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Painful Chronic Lateral Instability of the Ankle: Benefits of Arthroscopy Combined with Hemi-Castaing Ligamentoplasty

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ABSTRACT

Background and Aims

This study aimed to compare outcomes of chronic lateral instability of the ankle in patients treated by hemi-Castaingligamentoplasty with either arthrotomy or arthroscopy.

Patients and Methods

Eighty patients with painful chronic lateral instability who received lateral ligament reconstruction using a hemi-Castaing technique over a six-year period were included in this retrospective, single-centre study, with a mean follow-up of 36months (range 18-56months). Patients were divided into two groups: arthrotomy (n=50) and arthroscopy, (n=30). Preoperative and postoperative evaluation according to laxity, instability, pain, Olerud and Molander Ankle Scores and complications were compared between the groups.

Results

No difference in the subjective assessment of outcome (91% were ‘very satisfied’ and‘satisfied’ in arthrotomy patients versus 90% in arthroscopy patients) was detected. However, significant differences regarding persistence of pain at review were noted (60% versus 30% - p=0.0126). Superiority in outcomes in the arthroscopy group were also observed in overall functional outcome and its assessment through the Olerud and Molander Ankle Score with a mean gain of 11 (range, 0 to 35) points for arthrotomy (87.5) versus 20.5 (range, -50 to 60) for arthroscopy (90.5) (p=0.021) patients.

Conclusion

Our study shows that, when compared with a simple arthrotomy, ankle arthroscopy in the context of the hemi-Castaing technique results in marked reduction of pain symptoms and improvement of ankle function without affecting morbidity.

KEYWORDS

Ankle; Painful Lhronic Lateral Instability; Arthroscopy; Ligamentoplasty; Chondral Lesio.

INTRODUCTION

Ankle sprains are a frequently observed injury within emergency rooms, with an estimated incidence of 6,000 cases per day in France alone [1]. Worldwide, it also constitutes a notable Public Health and economic issue since, according to a recent survey, medical expenses related to ankle sprains in the USA in 2003 (with 24,000 cases admitted per day) accounted for an estimated $3.65 billion in spending within in primary care [2].

As ankle sprains are common, predominantly affect young and active subjects, the injury is reputed to be low risk and not to result in serious morbidity, therefore its medical treatment is frequently neglected in the emergency room. This situation is compounded by the lack of a ‘standardized’ protocol for initial treatment.One study found that after a patient’s first ankle sprain, evolution towards chronic instability occurred in between 6 and 45% and residual pain occurred in between 10 and 40% of patients [1]. Moreover, as the current body of evidence supports non-surgical management as the initial treatment for sprains, (including for grade III sprains [3]), incomplete ligament healing is more likely to occur, with eventual chronic laxity, resulting in instability with a recurrent sprain pattern [4].

Painful after-effects of ankle sprains have various causes including, but not limited to: bony injuries (osteochondral fracture of the talar dome, partial fractures of calcaneus), associated tendinitis (tendinous lesions), decompensation of a chronic or micro-traumatic pathology, incomplete ligamentous healing, chronic instability, or soft tissue-/bone-impingement (residual malleolarossicle, osteophytosis) [2]. The functional treatment of chronic instability has yet to be standardised. According to previous work, with active physiotherapy treatment, patients derive only up to a 50% improvement in symptomology of chronic instability (quantified by an instrumented ankle arthrometer)[5,6]. These studies have also provided additional evidence of the low efficacy of functional treatment for associated laxity/instability, with surgical repair deemed the only solution to effectively prevent further sprains in such cases.

Furthermore within chronic instability, associated intra-articular lesions are frequently observed and correlated with chronic pain. As surgery is typically restricted to only the instability and not the intra-articular lesion, surgery has a limited effect on pain [7,8]. Interestingly, Okuda et al. [9] showed that in the case of ankle instability, pain, but not instability, is effectively treated by arthroscopy; their study subsequently proposed the systematic use of this technique whenever a patient presents with a post-sprain painful ankle. However, arthroscopy alone is rarely a definitive treatment, and today, its role for ankle instability management has yet to be fully recognized internationally.

In the study reported here, we aimed to establish whether treatment of unstable and painful ankles by arthroscopy combined with hemi-Castaingligamentoplasty decreases patients' residual pain without affecting treatment morbidity, when compared with hemi-Castaingligamentoplasty and arthrotomy.

