

## Place of the Hemi-Castaing Technique in the Surgical Treatment of Chronic Ankle Instability: About 24 Cases

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### Abstract

### Original Research Article

Chronic ankle instability is one possible course in the natural history of acute ankle sprain. It represents 10% to 30% of sprain sequelae. Surgical treatment is reserved for patients with persistent ankle instability after rehabilitation causing disabling discomfort. The technique of ligamentoplasty using the peroneus brevis according to Castaing is the most popular in Morocco. The simplicity of the gesture and its good results encouraged us to pursue this path. This is a retrospective study of 24 patients who underwent fibular brevis ligamentoplasty according to Castaing between January 2017 and June 2020. The minimum follow-up was one year. The evaluation of the patients was based on the Karlson score and the "Ankle score" Molander and Olerud. Patients are satisfied or very satisfied with the intervention in 80% of cases reviewed. The functional results of our patients are comparable to those published in the literature. Removal of the peroneus brevis transplant does not seem to have any impact on ankle stability. Patients maintain satisfactory foot eversion with comparable force to the opposite side. The evolution of osteoarthritis of the ankle does not seem significant after this surgery. The weak point of our study is the number of patients lost to follow-up, this is linked to the youth of the operated population and to the recruitment of the nationwide service.

**Keywords:** Ankle-Hemi Castaing-Instability-Pain-Chronic.

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## INTRODUCTION

Ankle instability is one of the serious sequelae of severe ankle sprain (lateral in 61% of cases) when the initial therapeutic management has not been well conducted.

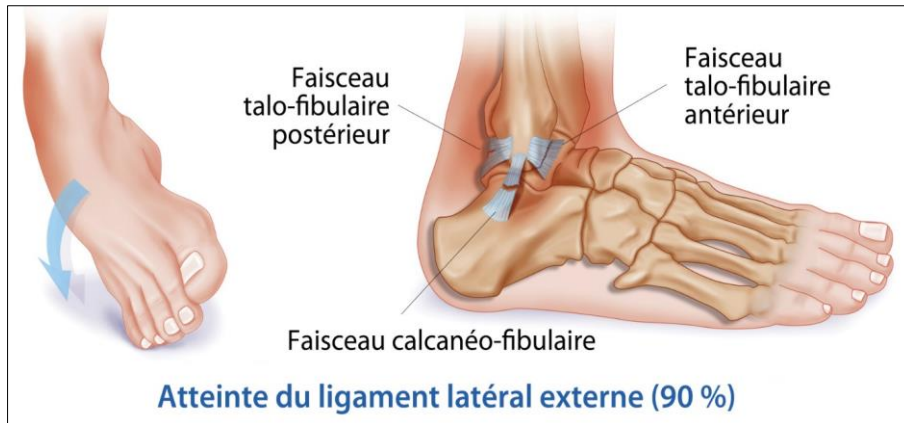
It mainly affects young female adults, sport is the main risk factor, followed by poor footwear (excessive heels).

In the anamnesis, there is an antecedent of ankle sprain, associated with recurrent feelings of "dropping out", apprehension or recurrence of sprains.

Residual swelling at the site of the sprain, palpation reveals abnormal sensitivity at the level of the ligament concerned (generally the anterior bundle of the fibular collateral ligament), proprioceptive insufficiency, deficient muscle testing of the extrinsic muscles (anterior and posterior tibialis, fibular, LFH).

The diagnosis is essentially clinical confirmed by ultrasound, scanner or MRI.

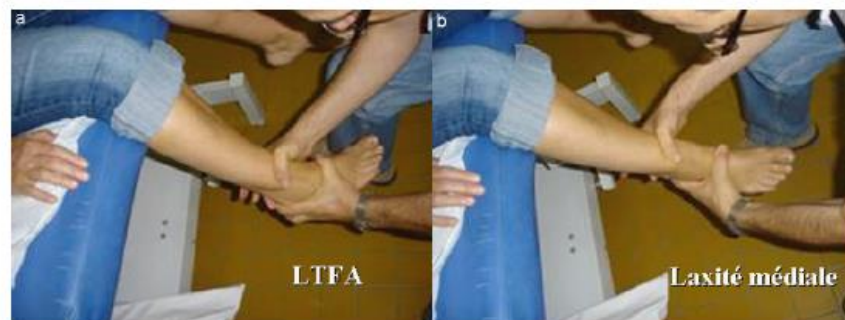
The initial treatment is based on functional reeducation with medical treatment associated with surgical treatment in the event of failure.



