

Chronic Acromioclavicular Joint Instability: Results After Stabilization Without Tendon Graft

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1. Introduction

Low-grade acromioclavicular joint (ACJ) injuries (Rockwood types I and II) are routinely treated conservatively, whereas high-grade injuries (Rockwood types IV–VI) are generally managed surgically [4,20]. The optimal treatment strategy for Rockwood type III injuries remains controversial, with both conservative and surgical approaches yielding acceptable results in selected patients [1,5,6].

Despite appropriate initial management, a relevant proportion of patients develops persistent pain, functional impairment, and dissatisfaction due to chronic instability of the ACJ [1,2]. Chronic instability may lead to scapular dyskinesia, loss of shoulder strength, and limitations in sporting and occupational activities [8,9]. In such cases, secondary surgical stabilization may be indicated [3,4].

A time interval of approximately 3–6 weeks after injury is commonly used to define the transition from an acute to a chronic situation [5,6,21]. In chronic ACJ instability, the intrinsic healing potential of the coracoclavicular (CC) ligament complex is assumed to be limited. Consequently, surgical strategies for chronic cases have traditionally differed from those used in the acute setting.

Historically, ligament transfer procedures such as the Weaver–Dunn technique were used for chronic ACJ reconstruction [24]. More recently, anatomical reconstructions using autologous or allogeneic tendon grafts—most commonly the semitendinosus or gracilis tendon—have gained widespread acceptance [2,7,10]. These techniques are supported by biomechanical studies demonstrating superior initial stability compared to non-biological constructs [22,23,26,27].

However, clinical outcome studies have not consistently demonstrated superior functional results following graft-based reconstructions compared with less invasive techniques [7,28]. Furthermore, tendon grafting is associated with increased surgical complexity, donor-site morbidity, prolonged operative time, and

higher costs [11–15]. Given these considerations, the necessity of routine tendon graft use in all chronic ACJ instabilities deserves critical evaluation.

The purpose of the present study was therefore to analyze clinical and radiological outcomes following surgical stabilization of chronic ACJ instability without tendon graft augmentation and to question whether grafting is truly required to achieve satisfactory mid-term results.

2. Materials and Methods

2.1. Study Design and Patient Selection

This retrospective case series included all patients who underwent surgical treatment for symptomatic chronic ACJ instability at our institution between October 2008 and November 2017. Inclusion criteria were:

1. Chronic symptomatic ACJ instability following initial conservative treatment, and
2. A minimum interval of eight weeks between injury and surgical intervention.

Sixteen consecutive patients fulfilled the inclusion criteria. Thirteen patients were available for complete clinical and radiological follow-up. Two patients were followed via video consultation due to excessive travel distance, and one patient was lost to follow-up because of psychiatric illness.

At the time of injury, the mean patient age was 43.2 years (range 17–75 years). At final follow-up, the mean age was 46.6 years (range 23–77 years).

2.3. Surgical Technique

All procedures were performed by the senior author. Diagnostic shoulder arthroscopy was initially conducted to exclude associated intra-articular pathology. No relevant intra-articular lesions were detected.

Coracoclavicular stabilization was performed using a mini-open technique comparable to the MINAR® system (Karl Storz, Tuttlingen, Germany) [16]. A skin incision of approximately 5 cm

was made from the lateral clavicle toward the coracoid process. The deltotraperzoidal fascia was incised longitudinally, and the coracoid process was exposed.

Fibrotic tissue between the clavicle and coracoid was debrided to promote tissue regeneration. Two trans clavicular drill holes (2.5 mm) and one trans coracoidal drill hole (3.5 mm) was created. A cortical button system (Arthrex, Naples, FL, USA) was shuttled through the drill channels and secured beneath the coracoid and on top of the clavicle using FiberWire® sutures.

Following reduction, additional acromioclavicular stabilization was achieved by temporary trans fixation with two 1.8–2.0 mm K-wires, which were anchored biotically in the clavicle. The deltotraperzoidal fascia was reconstructed as thoroughly as possible.

2.4. Postoperative Management

Postoperatively, the arm was immobilized in a shoulder abduction brace for three weeks. Passive, pain-adapted range-of-motion exercises were initiated early. Load bearing was limited to 4 kg for ten weeks. After ten weeks, the K-wires were removed under local anaesthesia, and unrestricted range of motion was gradually permitted. Sports and heavy labour were avoided until five months postoperatively.

2.5. Outcome Measures

Clinical and radiological outcomes were assessed using the Acromioclavicular Joint Instability Score (ACJIS) [17], the Taft Score (TS) [18], and the Subjective Shoulder Value (SSV) [19]. Radiological evaluation included panoramic stress views with 5 kg load and Alexander views to assess vertical and horizontal stability.