Patients and Methods

A retrospective, single-centre study was conducted over a six-year period in patients with painful chronic instability of the ankle (n=80), split into two groups according to treatment type for comparison, these were:patients who underwent a hemi-Castaing type ligamentoplasty with either arthrotomy (group A, n = 50) or arthoscopy (group B, n = 30).

All patients had received, but not benefited from a standard first-line non-surgical protocol (physiotherapy, splints, cast, strapping, non-weight bearing status) for their sprain before their operation.

Inclusion Criteria

The specific criteria for inclusion in this study were: all adult patients (aged over 18-years old) with a painful chronic ankle instability who had undergone a hemi-Castaing procedure combined with either arthrotomy or arthroscopy.

Exclusion Criteria

Patients with painless ankle instability, with a history of ankle or foot surgery or stabilization by another type of surgical procedure, in addition to patients with primary or secondary bone deformities of the ankle or ipsilateral foot were excluded from the study.

Preoperative Evaluation

For all patients, the existence of both laxity and pain symptoms was confirmed by clinical examination performed by two senior surgeons (MPH, AC).

The level of laxity (none, slight and severe) was assessed by comparing the patient's two ankles and assessing for an anterior drawer or abnormal distension in equinusvarus flexion movement. Level of instability (none, low, high), pain location and intensity (none, slight, severe). existence of subtalar joint abnormality (normal, lax, stiff), hindfoot morphology (in line, varus, valgus) and the existence of abnormalities of the sole (pesplanus, pescavus, normal) were also recorded. A preoperative functional score (Olerud and Molander Ankle Score) was determined for every patient (Figure 1).

Pain	None	25
	Minimal(according to the weather)	20
	During sporting activities	15
	Walking on even surfaces	10
	Constant and severe	0
Stiffens	None	10
	When stretching	5
	Constant	0
Edema	None	10
	Only the evening	5
	Constant	0
Stairs	No problems	10
	Impaired	5
	Impossible	0
Sporting Activities	Normal	10
	Difficult	5
	Impossible	0
Supports	None	10
	Taping/Wrapping	5
	Cane or crutch	0
Daily life activities	Unchanged	25
	Unchanged but slower	20
	Less heavy work or part-time	10
	Partially or totally impaired	0
TOTAL		100

Figure 1: The Olerud and Molander Ankle Score.

Preoperative imaging series consisted of: (1) weight bearing antero-posterior x-rays (with inward rotation of 15 degrees, (2) inversion and eversion stress x-rays or TELOS stress x-rays and (3) ultrasound or (4) MRI. Stress x-rays and dynamic evaluation of the lateral collateral ligament by ultrasound were used to confirm the level of laxity. The entire patient cohort underwent CT-Scan arthrography to confirm the lesion of at least one of the three bundles of the lateral collateral ligament and to diagnose other intra-articular injuries.

Surgical Procedure

Surgical interventions were carried out by two senior surgeons (MPH, FD) experienced in the hemi castaing technique and in ankle arthrotomy and arthroscopy. All procedures were performed under general or spinal anesthesia, with patients placed in a supine position with a cushion under the ipsilateral buttock and a tourniquet (inflated to 300 mmHg) at the limb root. All patients underwent a hemi-Castaingligamentoplasty combined with articular exploration and debridment in addition to repair of any intra-articular lesions observed.

The hemi-Castaingligamentoplasty was performed according to the standard technique. The ankle is set in dorsiflexion and eversion during the procedure. A lateral capsulorrhaphy of the ankle is performed with a two-plane suture made over a Redon-type suction drain. The surgical approach is arc-shaped under the lateral malleolar once the sural nerve had been identified at the lower aspect of the incision. The distal epiphysis of the fibula is exposed, and the fascicular membrane of fibular tendons are partly opened whilst taking care to conserve the retinaculum in order to preserve the stability of tendons within their sheath. The lateral peroneus brevis tendon is identified above and below the malleolus. Next, the peroneus brevis tendon is split into two hemi-tendons, with the distal part remaining attached to the base of the 5th metartarsal to preserve its continuity. To facilitate a minimally-invasive procedure, the transplant is sampled with a stripper and then passed through a lateral transmalleolar osseous tunnel drilled with a 4.5-mm drill moved back and forth, and then upwards. It is sutured to itself at the level of the lateral peroneus brevis tendon with a Pulvertaft stitch to permit tension and isometrical adjustments.