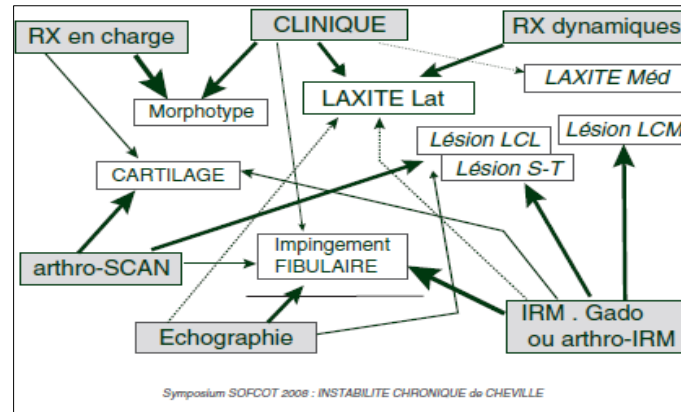
**Figure 1** Évaluation de la mobilité en varus de l'arrière-pied en décubitus ventral.



**Figure 2** Recherche de la laxité en varus. a : testing de l'étage talo-crural ; b : testing de l'étage subtalaire.



**Figure 3** Recherche du tiroir antérieur genou fléchi. a : pied en rotation médiale : testant le ligament talo-fibulaire antérieur ; b : pied en rotation latérale : testant le compartiment médial.



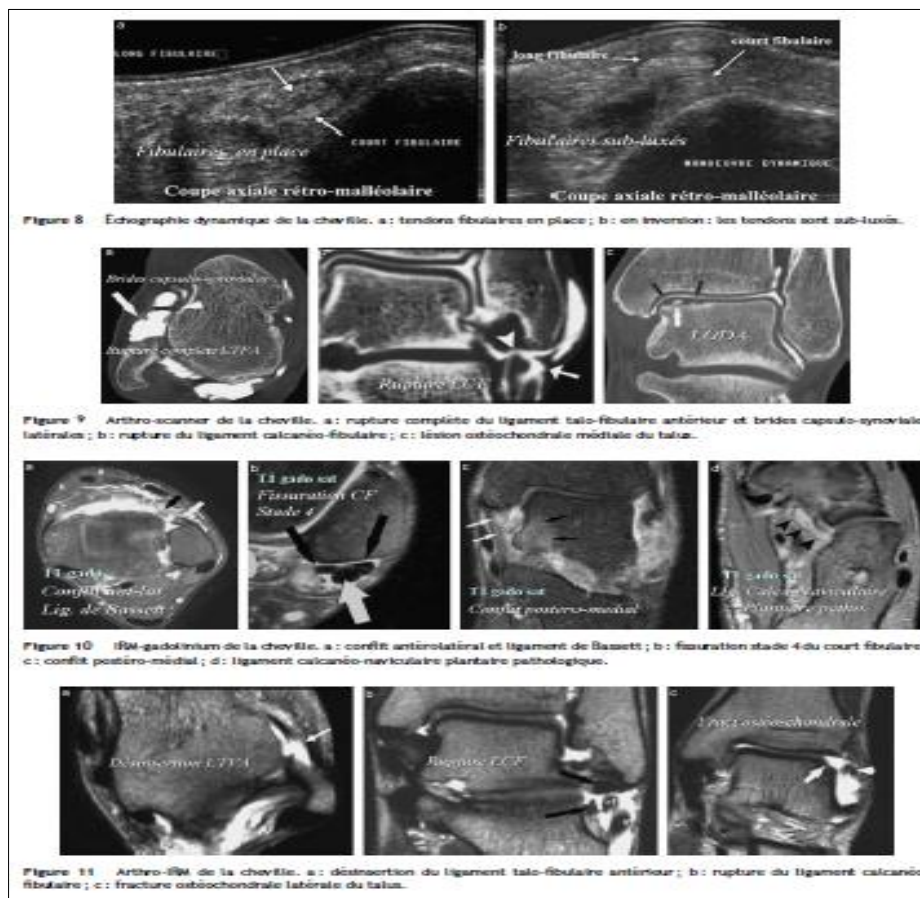
## MATERIEL AND METHODS

This is a retrospective study of 24 cases of chronic ankle instability collected in the Traumatology-Orthopedics Department of the Ibn Sina Hospital in Rabat over a period from January 2017 to June 2020. Our study includes 20 women and 04 men; 83% of patients are young adults with an average age of 40; 100% of the cases had a notion of severe neglected ankle sprain, chronic pain, or joint instability. 8 cases had a talus varus (33%), 16 cases practiced risky sports. Clinical examination showed lateral ligament laxity and a positive anterior drawer in 100% of cases. All the patients benefited from standard X-rays with

osteoarticular ultrasound. Cross-sectional imaging, namely arthro-CT in 20 patients (83%) and Arthro-MRI in 04 patients (17%). All our patients have benefited from surgical treatment using the Hemi-Castaing technique.

