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Case Report

Semitendinosus Tendon Reconstruction for Recurrent Acromioclavicular Joint Instability Following Repeated Fixation Failure and Postoperative Trauma: A Case Report

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ABSTRACT

Recurrent instability following surgical treatment of Rockwood type III acromioclavicular (AC) joint injuries is uncommon but represents a challenging clinical problem, particularly after repeated fixation failure. A 67-year-old man presented with a Rockwood type III AC joint separation following a same-level fall. Initial suture-button fixation failed 45 days postoperatively. Revision hook plate fixation subsequently failed after a further traumatic event, and a third procedure involving rigid AC stabilization with dual plating also resulted in early mechanical failure. Definitive treatment was achieved using biologic reconstruction with a semitendinosus tendon autograft combined with coracoacromial ligament transfer. At 1-year follow-up, radiographs demonstrated maintained reduction of the AC joint, and the patient regained satisfactory shoulder function with full return to daily activities. This case highlights the potential role of semitendinosus tendon reconstruction as a salvage strategy following repeated fixation failure. In such complex revision settings, durable outcomes may depend not only on restoring mechanical stability but also on preserving the biological environment necessary for successful healing.

Introduction

The acromioclavicular (AC) joint is a diarthrodial articulation formed between the distal clavicle and the acromial process of the scapula. Its stability depends on a combination of static and dynamic restraint mechanisms.[1] The AC ligament complex (superior, inferior, anterior, and posterior) functions as a capsular stabilizer, while the coracoclavicular (CC) ligaments (trapezoid and conoid) provide vertical support. Together, these structures constitute the primary static stabilizers of the AC joint, with additional dynamic support provided by the trapezius and deltoid muscles.[2]

Acromioclavicular joint dislocations are common shoulder girdle injuries, particularly in young and physically active individuals. They account for approximately 9% of shoulder injuries and commonly result from contact sports or high-energy trauma.[3] The Rockwood classification is the most widely used system for AC joint injuries, ranging from mild ligament sprains (Type I) to severe displacement with soft-tissue disruption (Type VI). While low-grade injuries (Types I–II) are usually treated nonoperatively, the optimal management of higher-grade lesions (Types III–VI) remains controversial.[4]

Although numerous operative techniques have been proposed for the management of acute, high-grade AC joint separations, no single technique has emerged as the standard treatment.[5] Current surgical options include anatomical fixation and various CC stabilization methods such as CC screws, suture constructs, Kirschner wires, hook plates, and suture-button systems. However, these mechanical methods are associated with complications including hardware failure or migration, loss of reduction, inadequate reduction, and iatrogenic coracoid or clavicle fractures.[6] In recent years, anatomical reconstruction using free tendon grafts has gained increasing attention, as several studies have demonstrated superior biomechanical stability and more favorable clinical outcomes and lower complication rates compared with isolated fixation techniques.[7]

Recurrent instability after AC joint fixation is a rare but challenging complication, especially following repeated fixation failure. In such cases, biologic tendon graft reconstruction may restore CC stability.[8]

The aim of this report is to highlight the potential impact of serial fixation failures on the local healing environment and to discuss biologic tendon reconstruction as a salvage strategy in complex revision settings.

Case presentation

A 67-year-old man with no significant medical history presented 1 day after a same-level fall with acute right shoulder pain and a visible prominence over the AC joint.

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On physical examination, the distal clavicle was prominent and caused irritation of the overlying skin, contributing to the patient's cosmetic concerns. Findings indicated combined vertical and horizontal instability, including increased anteroposterior mobility of the distal clavicle. Based on these findings, the injury was classified as a functionally unstable Rockwood type IIIB pattern (Figure 1A), for which surgical treatment may be considered in selected patients.

He was right-hand dominant and worked in a pharmacy, requiring frequent and active use of the right upper extremity for tasks such as stocking and handling medications. He expressed a desire for an early return to work. Following the injury, he reported significant shoulder pain, functional limitation, and dissatisfaction with the cosmetic deformity. Considering these factors, surgical treatment was recommended and subsequently performed. Body mass index was 29.1 kg/m^2, and there was no history of smoking or osteoporosis.

Surgical treatment was performed 3 days after the initial injury. Coracoclavicular stabilization was achieved using a TightRope system. Under fluoroscopic guidance, the clavicular entry point was identified for coracoclavicular tunnel placement. A mini horizontal incision was made over the clavicle, and a second incision was made over the palpable coracoid process. A 1.6-mm K-wire was advanced from the clavicle toward the coracoid process, followed by the creation of clavicular and coracoid tunnels using a 4.5-mm drill.