In group A, a tibiotalararthrotomy was carried out via the anterolateral approach after ligamentoplasty. Joint inspection and debridement were performed to clean and remove all foreign bodies (capsular and ligament debris and synovial folds). An overlapped suture of the fascicular remnants of the anterior talofibular ligament closed the surgical plane. The presence of any injuries and their surgical treatment were noted.

In group B, exploration and debridement of the joint was carried out by arthroscopy before ligamentoplasty. The ankle was left free at the end of the table, and manual distraction with a Kerlex Loop was applied to perform joint exploration. An anterolateral port for scope insertion was made between the medial edge of the lateral malleolus and the anterior aspect of the fibula. As the port lies between the medial and the dorsal branches of the superficial fibular nerve, it is advised to locate these properly under raking light before making the incision. Placement of the scope was preceded by instillation of normal saline solution (~15 cm$^{3)}$ into the joint. Intra-articular penetration was made with an arthroscopic cannula equipped with a soft insertion trocar. The ankle arthroscope (30 degree, 2.7-mm-diameter lens) was introduced and once the saphenous vein had been located, a medial surgical approach (instrumental) was made at the level of the palpable defect in the tendon of the tibialis anterior muscle. The relative ease in identification of the convex-shaped talar dome and that of the concavity of the tibialpilon facilitated assessment of injuries at articular surfaces for diagnosis of osteochondritis and subsequent evaluation by the Béguin-Locker classification (Figure. 2). Towards the front face, the anterior recess and its synovium were inspected and cleaned with a shaver. The whole medial gutter, the articular side of the malleolus lateralis and the talar facet opposite were inspected, in addition to the anterolateral compartment. After completion of injury evaluation, surgical fixation was achieved under arthroscopy. A joint debridement was performed before suturing the cutaneous orifices.

Beguin and locker classification.
Grade 0: Cartilage looks and feels and feels normal
Grade I: Softening of the cartilage or "chondromalacy". The surface is normal and smooth, but abnormal consistency at hook.
Grade II: Superficial fissure or erosion. Fissures may be single or multiple and create fine fibrillations giving a "fluffy, velvet-like" appearance. The hook achieves moderation between the fissures.
Grade III: Fissure or deep ulcerations. A single and deep fissure resembling "shark's head" "clam shell" in appearance. Numerous deep fissures give a "crab meat"-like appearance. Crater-like ulcerations to subchondral bone.
Grade IV: Exposed subchondeal bone.

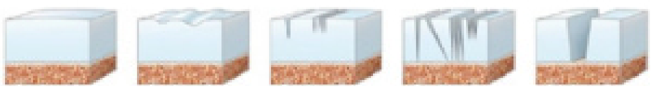

Figure 2: The Béguin and Locker Classification.

Postoperative Care

Postoperative care was identical for both groups: the Redon-type drain was removed 24 to 48 hours post-operatively. The ankle was immobilized for six weeks in an open cast boot in neutral position, and with non-weight bearing status. Preventive anticoagulation with low molecular weight heparin (LMWH) was administered for six weeks.

Patients were reviewed three weeks post-operatively for clinical evaluation of healing, then again at six weeks for removal of the immobilization boot and commencement of physiotherapy, with associated passive and active recovery of the range of motions made by the joint (ankle dorsiflexion) and gradual weight bearing and proprioceptive strengthening activities. The resumption of sporting activities was permitted after four months following a final clinical evaluation.

Patients Review

An independent investigator carried out a final radioclinical evaluation at a minimum of 18 months post-operatively. Furthermore, during each medical appointment, the onset or evolution of possible complications, e.g. neurological disorders, algoneurodystrophy, infection, Achilles or fibula tendinitis, deep vein thrombosis, hematoma, and slow or problematic healing, was evaluated.

For comparison with the preoperative condition, patients' functional status was evaluated through full clinical evaluation (laxity, range of motion, muscle strength in eversion/inversion determined by the Medical Research Council [MRC] score, sensitivity, painful area(s) and a postoperative functional score [Olerud and Molander Functional Score]). The subjective result evaluation considered both the ankle balance (scored according to the scale: 'stable', 'sometimes unstable' or 'unstable'), and pain (intensity and trigger factors). The patient's overall satisfaction was graded as: 'very satisfied', 'satisfied', 'somewhat satisfied', or 'dissatisfied'. Resumption of professional and sporting activities was also determined.