3. Results

3.1. Patient Characteristics and Follow-Up

Mean time from injury to surgical stabilization was 46.5 weeks (range 8-130 weeks). Thirteen patients were available for full follow-up at a mean of 51.1 months (range 12-124 months).

Six patients initially sustained Rockwood type V injuries, two had type IV injuries, four had type III injuries (type IIIB according to ISAKOS), and one patient had a type II injury.

3.2. Clinical Outcomes

At final follow-up, eleven patients reported no pain in the operated ACJ. One patient reported mild pressure-related discomfort, and one patient reported load-dependent pain. No patient reported pain at rest.

Range of motion of the operated shoulder was comparable to the contralateral side in all patients. Mean active flexion was 172°, mean abduction 170°, and mean external rotation 68°. All patients returned to their pre-injury level of daily activity, and sporting activities were resumed in all cases.

3.3. Radiological Outcomes

Postoperative radiographs demonstrated good vertical stability in the majority of patients. A vertical displacement of less than 10% compared to the contralateral side was observed in seven patients. Four patients showed a displacement of 10–25%, and two patients showed a displacement of 25-100%.

Horizontal stability assessed in the Alexander view was restored in eight patients. One patient showed displacement of less than one clavicular shaft width, and four patients demonstrated posterior displacement exceeding one shaft width. These findings did not correlate with clinical symptoms or functional impairment.

3.4. Scores

The mean ACJIS was 85.5 points (range 63–100). The mean Taft Score was 11.1 points (range 7–12). The mean Subjective Shoulder Value was 87%.

3.5. Complications

No intraoperative or postoperative complications were observed. No revision surgeries were required.

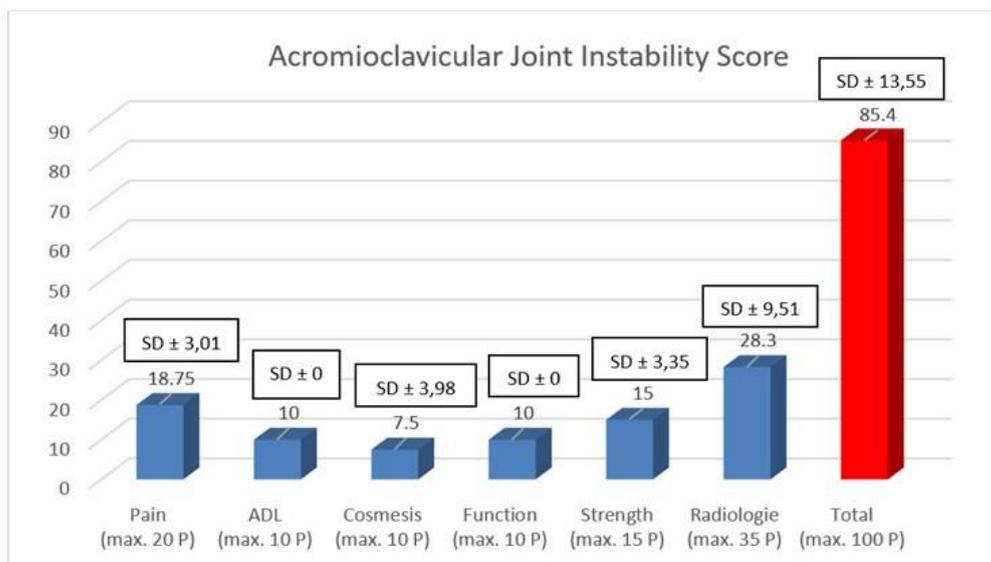


Diagram 1: Results without tendon graft in the Acromioclavicular Joint Instability Score (AJIS).

