

Chronic ankle instability treated with a periosteal flap augmentation: A case report

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World Journal of Advanced Research and Reviews, 2026, 30(02), 861-866

Publication history: Received on 04 April 2026; revised on 10 May 2026; accepted on 13 May 2026

Article DOI: <https://doi.org/10.30574/wjarr.2026.30.2.1320>

Abstract

Chronic lateral ankle instability is a common complication of ankle sprains and may lead to persistent pain, recurrent giving-way episodes, and functional impairment, with a progressive risk of cartilage damage and ankle osteoarthritis [2,3]. Although anatomical repair of the lateral ligament complex remains the gold standard surgical treatment, particularly through the modified Broström procedure, its limitations become apparent in longstanding or recurrent cases [4,5].

We report the case of a patient presenting with chronic lateral ankle instability that had evolved over several years, with symptomatic recurrence after a previous surgical procedure. Clinical examination revealed lateral laxity associated with mild hindfoot varus. Imaging studies, including standard and stress radiographs as well as magnetic resonance imaging (MRI), demonstrated a rupture of the anterior talofibular ligament (ATFL).

Ligament reinsertion reinforced with a pedicled periosteal flap was performed. Postoperative recovery was uneventful, with six weeks of immobilization followed by early functional rehabilitation.

At one-year follow-up, the clinical outcome was favorable, with resolution of pain, absence of instability episodes, and satisfactory ankle function on clinical examination, without postoperative complications.

Ligament augmentation using a pedicled periosteal flap represents a reliable anatomical surgical option for the management of chronic lateral ankle instability, particularly in longstanding or recurrent cases in which simple repair techniques may be insufficient [1,7,8].

Keywords: Chronic ankle instability; Anterior talofibular ligament (ATFL); Periosteal flap; Case report

1. Introduction

Lateral ankle sprain is one of the most common traumatic injuries of the musculoskeletal system, and its incidence remains high despite predominantly conservative initial management. It is estimated that 10% to 40% of patients develop chronic ankle instability following an acute ankle sprain, which may result from either a single severe trauma or repetitive low-grade injuries [1–3]. This instability may be functional, mechanical, or mixed, and its natural course exposes patients to an increased risk of chronic pain and secondary ankle osteoarthritis [4,5].

When conservative treatment fails, surgical management mainly relies on anatomical repair techniques of the lateral ligament complex, such as the modified Broström procedure, currently considered the gold standard technique [6,7]. However, in certain patients—particularly in cases of poor ligament quality, recurrence, or high functional demand—simple repair may be insufficient, thereby justifying the use of ligament augmentation techniques [8,9].

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Among these techniques, reconstruction using a pedicled periosteal flap harvested from the distal fibula represents an anatomical alternative employing local autologous tissue, allowing restoration of lateral stability without tendon harvest morbidity. Several studies have reported satisfactory functional outcomes, with high rates of stability and return to activity, including in patients with high functional demands [10–12].

We report a case of chronic ankle instability treated with ligamentoplasty using a pedicled periosteal flap, emphasizing the indications for this technique, the surgical procedure, and the short- and mid-term clinical outcomes.

2. Case Presentation

A 46-year-old housewife with no significant past medical or surgical history presented with chronic instability of the right ankle.

The patient's history dated back to 2008, when she sustained a neglected right ankle sprain following a supination injury. Since the initial trauma, she had experienced persistent mechanical pain during exertion, with progressively worsening symptoms characterized by increased pain while walking and the development of instability and giving-way sensations, significantly affecting activities of daily living. Appropriate conservative treatment had been undertaken, including proprioceptive rehabilitation, functional strapping, and use of an ankle brace, without lasting clinical improvement. An MRI performed in 2023 revealed chronic ligamentous lesions, leading to arthroscopic surgical management. In 2024, the patient experienced recurrence of symptoms, mainly consisting of pain during walking and subjective instability, prompting further evaluation.