X-ray was used to determine presence of tibiotalarosteoarthrosis through antero-posterior view of the inverted ankle (15 degrees) and profile view.

Statistical Analysis

Pre- and post-operative Olerud and Molander Functional Scores were compared using the Student's t-test. Qualitative character of postoperative pain and resumption of sporting activities comparisons were evaluated with a Fisher test. Significance was set at p <0.05.

All statistical analysis was performed using Statplus Mac software (AnalystSoft, Vancouver, Canada).

RESULTS

Epidemiological Data

A total of 74 patients (92.5%) were reviewed postoperatively, with a mean follow-up of 36 months (18–56 months; 44 patients in group A [88%], 30 patients in group B [100%]). This was distributed as individual group follow-ups of 37 months (range, 18 to 56) for group A and 35 months (range, 18 to 40) for group B. Both groups had similar demographics (Table 1).

Data		A n=44	B n=22
Average followup (months)		37 (18-56)	35 (18-40)
Sex	Male	17	18
	Female	27	4
Average age (years)			
	At initial sprain	15(9-30)	22(10-45)
	During the procedure	28(19-56)	34(18-50)
Time between initial sprain and intervention Number of sprain before the intervention		9yrs & months	9yrs & 1 month
	<5	36%	31%
	Between 5 and 10	19%	19%
Side of instability	>10	45%	50%
	Left	51%	49%
	Right	49%	51%
Traumatic episodes of instability		84%	96%
Constitutional laxity		16%	18%
Sporting activity	None	23%	27%
	Occasional	32%	23%
	Amateur level	38%	45%
	Professional level	7%	5%

Table 1: Patient Demographic.

Preoperative Evaluation

1. Laxity and instability (Table 2)

		Group A (n=44)	Group B (n=22)
Clinical Laxity		100%	87%
	Weak	30%	36%
	Acute	70%	64%
Subjective Instability			
	None	0%	5%
	Weak	13%	23%
	Acute	87%	72%

Table 2: Preoperative laxity and instability data.

Anterolateral laxity (movement in equinusvarus flexion and anterior drawer) was observed in 70 patients: 44 in group A (100%) and 26 in group B (87%). Four patients in group B had no clinical laxity but all of them described sensations of severe instability. Apart from one of the 30 patients, all subjects

Pain		A(n=44)	B (n=22)
Intensity			
	Weak	70%	68%
	Acute	30%	32%
Trigger factors			
	Barometric	23%	15%
	Upright standing	20%	10%
	Sporting activity	34%	42%

described feelings of instability (subjective instability) in group B.

Pain (Table 3)

	Daily life activity	23%	33%
Localization			
	Anterolateral	78%	50%
	Tibiotalar	12%	23%
	Internal	6%	27%
	External and Internal	4%	0%

Table 3: Preoperative pain scores.

All patients experienced pain; etiology of pain is described in Table 3.

3. Physical examinations showed no specific hindfoot-favoringmorphotype in any patients.

4. The overall preoperative functional assessment determined by the Olerud and Molander Ankle Score was 76.5 (range, 35 to 95) for group A and 70 (range, 30 to 95) for group B (Table 4).

Olerud and Molander Ankle Score	Group A (n=44)	Group B (n=22)
Mean Ankle Score out of 100	76.59(35-95)/100	70(30-95)/100
Pain	44	22
Stiffness	10	7
Edema	15	11
Stairs	11	11
Sporting activity	26	22
Supports (strapping)	4	4
Daily activitry, work	8	8

Table 4: Preoperative Olerud and Molander Ankle scores.

5. Preoperative CT-Scan arthrography results for ligamentous lesions and intra-articular injuries are shown in Table 5.

CT-Scan arthrography results		A(n=44)	B(n=30)
Lateral collateral ligament lesions			
	Anterior talofibular ligament alone	32	19
	Anterior talofibular and calcaneofibular ligaments	12	11
	Posterior talofibular ligament	0	1
Subtalar ligament lesions		9	8
Impingement			
Soft tissue impingement		24	18
Bony impingement		8	4
Malleolar ossification		9	5
Intra-articular foreign bodies 43		4	3

Table 5: Preoperative CT arthrography results.

