Trauma Monthly 2023; 28(2): 781-760

10.30491/tm.2023.398845.1599

Trauma Monthly

Original Article

Evaluation of the Pain, Functional Improvement, and Stability in Patients with Chronic Lateral Ankle Instability Using the Modified Brostrom Repair

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Received 2022-12-09; **Accepted** 2023-02-27; **Online Published** 2023-04-24

Abstract

Introduction: Injury to the lateral ankle ligaments caused by inversion of the ankle joint significant lower limb damage. This study aimed to assess patient with chronic lateral instability of the ankle and the return of movement function and stability of their operated ankle using the corrected Brostrom method at Baqiyatallah Hospital.

Methods: In this retrospective study, patients diagnosed with chronic lateral ankle instability from October 2019 to October 2022 were candidates for surgical treatment using the modified Brostrom method at Baqiyatallah Hospital. Information regarding age, gender, occupation of the patient, type of sport, the patient's anterior drawer examination (ADt), American orthopedic foot and ankle society (AOFAS) score, the range of motion (ROM) of the ankle joint, the pain, was recorded before surgery, three months and nine months after the operation.

Results: Forty patients were included, and 70% were men. Improvement in the AOFAS scores from pre-operation (55.97±6.97) to 3 and 9 months after surgery (73.60±7.07 and 90.27±8.57) was significant (P < 0.001), and also, the AOFAS scores significantly improved between the 3 and 9 follow-ups (P < 0.001). The decrease in the pain was significant between pre-operation and three and nine follow-ups and also significantly reduced between the three-month follow-up and the nine-month follow-up (P< 0.001). The increase in the ROM was significant between pre-operation and three and nine follow-ups (P<0.001). There were significant differences between preoperation and 3-month and 9-month follow-ups after surgery in ADT and sprain (P<0.001).

Conclusion: This study showed that significant improvements in the AOFAS scale, pain, ROM, ADT, and sprain modified Broström repair could cause satisfactory results.

Keywords: Modified Brostrom Repair, Pain, Functional Improvement.

Introduction

Ankle sprains are among the most common musculoskeletal injuries during exercise or daily activities such as walking [1-3]. The probability of an athlete's foot sprain in a period is 45%, among which 10-30% of acute ankle injuries will become chronic [4-5]. These people have symptoms of ankle instability [6]. The causes of chronic ankle instability include genetic factors in people, such as weak ligaments, and mechanical elements, such as mismatched alignment Foot, running, jumping, or cutting sports, such as football, basketball, and volleyball, can all cause repetitive ankle injuries, repeated sprains can lead to other injuries such as tendon tears or cartilage damage. Also, female athletes are exposed to more injuries due to hormonal and anatomical issues, and ankle sprains are more common in this group[7-9].

Injury to the lateral ankle ligaments caused by inversion of the ankle joint is one of the significant lower limb damages. In most individuals, only the ATFL is impacted, but in the minority, this is connected with a tear of the Calcaneo fibular ligament[10]. Surgical management for acute damage of the lateral ankle ligaments presumably gives little better operational outcomes than conservative treatment[11]. Conventional therapy causes complete functional healing in most

cases. This mechanical instability can be evaluated by radiological assessment utilizing the anterior drawer and ankle inversion examinations. Nevertheless, chronic ankle instability may happen with or without improved ligament laxity. These statements have caused the idea that functional instability outcomes from a neuromuscular insufficiency are implicated along with mechanical instability in cases with signs of chronic ankle instability [12-17].

Initial therapy for chronic ankle instability may consequently consist of neuromuscular ankle training. Several training schedules have been designed [18]. Surgical treatment is usually considered if signs persist after a rehabilitation program and risen ligament laxity are current. Surgical techniques fall into two major classifications. In "anatomic" reconstructions, the formerly ruptured ligaments are tightened by overlapping or re-attaching one ligament's end into the bone. In' nonanatomic' reconstructions, the structural laxity is fixed by utilizing other normal tendons and tissues. Studies suggest that anatomic reconstructions demonstrate superior outcomes over an extended period. Neuromuscular rehabilitation optimizes lower limb postural control and restores operational stability through exercise [19]. The aim of surgical reconstruction is the reduction of increased ligament laxity. Tape and braces may provide some external mechanical support for an unstable ankle. Still, it has also been suggested that enhancing proprioception movement, understanding the situation, and balance through skin tension have explained the beneficial effect. The efficacy of neuromuscular exercise requires to be assessed [18-23].