Comparative clinical examination of both ankles demonstrated globally preserved range of motion in dorsiflexion and plantarflexion, without significant limitation. No gastrocnemius tightness was noted, as dorsiflexion was identical with the knee flexed and extended. Dynamic maneuvers revealed no peroneal tendon dislocation, and hindfoot mobility was preserved. Palpation demonstrated tenderness predominantly over the anterior talofibular ligament, without significant pain over the other ligament bundles, the sinus tarsi, or tendon pathways. Ligament testing revealed a positive anterior drawer test on the right side associated with varus laxity compared with the contralateral side, without evidence of generalized ligamentous hyperlaxity. Static foot examination demonstrated mild hindfoot varus without associated major deformity.



Figure 1 Clinical appearance

Paraclinical assessment included standard anteroposterior and lateral radiographs of the right ankle, which showed no acute bone lesions or advanced osteoarthritis. Dynamic varus-valgus stress radiographs demonstrated lateral laxity of the right ankle. A Méary view confirmed mild hindfoot varus



Figure 2 Ankle radiograph with Méary view **Figure 3** Dynamic varus-valgus stress radiographs

MRI of the right ankle demonstrated rupture of the anterior talofibular ligament without associated medial ligament injury or significant osteochondral or tendon lesions. These findings confirmed the diagnosis of chronic lateral instability of the right ankle and supported the indication for surgical treatment.



Figure 4 MRI showing rupture of the ATFL

Given the failure of conservative treatment and the objective clinical laxity, surgical management was indicated. The patient underwent capsuloligamentous retensioning reinforced with a pedicled periosteal flap harvested from the distal fibula.

Postoperatively, the right ankle was immobilized in a resin boot to protect the ligament repair. Immediate postoperative recovery was uneventful, with no local or systemic complications.

Immobilization was discontinued after six weeks without incident. Early and progressive functional rehabilitation was then initiated, focusing on restoration of joint range of motion, muscle strengthening, and proprioceptive training.

At one-year follow-up, the clinical outcome was favorable, with progressive pain relief, absence of giving-way episodes, and satisfactory ankle stability on clinical examination. The patient resumed independent walking without significant functional impairment in activities of daily living. No postoperative complications were observed.

2.1. Surgical Technique

The procedure was performed under regional anesthesia with the patient in the supine position. A pneumatic tourniquet was applied at the root of the right thigh. The lower limb was prepared and draped according to standard sterile procedures.

A lateral approach centered over the lateral malleolus was performed. Following dissection of the subcutaneous tissues, the lateral capsuloligamentous complex was exposed. Opening of the joint capsule allowed inspection of the tibiotalar joint, which revealed no macroscopically visible chondral lesions.

After identification of the anterior bundle, anatomical reinsertion of the anterior talofibular ligament (ATFL) at the fibular insertion site was performed, associated with capsuloligamentous retensioning.



Figure 5 Intraoperative appearance of the ATFL

2.2. Periosteal Flap Reconstruction Stage

A pedicled periosteal flap was harvested from the distal fibula. The flap was delineated using a scalpel according to the following landmarks:

- Proximally, 8 to 10 cm above the tip of the lateral malleolus;
- Anteriorly and posteriorly, along the anterior and posterior borders of the fibula while preserving ligament insertions;
- Distally, its fibular attachment was preserved and reinforced with two sutures in order to maintain its pedicled nature.

The thickness of the flap included the entire lateral malleolar fibrous periosteum.



Figure 6 Delineation of the periosteal flap

In this case of isolated ATFL injury, the periosteal flap was rotated 180° and used to reinforce the ATFL reinsertion while respecting its anatomical course. Lateral stability was assessed intraoperatively.



Figure 7 Rotation of the flap and reinforcement of the ATFL

Following irrigation and hemostasis, layered closure was performed. A sterile dressing was applied, followed by immobilization in a neutral position.

No intraoperative complications were reported.

3. Discussion

Chronic lateral ankle instability is a frequent complication of ankle sprains, particularly when initial management is inadequate or delayed. Despite appropriate conservative treatment, a significant proportion of patients develop persistent instability, leading to mechanical pain, recurrent giving-way episodes, and functional impairment in daily activities, with a progressive risk of cartilage lesions and long-term osteoarthritis [2,3].