Using transport sutures, the acromioclavicular joint was reduced. One implant was positioned beneath the coracoid process and the other over the clavicle, after which the sutures were secured over the clavicle (Figure 1B).

No known diagnosis of osteoporosis was present; however, intraoperative assessment suggested relatively poor bone quality. Adequate soft-tissue coverage was observed around the acromioclavicular joint at the time of surgery. The early postoperative course was uneventful, but approximately 45 days later, pain and deformity developed after the patient experienced a "popping" sensation while reaching overhead at work. Radiographs confirmed fixation failure with loss of AC joint reduction (Figure 2A). Failure may also have been influenced by subtle variations in tunnel positioning, limited initial fixation stability, and compromised bone quality.

Approximately 50 days after the initial procedure, revision surgery was performed due to symptomatic loss of reduction. Hook plate fixation was applied to restore AC joint stability (Figure 2B). Intraoperative assessment confirmed satisfactory reduction without residual instability.

HIGHLIGHTS

- Conservative treatment should remain the first-line approach for many Rockwood type III injuries, particularly in patients without significant horizontal instability or high functional demands.
- Recurrent acromioclavicular joint instability after multiple fixation failures represents a complex and challenging clinical problem.
- Serial fixation failures and repeated surgical interventions may compromise soft-tissue healing and the local biological environment.
- In revision settings where further mechanical fixation is unlikely to succeed, biologic tendon reconstruction may represent a useful salvage option.
- Successful outcomes may depend on addressing both mechanical stability and the biological environment, particularly in revision settings.

However, 1 week after surgery, he presented again following a same-level backward fall on a wet surface. Radiographs demonstrated displacement of the hook plate and recurrent AC joint dislocation (Figure 3A). Possible contributors to failure included limited compliance with postoperative protection protocols and a mismatch between the mechanical properties of the fixation construct and the local biological environment. Subtle horizontal instability not evident during intraoperative assessment may also have contributed to recurrent failure, despite restoration of vertical stability.

After hook plate failure, recurrent pain and deformity occurred, and a third surgery was performed 10 days later with hook plate removal and rigid AC stabilization using dual plating (Figure 3B and 3C). No bone graft was applied to the AC joint. As no significant soft-tissue deficiency was observed around the AC joint, healing through fibrosis was considered adequate. Additionally, bone grafting was avoided to minimize potential donor-site morbidity. The primary goal of the procedure was rigid mechanical stabilization of the AC joint, particularly given the history of multiple failed fixation attempts. Intraoperative assessment after fixation demonstrated satisfactory construct stability during shoulder motion testing.

No postoperative complications occurred after the rigid AC stabilization procedure, and the patient was discharged; however, 5 days later, he presented with shoulder pain and deformity without any history of new trauma or excessive physical activity. Radiographs demonstrated early mechanical failure, with separation of the plates and screws from the bone (Figure 3D). This failure pattern may have reflected the combined effects of compromised bone quality and repeated surgical interventions on the local biological environment, potentially compromising both fixation stability and healing capacity. In addition, factors related to plate positioning, screw fixation, and bone quality may also have contributed to the early mechanical failure observed in this case.

Salvage biologic reconstruction was planned, and definitive reconstruction was performed under general anesthesia in the beach-chair position. A semitendinosus autograft was harvested, previous hardware was removed, and the AC joint was debrided with distal clavicle resection. The coracoacromial ligament was mobilized for transfer, and clavicular tunnels were created. The semitendinosus graft with suture tape was passed beneath the coracoid, and the coracoacromial ligament suture was passed through the clavicle (Figure 4A).

The semitendinosus autograft and suture tape were passed through the clavicular tunnel, and AC joint reduction was achieved using nonabsorbable suture tape. The graft was secured using the shoelace technique. A 1.5-mm Kirschner wire tunnel was created in the acromion to reconstruct the superior AC ligament with the remaining graft. The graft was covered with fascia, and the wound was closed in layers (Figure 4B and 4C).

Postoperatively, the shoulder was immobilized in a sling for 3 weeks, after which pendulum exercises were initiated. By the fourth week, full passive range of motion without weight bearing was permitted. Active range-of-motion exercises commenced after the sixth postoperative week.