Chondral and osteochondral lesions were graded according to Ferkel classification. Perioperative evaluation and treatment of others injuries (Table 6)

Peroperative evaluation and treatment		A (n = 44)		B (n = 30)
Chondral lesion	19	No treatment: 10 Chondroplasty: 5	22	No treatment: 11 Chondroplasty: 7
		PridieMicro-fracturing: 4		PridieMicro-fracturing: 4
Osteochondral Lesion of the Talus (Christel's grade 2, 3, 4)	11	No treatment: 5 Chondroplasty: 2 PridieMicrofracturing: 4	9	No treatment: 4 Chondroplasty: 2 PridieMicrofracturing: 3
Impingement				
Soft tissue impingement	12	synovectomy	22	Synovectomy with shaver Lateral gutter: 10 Medial gutter: 6 Antero-lateral: 13
Bony impingement	3	resection	6	Reamer and bone shaver
Foreign bodies	9	removal	4	removal
Malleolar ossification	9	removal	5	removal
Debridement	44		30	

Table 6: Peroperative evaluation and treatment of intra-articluar injuries.

Chondral lesions were assessed and graded based on the Beguin-Locker classification and osteochondral lesions of the talus (OLTs) were graded according to the Christel classification. Decision to perform either arthrotomy or arthroscopy for surgical repair was performed on a case-by-case basis (Table 6). After debridement, all Grade 3 chondral lesions were treated with chondroplasty, and Grade 4 lesions had microfracturing treatment. All patients had articular debridement.

Postoperative Evaluation

Subjective Results

Group A (Arthrotomy): Ninety-one per cent of patients were either 'very satisfied' or 'satisfied' postoperatively (30 and 10 out of 44, respectively). Three patients were 'somewhat satisfied', and only one was 'dissatisfied' with the procedure, secondary to continued laxity and instability in the ankle.

Group B (Arthroscopy): In this group, the percentage of 'very satisfied' or 'satisfied' patients was 90% (18 and nine out of 30, respectively). The remaining two patients were, respectively, 'somewhat satisfied' and 'dissatisfied' because of pain, although stability was restored.

No significant differences between arthrotomy and arthroscopy groups was detected (p=0.42).

Functional Results (Tables 7 and 8)

Functional results		Group A(n=44)	Group B (n=22)
Resumption of Sporting	70%	91%	
activites	No	30%	9%
	At the same level	43%	55%
	At a lower level	27%	36%
Back to work	100%	96%	
	No	0%	4%
	Retraining	3%	4%
	No change	97%	92%

Table 7: Functional results.

Olerud and Molander Ankle Score	A(n=44)	B(n=22)
Mean Ankle Score out of 100	87.5(50-100)/100	89.5(15-100)/100
Mean increase in Ankle Score	11 points(0-35)	19.points (-50-60)
Pain	26	8
Stiffness	8	5
Edema	12	4
Stairs	3	1
Sporting activity	18	12
Support (strapping)	3	2
Daily life activity	5	2

Table 8: Postoperative Olerud and Molander Ankle scores.

Group A (Arthrotomy): Sporting activities were resumed by 31 of the 44 patient subgroup (70%), of which, 19 continued at the same level of practice as preoperatively (43% of all group A patients). The percentage of patients who resumed professional activities without requirement of workplace adjustments was 98%; the only failure occurring after an accident at work.

The mean postoperative Olerud and Molander Score was 87.5 (range, 50 to 100), which corresponds to a mean increase of 11 points (range, 0 to 35) from preoperative status; the single greatest adjustment arising from the pain item of the score.

Group B (Arthroscopy): Sporting activities were resumed by 27 of 30 (90%) patients, and the level of practice was alike for 16 of them (54%). The percentage of patients able to resume work at the same level as previously was 93%; of the two remaining patients, one was required to retrain and transferred to a less physically demanding post, and the other patient had to give up work altogether.The inability to resume professional activities was also linked to a case of an occupational accident.

The mean postoperative Olerud and Molander Score was 89.5 (range, 15 to 100), corresponding to a mean increase of 20.5 points (range, -50 to 60).

A significant difference between groups A and B existed for the resumption of sporting activities (p=0.04), mean Olerud and Molander Scores and the mean increase in Olerud and Molander Scores (p=0.021 and p=0.008).