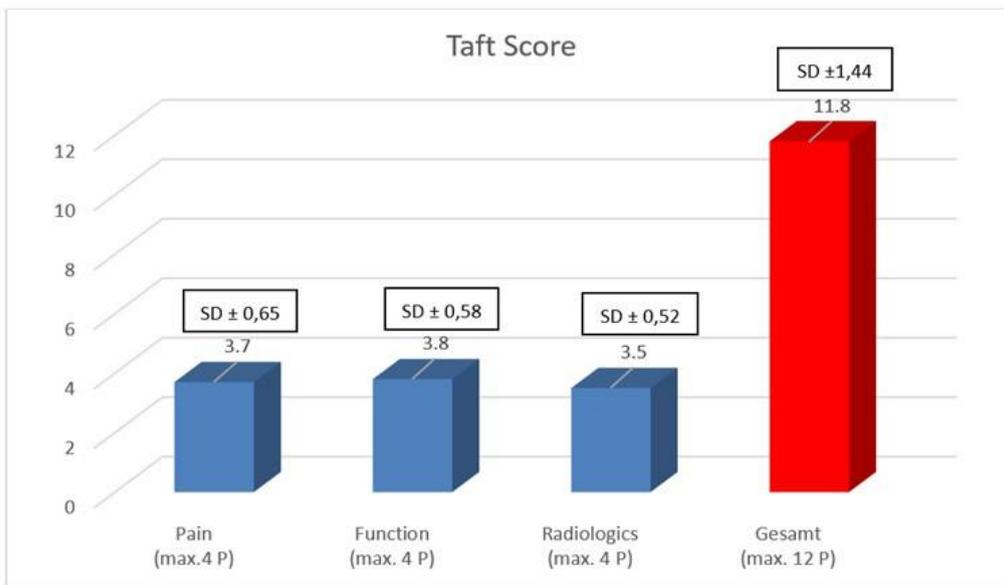


Diagram 2: Results without tendon graft in the Taft-Score.

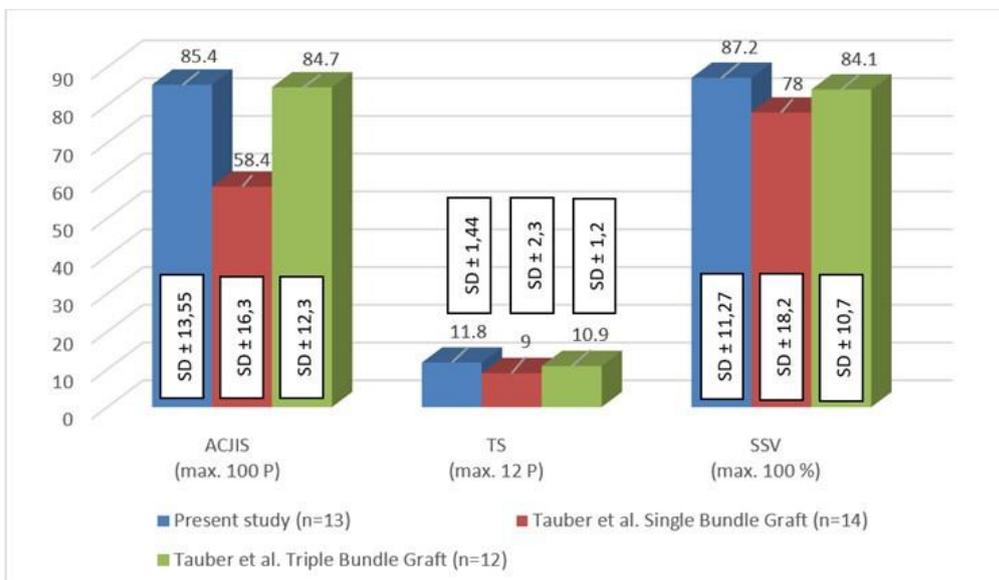


Diagram 3: Comparison of postoperative results of stabilization of chronic ACJ instabilities without tendon graft (blue) vs. results with tendon graft (red and green).

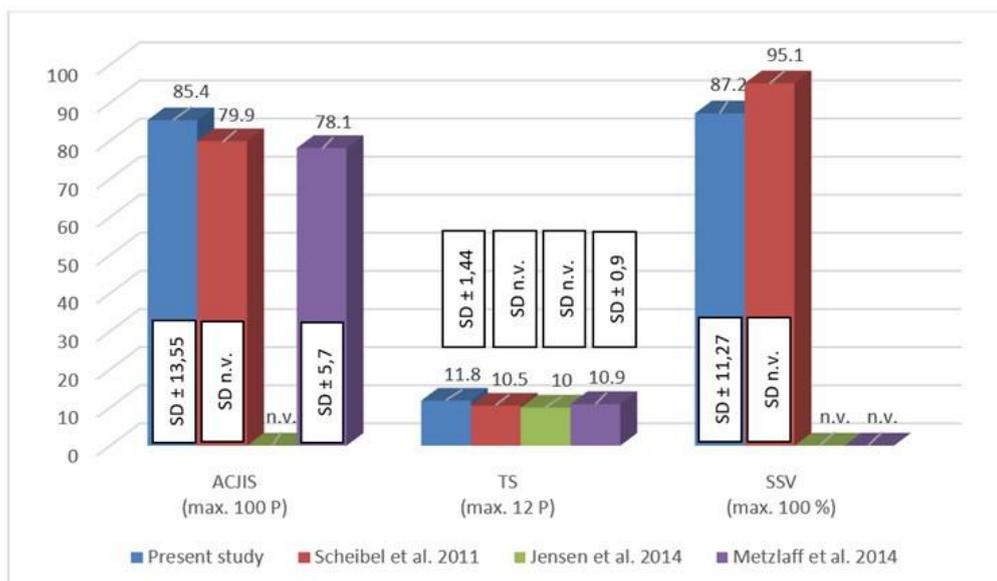


Diagramm 4: Postoperative results of chronic vs. acute ACJ stabilizations, both without graft.