In the postoperative suites: immobilization for six weeks with a two-week period without support followed by full support for four weeks.

Neuromuscular reprogramming emphasizing recovery from preactivation follows this postoperative immobilization.



## RESULTS

All our patients had a neglected management of the initial episode of the ankle sprain, the clinical examination and the radiological assessment confirm the diagnosis with a specific questions to ankle instability: Cumberland Ankle Instability Tool (most specific and reliable score, ICC if < 27), (ICC if difference of more than 4 cm with the healthy side, Side hop test (10 outward jumps -returns in less than 12 seconds), Inversion talar tilt test (exaggerated pain or laxity), interior drawer of the talocalcaneal block (> 1 cm).

All our patients have benefited from a first-line functional treatment with two associated aspects: the correction of the Static disorders (varus, valgus) and reeducation.

In view of the non-improvement, surgical treatment was carried out by ligament reconstruction, according to the hemi-casting technique.

To reduce the scarring impact, we use three short stepped incisions. This has a double interest: functional on the one hand in this friction zone and aesthetics on the other hand.

These three incisions are made next to the key areas: sampling, trans malleolar tunnel and suture.

In order to properly isolate the tendon, we use lacs: the tendon is deep proximally then superficial distally. After incising the tendon longitudinally, each hemi tendon is tensioned on a lake to facilitate dissection.

Before cutting it, we check using a wire that the length of the hemi tendon is sufficient and that it slides well over its entire harvesting path.

For an optimized trans malleolar passage, the path has been drawn beforehand. The tunnel is made by the successive passage of a 2.5 mm diameter drill then

another 3.5 mm. The wick is then used as a guide for the passage from front to back of a steel wire, which will serve as a traction wire. The hemi tendon is first tubulized at its end by PDS stitches to facilitate its passage through the trans malleolar tunnel.

The hemi tendon then takes a subcutaneous route (made using tweezers) to the lower incision.

Suturing is performed on an ankle at 90°, in neutral pronosupination using separate PDS stitches, which allows for regular tension control.

The duration of postoperative immobilization was six weeks on average ( $\pm 2$ ) and the duration of no weight bearing was three weeks ( $\pm 2$ ).

Postoperative physiotherapy with a proprioceptive aim was most often prescribed (97%).

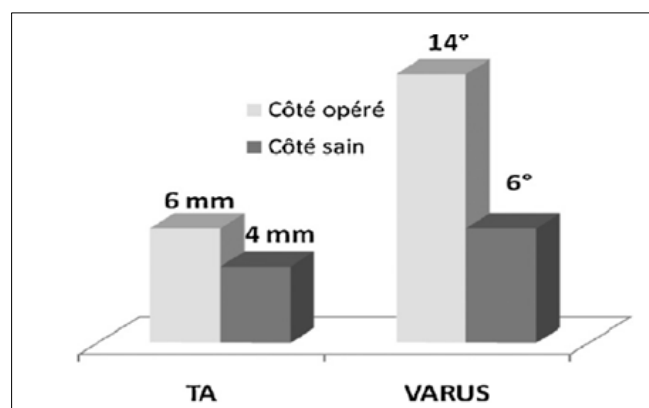
The Good-Jones-Livingstone score reflected an overall assessment.

The clinical examination assessed the mobility of the ankle, a possible laxity with the amplitude of lateral decoaptation measured in ventral decubitus, which corresponded to the sum of the mobility of the talocrural joint and the subtalar joint.