For all patients, the strength of periarticular muscles, especially peroneus brevis, was scored 4+ or 5/5 (MRC Score).

Stability results (Table 9)

Stability		Group A (n=44)	Group B (n=22)
Clinical Laxity		9	2
	Weak	7	2
	Acute	2	0
	Symptomatic	3	0
New episode of instability		5	1
	Trauma conditions	3	1
Subjective stability			
	Stable	84%	78%
	Sometimes unstable	13%	22%
	unstable	3%	0%

Table 9: Stability results.

Group A (Arthrotomy): Postoperative testing found evidence of clinical laxity in nine patients (20.5%), of which three showed functional symptoms. Clinical laxity was slight in seven cases (77.7%).

Five patients (11.5%) presented with new sprains or subluxation, for three of these patients, the relapse was triggered by trauma. Thirty-seven patients considered their ankle as 'stable' (84%), six others described it as 'sometimes stable' (14%), and one patient as 'unstable '(2%). Amongst these seven 'non-stable' cases, four had relapsed and three presented with a lax ankle. Only the patient with feelings of an unstable ankle was 'dissatisfied'.

Group B (Arthroscopy): Within this group, two patients showed evidence of slight clinical laxity (6.6%), however there was no history of a new sprain. One patient presented with a new sprain secondary to trauma, with no other additional injury.

Ankle balance was described as 'stable' by 24 patients (80%), 'sometimes stable' by six (20%) and 'unstable' by none. Two of six patients describing their ankle as 'sometimes stable' demonstrated signs of a slight clinical laxity.

No significant difference was found between the two groups for both clinical laxity (p=0.1918) and subjective stability (p=0.1890). Nine patients from group A and two from group B complained of a 'locked' ankle feeling at follow-up however this was not correlated to clinical features, ankle balance, nor pain.

Pain results (Table 10)

Pain at review		**Group A(n=44)**	**Group B (n=22)**
Patients presenting with pain Intensity		60%	37%
	Weak	70%	88%
	Strong	30%	2%
Trigger factors			
	Barometric	38%	25%
	Upright standing	18%	12%
	Sporting activity	10%	63%
	Daily life activity	34%	0%
Localization			
	Anterolateral	31%	37%
	Tibiotalar	54%	50%
	Internal	15%	13%
	External and internal	0%	0%

Table 10: Postoperative pain results.

Group A (Arthrotomy): At final review, of the 44 patients of this group, 26 (59%) still experienced pain, 18 had slight pain(41%) and eight severe pain (18%).

Group B (Arthroscopy): Nine of the 30 patients (30%) still experienced pain, which was slight for eight cases, and severe in one case.

We found a significant difference between the two groups concerning persevering pain (p=0.0126).

All of the somewhat 'satisfied' or 'dissatisfied' patients complained of pain.

Complications (Table 11)

Complications		**Group A n=44**		**Group B n=22**	
Number		13		5	
	Involved patients		9		3
	Resolved		13		5
	Further treatment		0		1
Type of complication					
	Algoneurodystrophy		3		1
	Neurological damage		6		1
	Cutaneous problems		1		1
	Hematoma		1		1
	Phlebitis		1		0
	Achilles tendinitis		1		0
	Infection		0		1

Table 11: Postoperative complications.

The overall complication rate was 25.7% with a total of 19 complications for 13 patients. At final review, all complications were considered to have been resolved.

Group A (Arthrotomy): Nine patients developed a total of 13 complications. The immediate postoperative complications consisted of delayed cutaneous healing, phlebitis and hematoma (one case of each), the latter with no need for further surgical intervention. Long-term complications were: Achilles tendinitis (one case), algoneurodystrophy (three cases), sural nerve neuroma (three cases), and dysesthesia of the lateral aspect of the foot (three cases).

Group B (Arthroscopy): Four patients developed a total of six complications. Immediate postoperative complications were of two cases of delayed cutaneous healing, and one case of hematoma with no need for further surgical intervention. Onset of infection at the surgical site in one case necessitated further intervention, which revealed an inflammatory rejection reaction to the prolene threads used for the plasty.

In the longer term, one case of dysesthesia caused by superficial fibular nerve damage and one case of algoneurodystrophy were recorded. It should be noted that the patient who presented with algoneurodystrophy was the one who required further surgical treatment.