Hamiton et al. explained the modified Broström repair, which is more appropriate for patients because it allows a full range of plantarflexion, dorsiflexion, and standard peroneal procedure [24]. The expected benefits of this approach contain its clarity and reliability, and it is conducted with the original ligament tissue, which does not hurt the common tendon.

We considered the difference in the treatment results of patients with chronic ankle instability in different medical centers and the effect of various surgical approaches on their recovery rate. This study aimed to investigate patients with chronic lateral instability of the ankle and the return of movement function and stability of their operated ankle using the corrected Brostrom method in Baqiyatallah Hospital.

Methods

In this retrospective study, 40 patients diagnosed with chronic lateral ankle instability from October 2019 to October 2022 were candidates for surgical treatment using the modified Brostrom method at Baqiyatallah Hospital. The inclusion criteria included age between 18 and 60 years and the absence of vascular collagen diseases. Exclusion criteria included lack of information in the patient's file, failure to refer the patient for follow-up after surgery, and history of multiple fractures in the ankle joint.

Information regarding age, gender, occupation, type of sport, the patient's ADt, AOFAS score, the ROM of the ankle joint, and the pain was recorded before surgery, three months, And nine months after the operation. The pain was evaluated with the 10-grade Visual Analogue Scale (VAS) (score zero (no pain) to score 10 (the most pain experienced)). The American Orthopedic AOFAS questionnaire is a standard used to evaluate the functional status of the foot and ankle in patients. This questionnaire has nine general questions and consists of 3 parts of pain assessment (40 points), function (50 points), and alignment (10 points).

We calculated the ankle joint's range of motion based on the standard method described by Martin et al. [2]. In this way, the ankle joint formed a 90-degree angle between the outer malleolus and the outer border of the foot. Then the plantar and dorsi flexion of the patient was calculated relative to the rest position (0-degree angle). An anterior ankle drawer test is done so that during the ankle examination, we hold the heel of the patient's foot with one hand and fix the leg part with the other above the ankle. The movement of the heel determines the degree of instability of the joint.

The data were analyzed by SPSS-26 software. The normality of the distribution of data was checked by Kolmogorov–Smirnov test. The paired t-test, Wilcoxon, and McNemar tests were used to compare the data before and after surgery.

Results

Forty patients were included, and 70% were men. The mean return to work was 7.69±2.01 weeks. The most common sport of the patients was football 11 (27.5%) (Table 1).

Improvement in the AOFAS scores from preoperation (55.97±6.97) to 3 and 9 months after surgery (73.60±7.07 and 90.27±8.57) was significant (P < 0.001). Also, the AOFAS scores significantly improved between the 3 and 9 follow-ups (P < 0.001) (Table 1) (Fig 1).

The pain was 6.60±1.17, 3.17±1.35, and 1.35±0.92 at each time point. The decrease in the pain was significant between preoperation and three and nine follow-ups (P<0.001) and also significantly reduced between the three-month follow-up and the nine-month follow-up (P< 0.001) (Table 1) (Fig 2).

The mean ROM was 48.50±10.75 preoperation, 57.37±5.42 at the 3-month follow-up, and 59.37±2.81 at the 3-month follow-up. The increase in the ROM was significant between preoperation and three and nine follow-ups (P<0.001). However, there were no significant differences between 3-month and 9-month follow-ups after surgery (Table 1) (Fig 3).

Significant differences existed between preoperation and 3-month and 9-month follow-ups after surgery in ADT and sprain (Table 1).

Table 1: Patients' characteristics.

Items		Number (41)
Sex	Male	28 (70%)
	Female	12 (30%)
Age, years	Weeks	32.92±9.42
Time to return work	Years	7.69±2.01
Sport	Football	11 (27.5%)
	Running	8 (20.0%)
	Walking	7 (17.5%)
	Volleyball	7 (17.5%)
	Wrestling	1 (2.5%)
	Boxing	1 (2.5%)
AOFAS	baseline	55.97±6.97
	3 months	73.60±7.07
	9 months	90.27±8.57
Pain	baseline	6.60±1.17
	3 months	3.17±1.35
	9 months	1.35±0.92
ADT	baseline	6.85±1.75
	3 months	0.025±0.15
	9 months	0.025±0.15
sprain	baseline	8.87±2.92
	3 months	0.0±0.0
	9 months	0.0±0.0
ROM	baseline	48.50±10.75
	3 months	57.37±5.42
	9 months	59.37±2.81

