without compromising its function (Figure 3). The anterior strand was passed through an anteroposterior horizontal bone tunnel (Figure 4), and fixed on itself with gentle tension to correct lateral laxitý of the ankle (Figure 5). This was followed by layered closure of the subcutaneous and skin planes. Closure was followed by immobilisation in a plaster cast boot for 4 weeks.

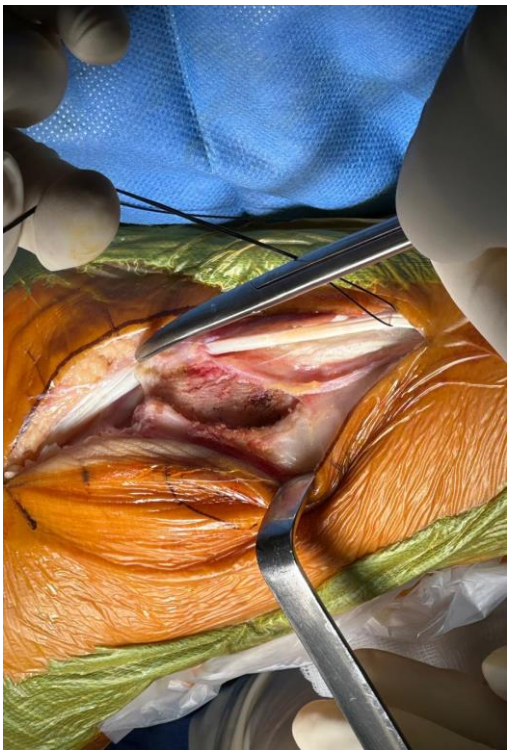

Figure 2: skin incision and location of the fibularis brevis tendon

Figure 3: Proximal dissection with harvesting of the hemitendon of the short fibula

Figure 4: Progression of the fibularis brevis graft through the lateral malleolar tunnel

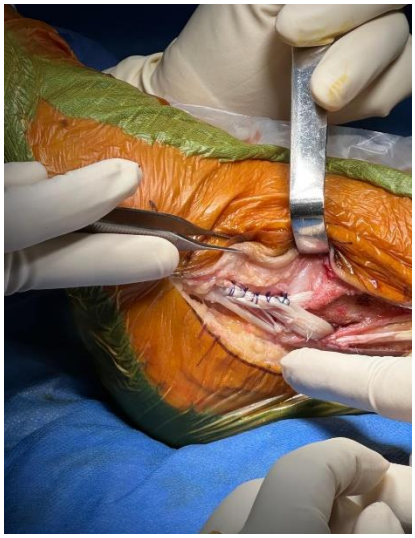

Figure 5: Suturing the transplant

4. Post-operative evaluation and functional results:

Postoperative results were assessed after an average follow-up period of 18 months (range:12 to 24 months). Post-operative functional scores showed significant improvements:

- AOFAS score : The mean score increased to 89 ± 3.5 (range : 85 to 92), representing a 31-point improvement over the pre-operative score ($p < 0.01$). This improvement is indicative of a restoration of ankle function, with a return to functional, pain-free walking.

- Karlsson score : The mean post-operative score was 88 ± 4.1 (range : 84 to 90), representing a significant and lasting functional improvement.

- Tegner score : The mean postoperative score rose to a mean 6.2 (range : 6 to 7), reflecting a return to normal or close to pre-pathology level sports activities.

5. Resumption of physical activity and sport:

Resumption of sports activities was possible in 8 out of 10 cases, with an average delay of 4.5 months for light sports activity. Full return to sport took place between 4 and 5 months post-operatively, with a return to activity levels comparable to those observed before the onset of instability. Two patients were unable to return to their sport, which was related to the nature of their activity and individual factors, in particular persistent complaints unrelated to the instability.

6. Post-operative complications:

One post-operative complication was observed in two cases: transient algodystrophy, which was successfully treated with medical therapy and specific rehabilitation. No major complications, such as infection, thrombosis, nerve damage or recurrence of instability, were reported. These results are consistent with those observed in the literature, where the Hemicastaing technique is generally well tolerated, with a low rate of complications.

7. Patient satisfaction:

Patient satisfaction was high overall, with 80% of patients declaring themselves satisfied or very satisfied with the outcome of the procedure. No patients expressed major regrets, and most reported a significant improvement in their quality of life, with a rapid return to sporting and daily activities.

8. Long-term stability:

Clinical and radiological assessment after an average follow-up of 18 months revealed no deterioration in functional stability. All patients maintained comparable function between the two ankles, with satisfactory eversion and similar muscle strength between the limbs.