One-year follow-up radiographs demonstrated maintained joint reduction with no evidence of recurrent instability (Figure 5A). At the 1-year follow-up, the patient reported no limitations in daily

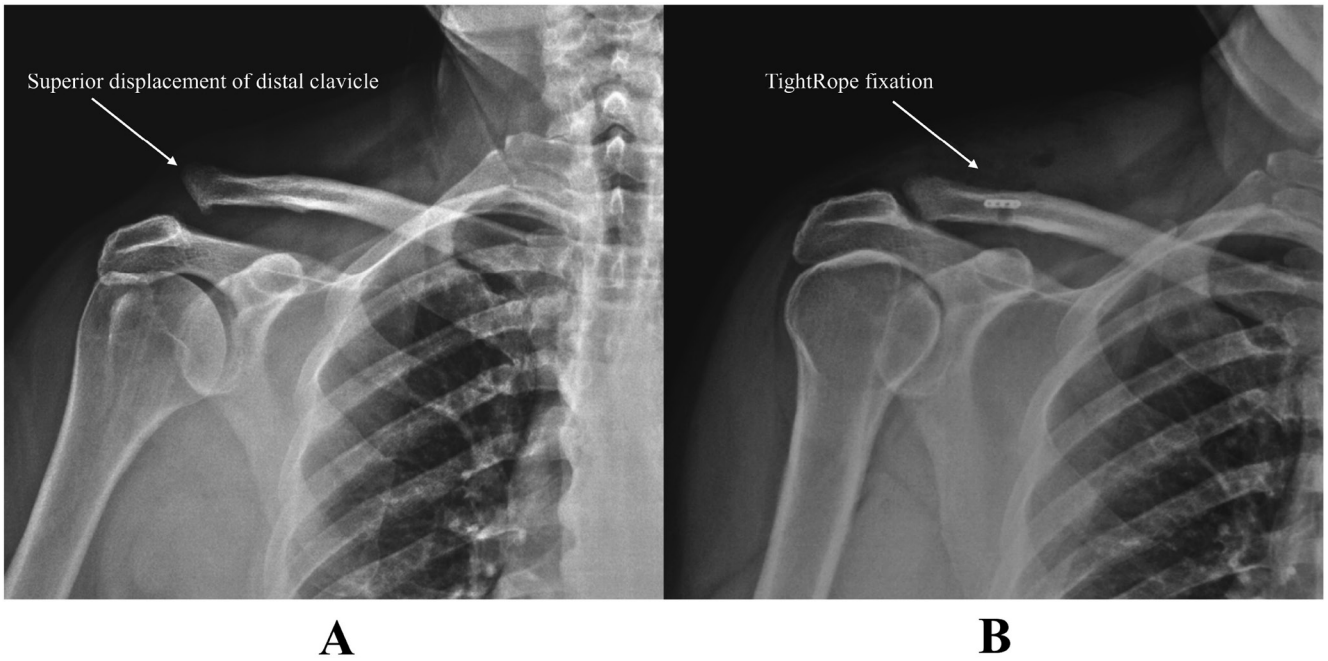

Figure 1. (A) Preoperative radiograph demonstrating superior displacement of the distal clavicle consistent with acromioclavicular joint instability. (B) Early postoperative radiograph following TightRope coracoclavicular fixation demonstrating reduction of the acromioclavicular joint.

activities, and shoulder range-of-motion measurements demonstrated forward flexion of 170°, abduction of 165°, internal rotation of 60°, and external rotation of 80° (Figure 5B). At the latest follow-up evaluation, he demonstrated satisfactory shoulder function with a Constant score of 92 points, a Disabilities of the Arm, Shoulder and Hand (DASH) score of 9, and a Visual Analog Scale (VAS) pain score of 1/10, without recurrent instability or significant functional limitation.

Chronological clinical events and surgical interventions are summarized in Figure 6.

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Discussion

Management of Rockwood type III AC joint dislocations remains controversial. Recent evidence suggests that operative and conservative treatments provide comparable long-term functional outcomes. In a recent meta-analysis, Xie et al[9] reported that surgical treatment was associated with a higher incidence of complications, including hardware-related problems and posttraumatic osteoarthritis, despite similar functional outcomes compared with conservative management.

Various surgical techniques have been described for the treatment of AC joint separations, including CC fixation, autologous ligament reconstruction, hook plate fixation, and Endobutton fixation. However, each technique has specific limitations and potential