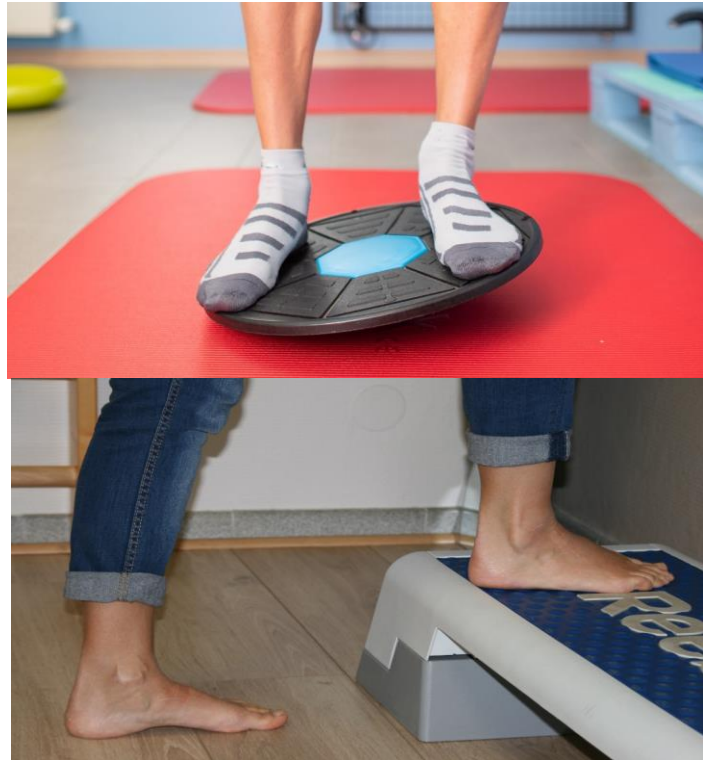
The radiographic assessment of the operated ankle and the contralateral ankle included AP (in internal rotation of 20°) and lateral load-bearing x-rays, a radiograph of the hind foot circled in support of Meary and dynamic images in forced varus, anterior drawer.

This assessment made it possible to evaluate an osteoarthritis evolution quantified according to the classification in four grades of Van Dijk.

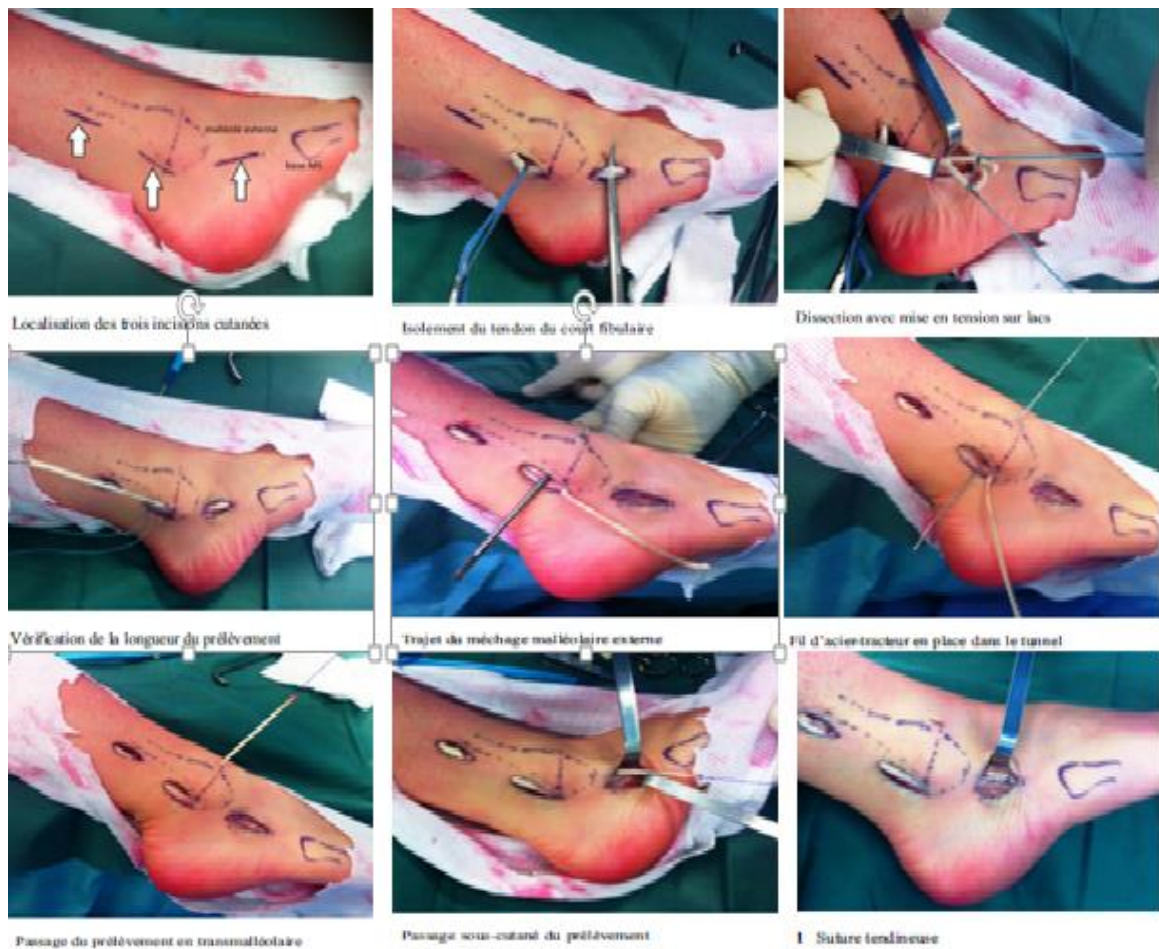
Over a one-year follow-up, all our patients resumed their sports activities with good functional results and a Karlson score between 94 and 100.