With the numbers of cases available in our study, no significant differences between groups A and B were detected concerning the occurrence of complications (p=0.2593 and p=0.1390).

DISCUSSION

For patients presenting with repeated sprains, joint laxity is usually accompanied by intra-articular pain. Mechanical joint laxity is caused by torn or incompetent anterior talofibular (ATFL) and calcaneo fibular ligaments (CFL) secondary to stretching; whereas functional instability is due either to a deficiency in proprioception ability or to other neuromuscular disorders. In this context, the signs and symptoms of intra-articular pain could result from primary or secondary intra-articular lesions and generate instability and/or pain [4,10].

Briefly, the surgical procedures enabling restoration of stability are either (1) direct anatomical repairs of ligaments or scar tissues or (2) ligamentoplasty by tendon substitution[11]. Controversially[6, 12, 13], following a retrospective analysis of surgical techniques, a symposium led by the Sociétéd'Orthopédie de l'Ouest (Orthopaedic Society of Western France, 2005) concluded there was no difference between the procedures with regards to mid-term outcomes and more recently with regards to long-term outcomes, based on work by Mabit et al. [14,15]. Each approach has been described as having advantages and drawbacks: anatomical repair benefits from its low rate of surgical complications, and substitution ligamentoplasties from both the stabilization of the subtalar joint and low rate of residual instability [14, 15].

With 90% of patients in the overall patient cohort 'very satisfied' or 'satisfied' (including 82% with no sign of laxity, but a feeling of a 'stable' ankle instead), this study which dealt with two comparable groups of patients, confirmed results reported by Dubrana and Mabit [14,15]. Regarding the two 'dissatisfied' patients, found respectively in groups A and B, dissatisfaction was explained in one case by a still lax and unstable ankle, and in the other by the persistence of residual pain in an otherwise stable ankle with no laxity.

All of the patients who were either 'somewhat satisfied' or 'dissatisfied' presented with residual pain at review. Even if a hemi-Castaing-type ligamentoplasty can improve ankle stability, as it is unable to solve the issue of painful associated intra-articular lesions, it negatively affects the quality of the treatment outcome [16].

DiGiovanni et al. [17] suggested that an exploratory and curative arthrotomy for the treatment of intra-articular lesions aimed at ligament reconstruction would improve outcomes. However, these procedures have proved to be still insufficient, especially for dealing with pain [7]. Indeed, arthrotomy increases surgical morbidity and allows only 20% of intra-articular lesions to be visualized compared to arthroscopic exploration [18].

By systematically carrying out an exploratory and therapeutic arthroscopy before ankle ligamentoplasty, Komenda and Ferkel identified 51 ankles (93%) with intra-articular pain, in addition to foreign bodies (12), synovitis (38), osteochondral lesions of the talus (9), ossification (14), and chondromalacy (12). Their reported percentage of excellent or good results is 96% [19]. In a more recent study by Ferkel et al., [18] the use of arthroscopy prior to a ligamentoplasty procedure allowed discovery of intra-articular lesions in 20 of 21 patients. At 60-month follow-up, results were excellent or good in all patients.

Moreover, again under arthroscopy, Hua et al.[20] found a strong incidence of intra-articular lesions (90.85%) in patients with chronic ankle instability. Following treatment by arthroscopy and a Broström procedure, 92.5% of results were either good or excellent.

In the study reported here, with the numbers available, no significant difference in the subjective assessment of outcome (91% of patients were 'very satisfied' and'satisfied' in group A versus 86% in group B) could be detected. However, a significant statistical difference was found between the persistence of pain at review between groups ($p = 0.0126$). Differences were also noted in the overall functional outcome and its assessment through the Olerud and Molander Ankle Score with a mean gain of 11 points for group A (87.5) versus 20.5 for group B (89.5) ($p < 0.05$). This difference is all the more marked as one patient from group B experienced three out of six negative elements (healing problems with further surgical treatment and algoneurodystrophy, an unstable ankle and pain/inability to resume work), with a resultant Olerud and MolanderAnkle Score of -50 points - the only example of a decreased post-operative score.