Table 4: Results of pre- and post-operative functional scores

Patient	AOFAS pre-op	AOFAS post-op	Karlsson pre-op	Karlsson post-op	Tegner pre-op	Tegner post-op	Return to sports
1	60	92	54	90	3	6	Oui
2	55	88	50	85	3	6	Oui
3	58	86	52	84	3	6	Oui
4	62	91	55	89	4	7	Oui
5	56	85	50	82	2	5	Non
6	60	90	54	88	4	7	Oui
7	59	87	53	86	3	6	Oui
8	55	84	51	80	3	6	Non
9	60	89	52	87	4	6	Oui
10	57	87	51	85			

DISCUSSION

The Castaing technique, which uses the fibularis brevis tendon, is widely used in France to treat chronic lateral ankle instability. In a retrospective study of 52 patients, the mean Karlsson score was 84, and the mean Molander and Olerud functional score was 83.7 points. These results are comparable to those reported in the literature, where Dubranne found a mean functional score of 85.5 points [1].

Pain persisted in 26.9% of cases, mainly during sports, which is lower than the rates of 37% to 58.7% reported in other series [1-3]. Residual instability was observed in 23% of patients, slightly higher than the 9-20% reported in the literature [1,3,4]. This difference could be due to a less tight plasty to preserve subtalar mobility, in accordance with the teachings of Pascoët [5].

Return to sport at the same level was equivalent to that observed with anatomical techniques [1, 6, 9]. Stiffness of the subtalar joint, often attributed to ligamentoplasty, did not appear to be a factor limiting return to sport. The reduction in the tibiotalar angle from 10.9° to 3.4° after surgery suggests effective correction of laxity [10].

Regarding the morbidity of harvesting the fibularis brevis, 33 out of 40 patients had an eversion estimated at 5/5, indicating comparable strength to the opposite side. An isokinetic study conducted by

Colombet et al. after Chrisman-Snook plasty showed no significant difference with the unoperated ankle [12].

Anatomical repair according to Broström, often modified by Gould, is considered the gold standard for chronic ankle instability. In a study of 89 procedures, the mean AOFAS score increased from 70 to 90 points, and the Karlsson score from 62 to 90 points, after a mean follow-up of 29 months [5]. The complication rate was 11%, with resumption of professional activity at 3.7 months and sporting activity at 4.8 months.

Another multicentre study of 286 patients showed a significant improvement in AOFAS and Karlsson scores, from 62.1 and 55 respectively preoperatively to 89.2 and 87.1 postoperatively. Overall patient satisfaction was 8.5/10, with a rate of neurological complications of 10% and skin or infectious complications of 4.2% [2].

The Hemi-Castaing technique, using the hemitendon of the fibularis brevis, showed a significant improvement in stability, radiological frontal laxity and functional activity. In a series of 32 patients, the mean functional score increased from 59 preoperatively to 90 postoperatively, with 90% of patients returning to their previous sport at the same level [6].

The Chrisman-Snook technique, using half of the fibularis brevis to reconstruct the anterior talofibular and calcaneofibular ligaments, effectively controls the anterior drawer and lateral talocrural yaw. However, it limits the mobility of the subtalar joint [4].

The Watson-Jones procedure, aimed at limiting internal rotation and subluxation, has shown good to excellent results in 88% of cases after a 13-year follow-up [4].

Arthroscopic techniques, such as arthroscopic Broström-Gould repair, offer comparable results to open techniques. They allow a complete assessment of ligament injuries and treatment of associated injuries. Skin complications are at least half as frequent as with open techniques [2].

One study showed that the arthroscopic Broström-Gould procedure improved clinical scores with a complication rate comparable to open techniques. The revision surgery rate was 1.1% [5].

The use of tendon allografts in the treatment of chronic ankle instability has not shown any significant benefit over techniques using autografts. In a study comparing the Broström technique with ligamentoplasty using a tendon allograft, there was no significant difference in functional or radiological scores. Postoperative complications were similar in both groups.

The results of our study confirm the satisfactory performance of the Hémicastaing technique in the treatment of chronic lateral ankle instability. This extra-anatomical technique has several key advantages, including ease of exécution, reproducibility and preservation of muscular integrity. The use of the hemitendon of the fibular brevis allows good post-operative muscle strength to be preserved, as demonstrated in our series with complete recovery of eversion.

Moreover, the low morbidity associated with tendon harvesting, the absence of recurrent instability, and the rapid return to physical activity—on average at 4.5 months—highlight the relevance of this surgical option. Compared to anatomical or arthroscopic techniques, the Hemi-Castaing procedure remains a valid approach, particularly in severe forms or in patients with high functional demands, due to its durable stability and the very low complication rate observed in our series.

Conclusion

Ligament reconstruction using the Hemi-Castaing technique represents a reliable, effective, and minimally invasive surgical option for managing chronic lateral ankle instability. In our series, it led to a significant improvement in functional scores, a rapid return to sports, and no recurrence of instability at mid-term follow-up. Its favorable safety profile, preservation of muscle function, and technical simplicity make it a credible alternative to conventional anatomical techniques, especially in complex or recurrent cases. Although our study is limited by a small sample size, the outcomes are consistent with existing literature and support the use of this technique in routine clinical practice.

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