Anatomical repair of the lateral ligament complex, particularly using the modified Broström technique, currently remains the gold standard surgical treatment for symptomatic chronic instability [4,5]. Although this technique generally provides good outcomes, its limitations have been reported in certain situations, especially in longstanding instability, recurrence following previous surgery, or poor ligament tissue quality [2,6]. In such cases, simple capsuloligamentous retensioning may be insufficient to provide durable stability.

Other surgical options have also been described, including anatomical and non-anatomical ligament reconstructions using tendon grafts. Although these techniques may provide satisfactory stabilization, they are associated with donor-site morbidity, potential alteration of ankle biomechanics, and are generally reserved for complex cases or failures of simple anatomical repair [6–8].

Ligament augmentation using a periosteal flap represents an interesting anatomical alternative for the management of chronic lateral ankle instability. This technique was initially described by Roy-Camille and later refined and widely disseminated by Mittlmeier and Rammelt in more recent publications [1,7]. It relies on the use of distal fibular periosteum harvested locally while preserving its pedicle, thereby maintaining vascularization and optimizing biological healing potential. Following anatomical repair or reinsertion of the anterior talofibular ligament, the periosteal flap is rotated and fixed to reinforce the ligament repair while respecting the anatomical ligament pathway.

This technique offers several advantages over tendon reconstructions. It provides ligament reinforcement without tendon sacrifice or donor-site morbidity. The autologous and local nature of the periosteum facilitates tissue integration and limits the risk of complications. Furthermore, the periosteum possesses osteofibrogenic biological potential that may promote healing and repair, which represents an advantage in chronic or recurrent cases where ligament quality is often compromised [1,7,8].

From a biomechanical standpoint, the periosteal flap acts as an augmentation procedure, reinforcing ligament repair without excessively stiffening the joint. It therefore provides satisfactory stability while preserving physiological ankle mobility, unlike non-anatomical techniques that may alter ankle biomechanics.

In the present case, several factors made this strategy particularly relevant: the chronicity of the instability, symptomatic recurrence after previous surgical treatment, MRI evidence of isolated ATFL rupture, and the presence of mild hindfoot varus, a recognized mechanical factor contributing to ankle instability [2,3]. The choice of ligament reinsertion reinforced with a periosteal flap therefore allowed restoration of lateral stability while respecting anatomy and avoiding a more invasive tendon reconstruction.

The postoperative management used in this case, combining six weeks of immobilization followed by early and progressive functional rehabilitation, is consistent with current literature data suggesting that limited immobilization associated with early functional recovery provides better outcomes than prolonged immobilization [9].

The favorable clinical outcome observed in this patient, characterized by pain resolution, absence of recurrent instability, and satisfactory functional recovery, further supports the value of this combined therapeutic strategy.

This study has certain limitations, mainly related to the isolated nature of the reported case and the absence of comparison with other surgical techniques. Nevertheless, the one-year clinical follow-up allows assessment of the durability of the result over time, with sustained favorable evolution. This case therefore illustrates the usefulness of ligament augmentation using a pedicled periosteal flap as a reliable anatomical option in carefully selected cases of chronic lateral ankle instability.

4. Conclusion

Chronic lateral ankle instability is a common condition that may lead to persistent pain, functional instability, and impaired quality of life when inadequately treated. Although anatomical repair of the lateral ligament complex remains the reference treatment, its limitations become apparent in longstanding or recurrent cases. In such situations, ligament augmentation using a pedicled periosteal flap represents an anatomical surgical alternative capable of restoring ankle stability without tendon-related morbidity. The present case, with a favorable one-year clinical outcome, highlights the value of this technique in carefully selected indications and supports its place within the therapeutic armamentarium of the orthopedic surgeon.

Compliance with ethical standards

Acknowledgments

The authors would like to thank the medical and nursing staff involved in the management of the patient.

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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