In group A, all 26 patients experiencing pain suffered from a chondral or an osteochondral lesion of the talus verified by both CT-Scan arthrography and arthrotomy. Of the 26, the eight patients suffering from severe pain showed chondral lesions of grade III or IV and osteochondral lesions of grade II or III. One should note in group B, that of the nine patients with persistent pain, eight showed grade III or IV chondral lesions and one a grade II lesion, under arthroscopy. Furthermore, 73.3% (22/30) of patients from group B had chondral lesions, half of which were of grade III or IV. One patient with a grade-III lesion showed neither signs nor symptoms of pain at review.

According to work by Hua et al. [20], surgically treated ankles with osteochondral lesions have lower postoperative functional scores (AOFAS scores) and lower improvements between preoperative and postoperative scores when compared with ankles with no osteochondral lesions.This is supported by work by Taga et al. [21] (who recorded a 50% rate for residual pain in ankles with osteochondral lesions of at least Grade III) and Takahashi et al. [22] (who found a significant link between the presence of chondral lesions and the persistence of postoperative ankle pain). Furthermore, in a cohort of 64 patients who had undergone surgery for chronic ankle instability, Choi et al. [16] aimed to identify the existence of a relationship between the presence of intra-articular lesions and patient satisfaction postoperatively. The group concluded that osteochondral lesions are a predictive and significant factor of dissatisfaction by patients about the outcome of surgery in the case of ankle ligament reconstruction for chronic instability.

Conversely, according to several authors, osteochondral lesions seem to not affect the outcome of surgery. In a study by Ferkel and Chams [18] where the prevalence of chondral lesions was 33.3%, postoperative outcomes were all either good or excellent. Similarly, Okuda et al. [23], found that outcomes of the 63% of patients who had focal chondral lesions, were not significantly different, nor was there any difference in the Karlsson functional score, when compared with patients without lesion.

On balance however, outcomes reported in the literature are consistent with our results and support the idea that chondral and osteochondral lesions are associated with worse postoperative outcomes, especially for pain.

Complication rates in groups A and B were similar with a total of six complications in group B (of 30 patients) and

13 in group A (of 44 patients) recorded at review. Only one patient required further surgical treatment with after-effects stabilized over time. These results suggest no additional morbidity in an arthroscopy combined with a hemi-Castaing procedure (p=0.2593).

There was, however, a marked difference observed in neurological complications; the complication rate in the arthroscopy group was far lower than the arthrotomy group (one versus six). This difference may be explained by the size of the surgical approach being significantly smaller in the arthroscopy group because of the lack of arthrotomy. To be correctly performed, a joint inspection by arthrotomy requires a longer incision and wider exposure with subsequent increased potential for nerve injuries due to either incision or dissection. Furthermore, one of the main complications of a surgical approach in ankle arthroscopy is damage to the superficial fibular nerve. Therefore, nerve structures are always actively identified and respected during arthroscopic surgical approaches.

The overall complication rate in this study was higher (25.7%) than that reported in the literature, with nerve injuries (9.5%), delayed or incomplete healing (4%) and algoneurodystrophy (5.5%) arising in our patient cohort. For comparison, a review by Sammarcofocusing on the anatomical and non-anatomical complications in ankle ligament reconstruction reported an overall complication rate of 5.7% [25]. The main observed complications were superficial nerve damage (3.8%) and healing issues (1.8%), one should note that most of them were liable to be resolved. In general however, complications arising in ankle arthroscopy, are temporary and resolved within six months, as determined by Ferkel et al. [24].

The results of our study are consistent with similar work in the literature and therefore add weight to the argument that the combination of ankle arthroscopy with a hemi-Castaing-type stabilization procedure is a reliable treatment in the management of painful chronic ankle instability.

Limitations of this retrospective study include the relatively small numbers within the two patient groups and the lack of sensitivity, comprehensiveness, and precision of assessment of ankle functional characteristics by the Olerud and Molander Score employed. Future work would use the AOFAS score [26] to produce more holistic results, which would also be comparable against other studies in the literature, which tend to use this score also.

CONCLUSION

The combination of ankle arthroscopy and the hemi-Castaingligamentoplasty constitutes a reliable procedure for the treatment of recurrently unstable and painful ankles, with no increase in comorbidity.Compared to a simple arthrotomy, the arthroscopic technique results in a marked reduction of pain symptoms and improvement of the overall functional results in patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest: no external funds were received in support of this study.

This study complies with the current laws of the country in which it was performed and has therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

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