**Figure 7: Ankle stability testing**



**Figure 8: Different operating times of the Hemi Casting intervention**

Categorie	Degré	Score
Douleur	Aucune	20
	À l'effort	15
	Marche en terrain instable	10
	Marche en terrain stable	5
	Constante (sévère)	0
Œdème	Aucune	10
	Après effort	5
	Constant	0
Instabilité (subjective)	Aucune	25
	1 à 2 entorses/an	20
	1 à 2 entorses/mois	15
	Marche en terrain instable	10
	Marche en terrain stable	5
	Constante (sévère) utilisation attelle...	0
Raideur	Aucune	5
	Modérée (matin, après exercice)	2
	Marquée (constante, sévère)	0
Escaliers	Aucun problème	10
	Gêne (instabilité)	5
	Impossible	0
Course	Aucun problème	10
	Gêne (instabilité)	5
	Impossible	0
Travail et activités	Identique	15
	Même travail, moins de sport, activités de loisir inchangées	10
	Travail moins lourd, pas de sport, activités de loisir inchangées	5
	Changement de travail, activités de loisirs diminuées	0
Aide, orthèse	Aucune	5
	Pendant le sport	2
	Pendant activités vie quotidienne	0
Total		100

Tableau 3 Score fonctionnel de Good-Jones-Livingstone.

Excellent	Reprise complète des activités, pas de douleur, pas d'œdème, stabilité parfaite
Bon	Douleur occasionnelle (exercice violent), stabilité correcte (pas d'appréhension)
Moyen	Pas d'instabilité vraie mais appréhension (terrain accidenté)
Mauvais	Instabilité résiduelle, douleur et œdème à répétition

Tableau 4 Classification radiologique selon Van Dijk [5].

Stade radiologique	Interligne tibiotalier
G0	Normal
G1	Ostéophytes sans pincement
G2	Pincement ± ostéophytes
G3	Pincement complet

## DISCUSSION

Chronic ankle instability is a predominantly female pathology. Some series have even counted up to 80% of women in the affected population.

This minimally invasive technique of staged sampling makes it possible to reconcile legitimate aesthetic considerations in this young population (20–30 years) and functional imperatives.

To this must be added the interest in footwear (less scarring discomfort, no more dysesthesia).

The importance of the preoperative clinical and paraclinical evaluation is demonstrated in order to make a complete lesion assessment (search for lesions associated with that of the ligamentous plane of the ankle: cartilage or ligament).

This makes it possible to propose an adapted and complete surgical procedure, sometimes combining several techniques and giving a maximum chance of positive functional results.

The favorable functional result of this technique has already been highlighted in numerous studies. Functional satisfaction can be up to 90% of operated patients followed for at least one year.

The main result sought is joint stability and the prevention of osteoarthritis in the long term. Among the postoperative complications noted in this technique, cases of Achilles tendinitis, algodystrophy, neuroma of the lateral saphenous nerve and dysesthesias of the lateral edge of the foot are noted. These cases are rare, the main complications to remember being recurrence of instability (10%) and painful sequelae (50%). With the surgical technique described in our study, no increase in these complications was observed,

The objective and subjective clinical results of anatomical repairs or ligament reconstructions are globally comparable. The two main differences relate to persistent (subjective) instability and postoperative surgical complications. Thus, each of the two techniques has advantages and disadvantages: advantage for anatomical repairs because of their low rate of surgical complications, advantage for ligament repairs, because they stabilize the subtalar joint and have a low rate of residual instability.