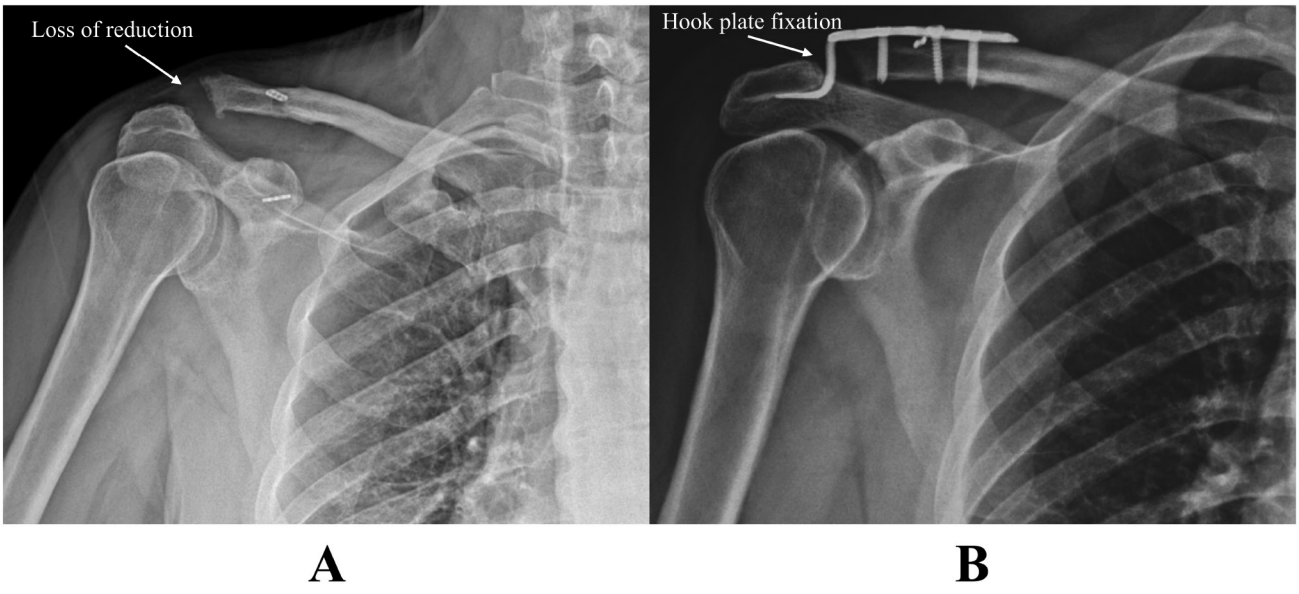

Figure 2. (A) Radiograph demonstrating loss of reduction after TightRope fixation. (B) Postoperative radiograph following revision surgery with hook plate fixation.