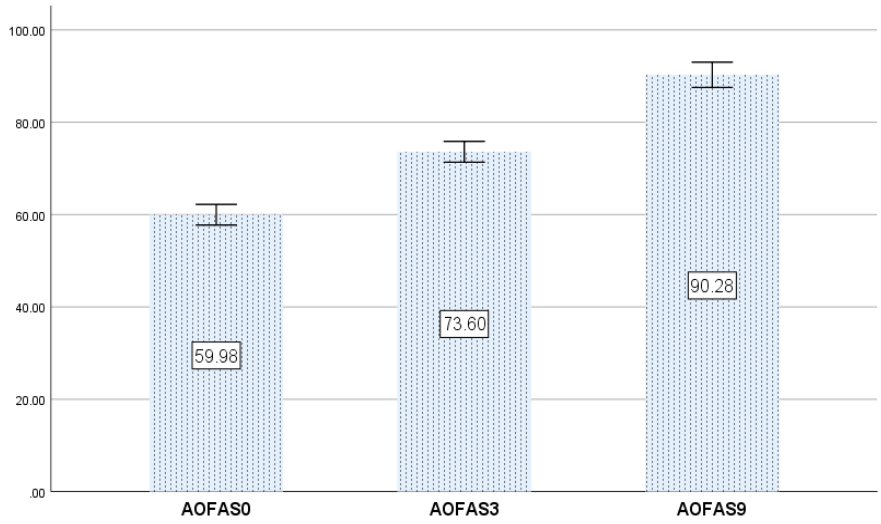

Figure 1: AOFAS scores from pre-operation, 3 and 9 months after surgery.

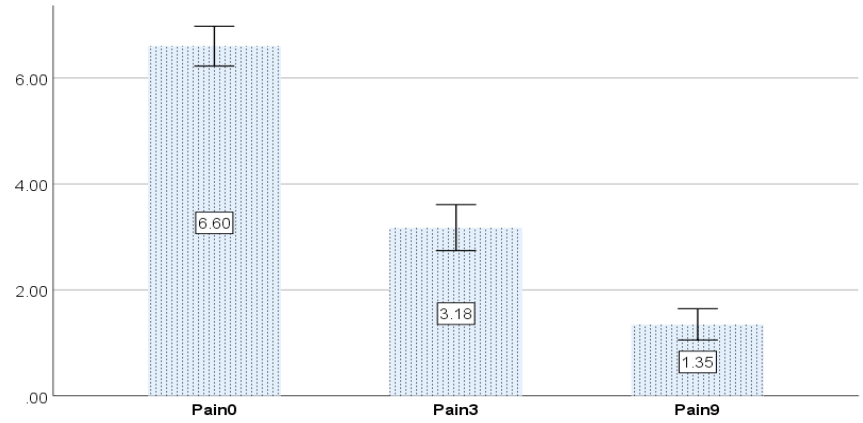

Figure 2: Pain from pre-operation, 3 and 9 months after surgery.