Moreover, the invasive nature of the ligamentoplasty is reduced by the use of a hemi tendon and not the entire tendon, which preserves a significant functional part of the elevator muscles. The use of three short skin incisions limits the risk of scarring complications compared to a wide incision.

The stabilization resulting from this ligamentoplasty also has the functional advantage, compared to other techniques, of being just as effective on the subtalar joint.

To date, there are more than 80 interventions aimed at restoring stability with good results between 80 and 95%.

Among the many variants of tendon substitutions described in the literature, let us mention that of Watson-Jones in 1952 which replaces the anterior beam, that of Evans in 1953 than that of Emslie Chrisman and Snook and Vidal *et al.*, who propose lateral peripheral frames.

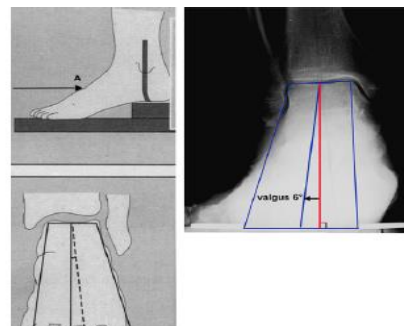
However, in France, the technique for a long time the most widespread was that of Castaing *et al.*, non-anatomical plasty, which, by a triangulation assembly, achieves a functional palliative by creating a bisector between the anterior beam and the middle beam with a real locking of the subtalar joint. This tenodizing effect remains very controversial in the literature on the biomechanical level, particularly in the absence of subtalar involvement and in young athletes. To preserve this active stabilizer in inversion, essential for respecting proprioception, the technique has evolved towards hemi-Castaing, which takes only the anterior part of the peroneus brevis.

The use of all or part of the peroneus brevis requires compliance with technical requirements: do not "tighten" too much in valgus at the risk of even appearing ankylosis of the subtalar; determine the exact positioning of the trans-malleolar tunnel, respecting the criteria of obliquity and height in relation to the apex of the fibular malleolus, thus leading to defining a "pseudo-isometry" of this ligamentoplasty to the fibular short. The knowledge of these different procedures remains important for the surgeon who can choose according to preoperative but also intraoperative data, the most suitable technique.

The interest is to allow an anatomic ligament reconstruction, without sacrificing the patient's peroneus brevis.



Figure 4 Analyse du morphotype de l'arrière-pied en charge (varus à gauche; valgus à droite).



**Tableau 1** Performances des différents examens pour le diagnostic de la laxité et des lésions ligamentaires.

	Laxité	LCL fx LTFA	LCL Fx LCF	S/T cervical interosseux	LCM spring ligamen
Clinique	+	++	+	+	±
Rx simple	0	0	0	0	0
Rx DYN	++	++	+	0	0
Arthro-scan	0	++	±	+	±
Arthro-IRM	0	+	+	++	+
IRM gadolinium	0	++	++	++	++
Écho	+	+	+	±	±

**Tableau 2** Performances des différents examens pour évaluer l'axe de l'arrière-pied et diagnostiquer les lésions de synovite antérolatérale, des tendons fibulaires et cartilagineuses.

	Axe arrière-pied	Synovite latérale	Tendons fibulaires	Cartilage
Clinique	+	±	+	0
Rx simple	++	0	0	+
Rx DYN	0	0	0	0
Arthro-scan	±	+	±	++
Arthro-IRM	0	+	+	++
IRM gadolinium	0	++	++	+
Écho	0	++	+	0

**Figure 7** Clichés dynamiques des deux chevilles : technique d'auto-varus.

## CONCLUSION

Instability of the ankle, in particular lateral, represents the main complication of a severe neglected sprain, it frequently occurs in young adult athletes, its diagnosis and early management are essential to avoid major complications in this case osteoarthritis of the ankle, which calls for well-adapted functional treatment and then, in the event of failure, early surgical repair of this lateral ligament plane.

Several techniques are described, the interest of which is to allow anatomical ligament reconstruction, without sacrificing the patient's fibular brevis, in particular, the minimally invasive variant of Hemi-Castaing with very good results and fewer complications evaluated by the KARLSON and Good-Jones-Livingstone score and which remains the reference technique in France and which is currently adopted in our service.



The development of arthroscopy of the ankle has given rise to capsuloligamentary tensioning techniques which must be evaluated both on their effectiveness and their morbidity in order to know their limits and ideal indications.

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