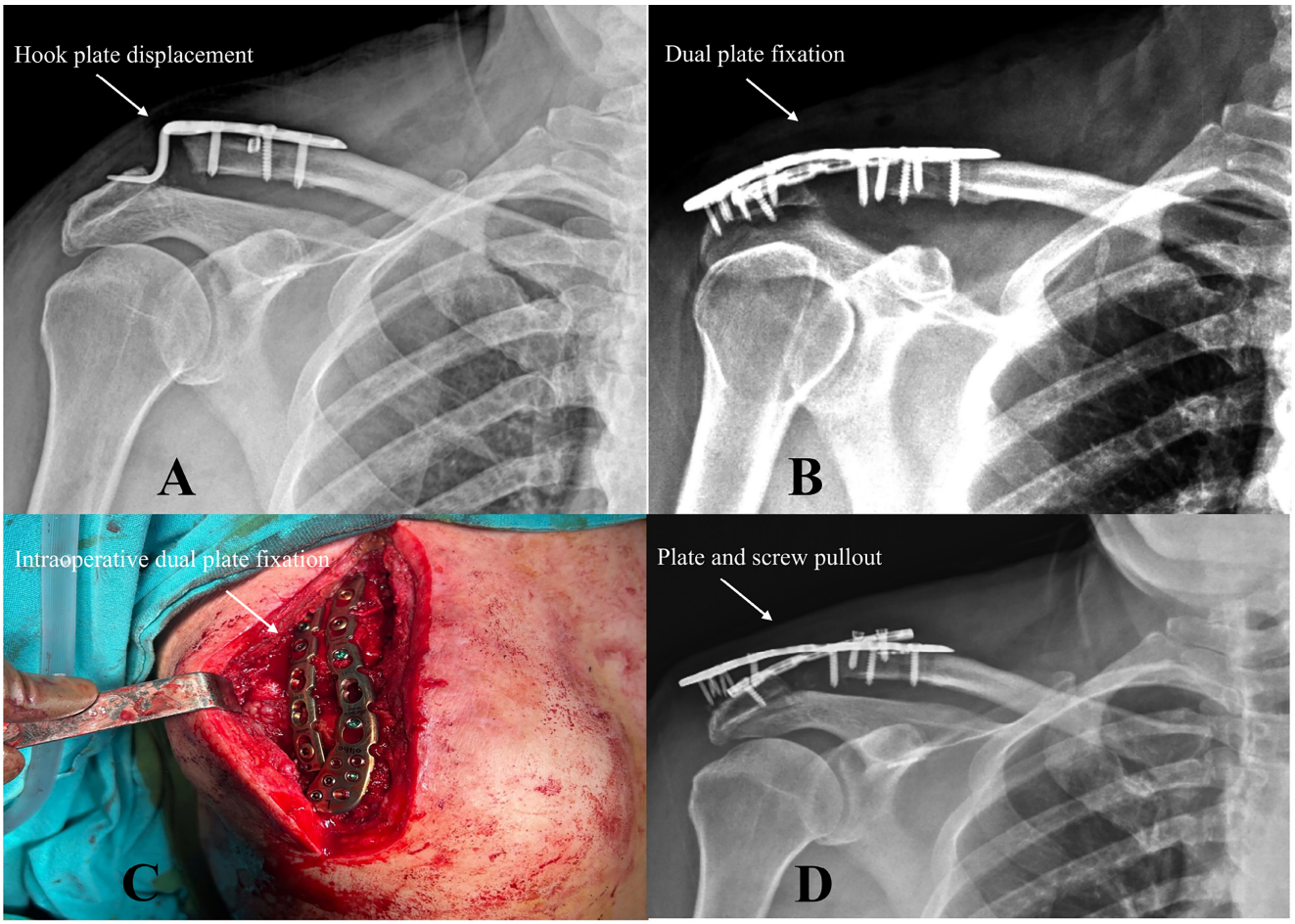

Figure 3. (A) Radiograph demonstrating hook plate displacement and recurrent acromioclavicular joint dislocation after postoperative trauma. (B) Radiograph showing rigid acromioclavicular stabilization with dual plate fixation. (C) Intraoperative image demonstrating rigid acromioclavicular stabilization with dual plate fixation. (D) Follow-up radiograph demonstrating early mechanical failure with plate and screw pullout.

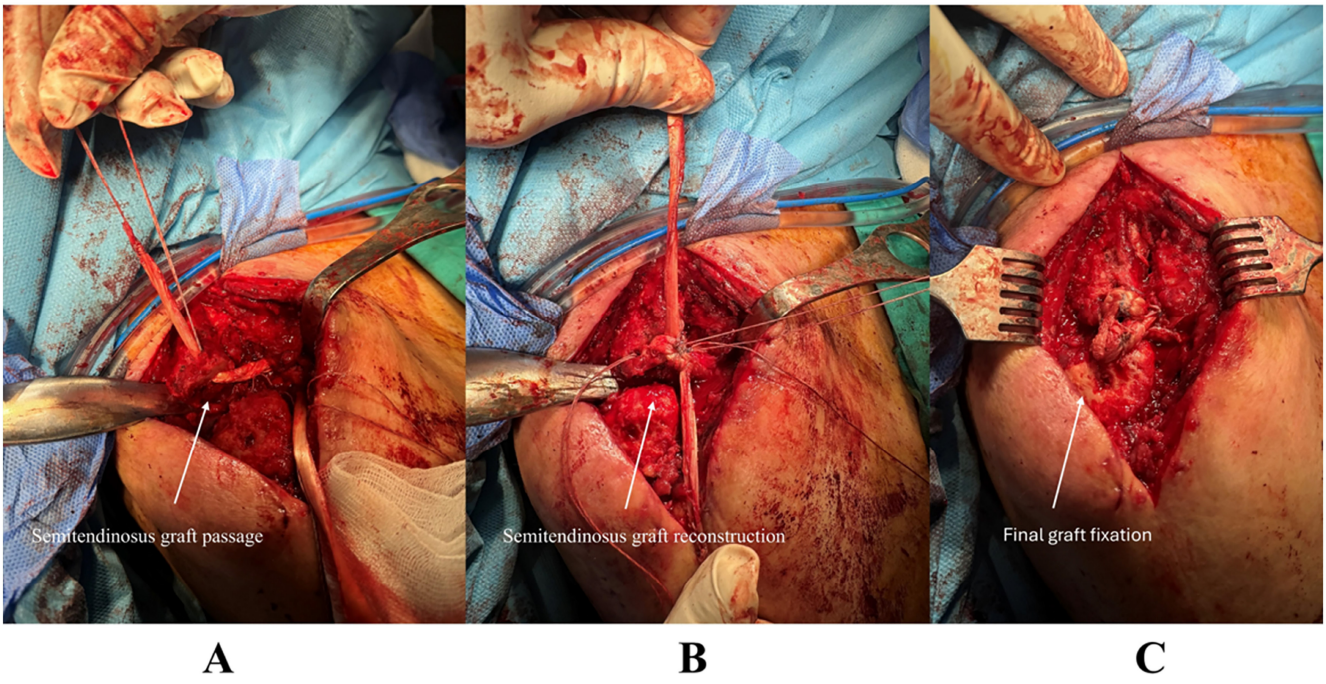

Figure 4. (A) Intraoperative image demonstrating passage of the semitendinosus tendon graft beneath the coracoid process. (B) Intraoperative image showing semitendinosus tendon graft reconstruction of the acromioclavicular joint. (C) Intraoperative image demonstrating final graft fixation after reconstruction.