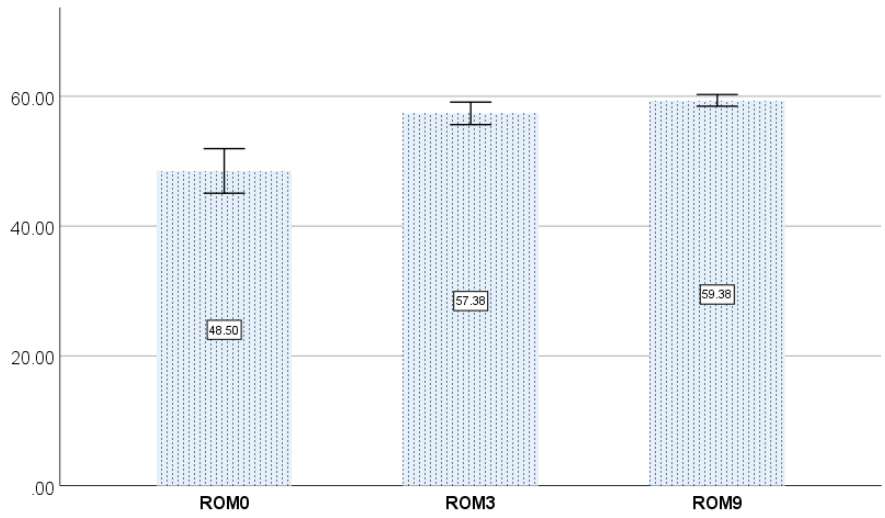

Figure 3: ROM from pre-operation, 3 and 9 months after surgery

Discussion

Lateral ankle instability is typical, but the best therapy technique remains controversial [25]. Several surgical strategies for chronic lateral instability of the ankle have been used. The modified Broström method, which is an anatomic reconstruction, has shown promising results, but there are still some complications, including ankle instability and ligament tear [22-25].

This current study showed improvement in the AOFAS scores from preoperation to three and nine months after surgery. Also, the AOFAS scores significantly improved between the 3 and 9 follow-ups. The decrease in the pain was significant between preoperation and three and nine follow-ups and reduced considerably between the three-month and nine follow-ups. The increase in the ROM was significant between preoperation and three and nine follow-ups. However, there were no significant differences between 3-month and 9-month follow-ups after surgery. Significant differences existed between preoperation and 3-month and 9-month follow-ups after surgery in ADT and sprain. Ding et al. (2019) assessed 53 cases treated with modified Broström repair. Satisfactory outcomes and significant improvements (pain, AOFAS, and ROM) were reported [25]. Huang et al. reported that in chronic lateral ankle instability cases, treated with the modified Broström surgery at the final follow-up [26]. Also, Petrera et al. reported satisfactory outcomes for patients treated with modified Broström repair. Sami et al. investigated patients with the modified Broström approach. In AOFAS scores, 71.4% had excellent results, 14.3% had acceptable outcomes, 4.8% had reasonable outcomes, and 29.5% had unsatisfactory outcomes [14].

Although many researchers are studying the modified Broström repair or modified Broström repair with augmentation using suture tape, few prospective studies compared the two methods. Our results showed significant improvements in the AOFAS scale, VAS scale, ROM, ADT, and sprain from preoperation to the follow-up. Moreover, the AOFAS scale, VAS, ROM ADT, and sprain outcomes had statistically significant progress at the follow-up. This result means the modified Broström repair has satisfactory clinical results for lateral ankle instability. Some studies have noted comparable results of ankle function recovery during follow-up [24-26].

The extension of ligaments is related to ankle laxity and reduced instability after the ankle ligament repair. Consequently, the suture tape augmentation permitted increased ankle stability and reduced ligament extension. The modified Broström repair with augmentation utilizing suture tape can enhance the ankle stability of the reconstructed ATFL. Functioning practice can boost the healing of ligament stability and outcome in the improvement of ankle operation. This is a potential explanation for why the outcomes were remarkably enhanced at the follow-up. Some studies documented that functioning practice can improve the development of hormone classes in the serum and outcome in more tensile stability of the ligament[23-28]. Considering patients' characteristics for treatment and management of cases is recommended [29]. We had some limitations in the current research. The number of patients was low, and the follow-up was short coverage of nine months. However, this recent study included prospectively a reasonably homogeneous sampling of cases regarding activity class and demographic characteristics.

Conclusion

The study showed that significant improvements in the AOFAS scale, pain, ROM, ADT, and sprain modified Broström repair could cause satisfactory results.

Acknowledgments

The authors would like to thank the Deputy of Clinical Development Medical Center of Baqiyatallah Hospital for their support.

Conflict of Interest Disclosures

All authors declare that there is not conflict of interest in this study.

Funding Sources

None.

Authors' Contributions

Concept and topics: Kavous Vaziri, Alirea Rahimnia, and Mohammad Majid Aliakbari. Data gathering and analysis: Kavous Vaziri, Alirea Rahimnia, Mohammad Majid Aliakbari, and Mehdi Raei. Writing and editing of paper: Kavous Vaziri, Alirea Rahimnia, Mohammad Majid Aliakbari, and Mehdi Raei. Confirmed: Kavous Vaziri, Alirea Rahimnia, Mohammad Majid Aliakbari, and Mehdi Raei.

Ethical Statement

The ethical committee of Baqiyatallah University of medical sciences confirmed the protocol of this study (Cod: IR.BMSU.BAQ.REC.1401.082).

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