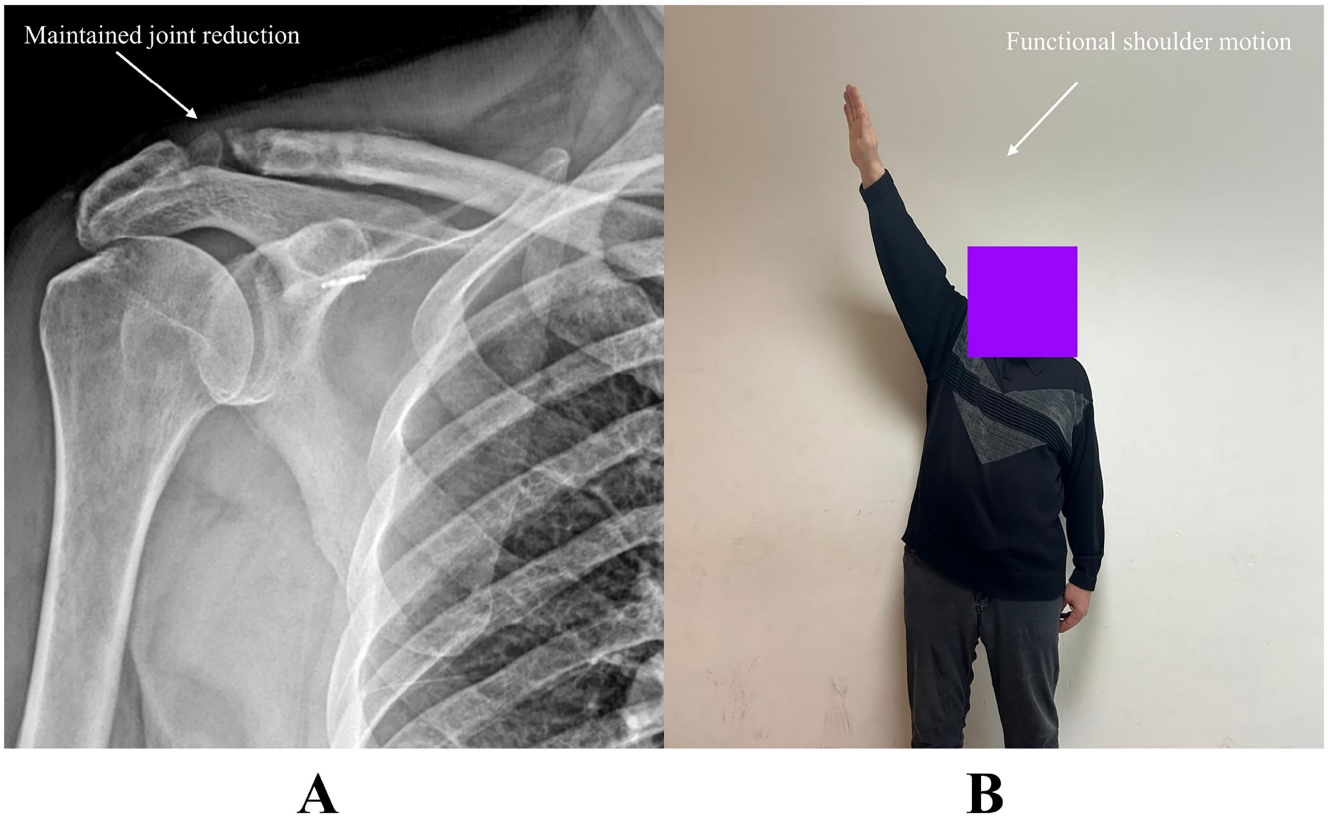

Figure 5. (A) One-year follow-up radiograph demonstrating maintained acromioclavicular joint reduction without recurrent instability. (B) Clinical photograph demonstrating satisfactory functional shoulder motion at the latest follow-up evaluation.

complications, such as hardware-related problems, insufficient stability, technical complexity, prolonged recovery, and donor-site morbidity. Therefore, achieving optimal and consistent outcomes remains challenging.[10]

Although hook plate fixation has been widely used in the treatment of AC joint dislocations, it may lead to complications such as subacromial impingement, acromial erosion, rotator cuff tears, pain, and plate migration. In contrast, the TightRope system provides vertical

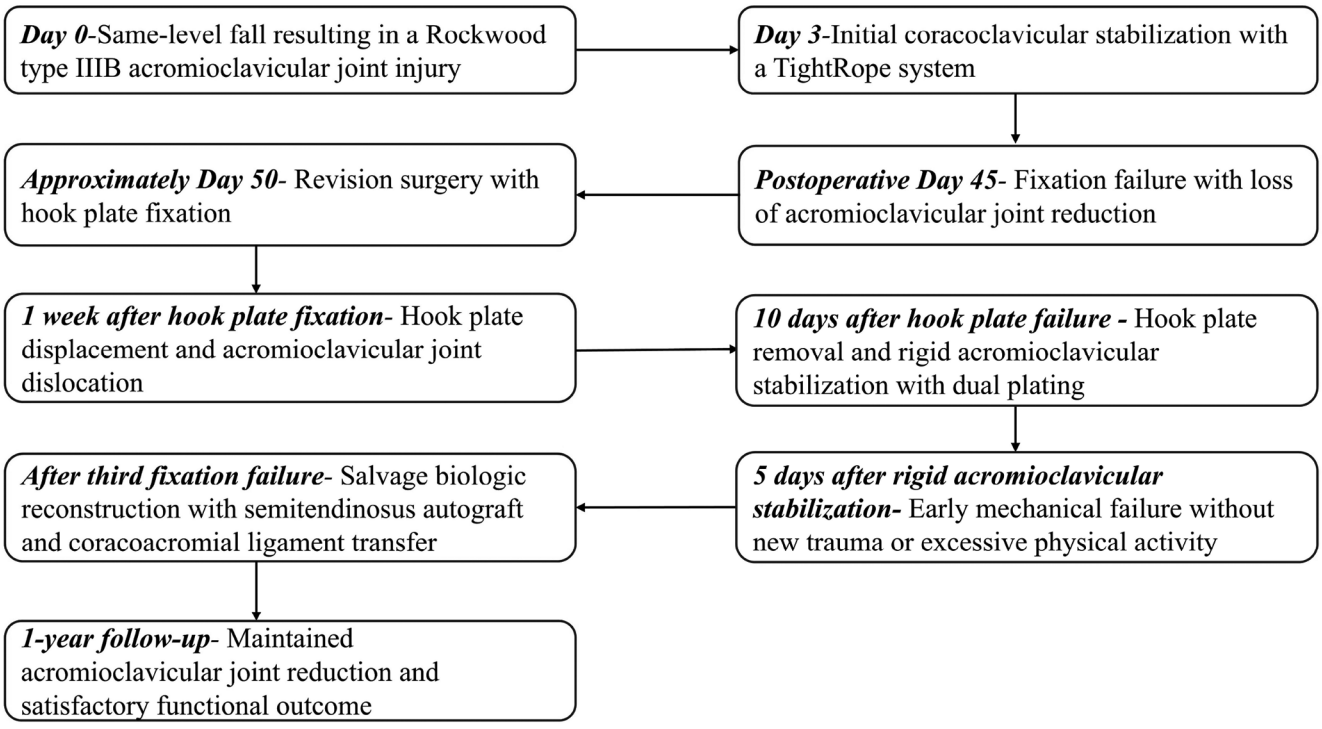

Figure 6. Timeline summarizing the chronological clinical course, recurrent fixation failures, revision procedures, and final salvage biologic reconstruction performed for recurrent acromioclavicular joint instability.

and indirect horizontal stability by restoring CC ligament function and has been reported as an effective treatment option with favorable clinical and radiographic outcomes and low complication rates.[11] In the present case, TightRope fixation was selected as the initial surgical treatment because of its minimally invasive nature, favorable biomechanical properties, and lower complication profile compared with hook plate fixation.

Autologous tendon graft reconstruction has been reported as an effective option for chronic and revision AC joint instability because of its favorable biomechanical properties and lower rates of recurrent failure.[12] Saccomanno et al[13] demonstrated significant clinical and radiological improvement after anatomic CC and AC ligament reconstruction using a semitendinosus tendon graft. Similarly, Jildeh et al[14] emphasized the importance of addressing both vertical and horizontal instability in revision settings and supported biologic tendon graft reconstruction after failed fixation. In the present case, semitendinosus tendon graft reconstruction was selected after recurrent fixation failure to restore joint stability.

Karia et al[15] reported a case of recurrent AC joint dislocation associated with an iatrogenic coracoid fracture after 2 failed AC joint reconstructions using a synthetic ligament. The patient was successfully treated with autologous hamstring graft reconstruction protected with a hook plate, further supporting biologic graft reconstruction as a salvage option after failed AC joint stabilization.

In the current case, multiple surgical procedures were performed within a short period. Importantly, the mechanisms underlying the repeated fixation failures in this case are likely multifactorial and should not be attributed solely to postoperative trauma or patient-related factors. From a technical perspective, subtle variations in tunnel positioning, reduction quality, implant placement, and the mechanical characteristics of the fixation constructs may have influenced biomechanical stability. In addition, bone quality may have played a role, particularly in the context of fixation strength and resistance to cyclic loading.

From a biological standpoint, the absence of significant soft-tissue deficiency does not exclude the potential impact of repeated surgical interventions on the local biological environment. Repeated procedures performed within a short time frame may compromise vascularity, tissue integrity, and healing capacity. Therefore, the pattern of failure observed in this case likely reflects a complex interaction between mechanical, biological, and patient-related factors rather than a single isolated cause. However, these potential biological mechanisms remain speculative, as no objective biological assessment was performed in the present case.

In addition, cyclic loading and construct fatigue may have contributed to the recurrent failures observed in this case. Repetitive shoulder motion and continuous mechanical stress can gradually compromise fixation constructs through suture loosening, tunnel widening, micromotion, and implant fatigue, even in the absence of major trauma. These effects may be particularly relevant in functionally unstable type IIIB injuries, in which isolated fixation constructs may not sufficiently control horizontal and rotational instability. Horizontal instability has been increasingly recognized as an important factor influencing clinical outcomes after AC joint stabilization. Aliberti et al[16] reported that horizontal instability is frequently underdiagnosed and that many currently available surgical techniques primarily address vertical instability, potentially leaving the horizontal component insufficiently controlled. Inadequate restoration of horizontal stability may contribute to persistent symptoms, recurrent deformity, and failure after surgical stabilization. In the present case, subtle horizontal instability that was not evident during intraoperative assessment may also have contributed to recurrent fixation failure. Furthermore, purely mechanical fixation techniques primarily rely on implant integrity until biological healing occurs, whereas tendon graft reconstruction may facilitate biological incorporation and contribute to long-term ligamentization. In the present case, biologic semitendinosus tendon reconstruction may have provided more durable stability after repeated failure of isolated mechanical fixation procedures.

The treatment sequence in this case also reflects the complexity of decision-making in recurrent AC joint instability. Although non-operative treatment is commonly recommended for many Rockwood type III injuries, the initial decision for surgery was based on the patient's dominant-arm involvement, high functional demands, clinically significant horizontal instability, cosmetic concerns, and desire for early return to work. Following each subsequent failure, revision strategies were selected according to the predominant clinical problem at that stage, including restoration of mechanical stability after loss of reduction and, ultimately, biologic reconstruction after repeated construct failures.

Recent evidence further supports the role of biologic reconstruction techniques in the management of complex AC joint instability. Bascı et al[17] demonstrated that combined coracoclavicular ligament and transacromial capsule reconstruction provided favorable clinical and radiological outcomes while improving both vertical and horizontal stability in patients with chronic AC joint instability. Similarly, the current case supports biologic semitendinosus tendon reconstruction as an effective salvage strategy after repeated fixation failure in complex revision settings.

Unlike previously reported cases, sequential failure of multiple distinct fixation constructs occurred within a short period in the present case, suggesting that repeated revision procedures themselves may contribute to progressive biological compromise. To the best of the authors' knowledge, reports describing this pattern of recurrent failure are very limited in the current literature.

Conclusion

This case highlights the complexity of recurrent AC joint instability after serial fixation failures. In complex revision settings, biologic tendon reconstruction may represent an effective salvage option, particularly when repeated mechanical fixation procedures fail to restore durable stability. Successful management may depend not only on mechanical stabilization but also on preservation of the biological healing environment.

Several limitations should be acknowledged, including the single-case design, relatively short follow-up duration, and limited generalizability of the findings. In addition, objective functional outcome scores were not available during the initial postoperative period and were obtained only at the latest follow-up evaluation. Nevertheless, the present case may provide useful clinical insight into the management of complications and salvage strategies following failed acromioclavicular joint stabilization procedures.

Data Availability Statement: The data that support the findings of this study are available on request from the corresponding author.

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Informed Consent: Written informed consent was obtained from the patient who agreed to take part in the study.

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