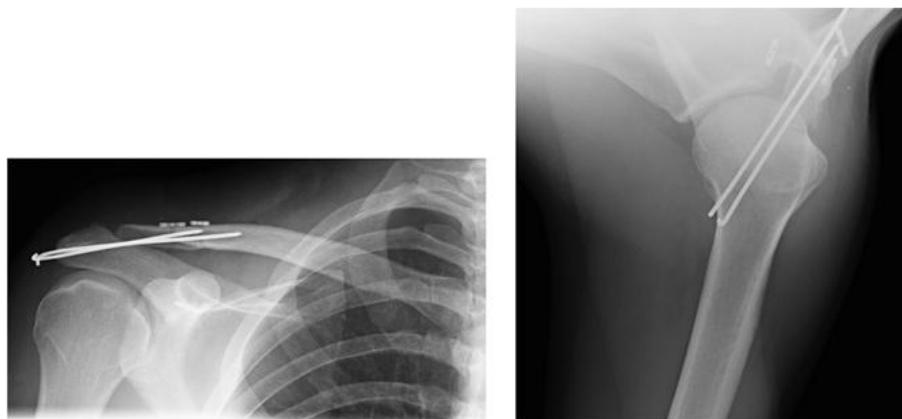


Figure 1: Postoperative evaluation with correctly inserted endobuttons and K-wires in a.p. and axial projection.



Figure 2: Panorama view under load of both upper extremities with 10 kg each; 8 years postoperatively with regular acromioclavicular alignment.

4. Discussion

The principal finding of the present study is that satisfactory functional and radiological outcomes can be achieved in patients with chronic acromioclavicular joint (ACJ) instability without the use of a tendon graft. This finding directly challenges the prevailing concept that biological graft augmentation is mandatory once a chronic situation has been established [2,7,10].

4.1. Biological Rationale and Chronicity

In the literature, a time interval of approximately 3-6 weeks after injury is commonly used to define the transition from an acute to a chronic ACJ injury [5,6,21]. After this period, intrinsic healing of the coracoclavicular (CC) ligament complex is assumed to be limited, and surgical strategies are typically modified accordingly. This assumption has led to the widespread recommendation of ligament transfer procedures or anatomical reconstructions using tendon grafts in chronic cases [2,7,10,24].

However, direct clinical evidence proving the absence of biological healing potential in chronic ACJ instability is lacking. Experimental studies on ligament regeneration are largely derived from knee joint models and cannot be directly transferred to the ACJ or CC ligament complex [21]. To date, no human studies have conclusively demonstrated that residual CC ligament tissue or surrounding soft tissues are incapable of contributing to secondary stabilization after surgical debridement and mechanical reduction.

4.2. Biomechanical Superiority Versus Clinical Relevance

Biomechanical studies have repeatedly demonstrated superior initial mechanical stability of tendon graft reconstructions,

particularly with respect to horizontal translation of the clavicle [22,23,26,27,29-31]. Mazzocca et al. showed that anatomically placed tendon grafts may approximate the stability of native CC ligaments [26]. Based on these findings, graft-based reconstructions are often considered the biomechanical gold standard.

However, biomechanical superiority does not necessarily translate into superior clinical outcomes. Clinical studies consistently demonstrate that residual radiological instability is common after ACJ reconstruction, regardless of the surgical technique employed [7,28]. Importantly, this residual instability often does not correlate with pain, shoulder function, or patient satisfaction.

4.3. Radiological Findings and Functional Outcome

In the present study, minor residual vertical or horizontal displacement of the lateral clavicle was observed in several patients at final follow-up. Nevertheless, this did not result in inferior functional scores, reduced range of motion, or decreased subjective satisfaction.

This observation is consistent with previous reports. Spencer et al. demonstrated radiographic loss of reduction in more than 20% of patients following ACJ reconstruction, independent of the surgical technique used, without consistent impairment of functional outcomes [28]. Tauber et al. reported residual posterior instability after tendon graft reconstructions despite satisfactory clinical results [7].

These findings raise the question of whether perfect anatomical restoration, as judged radiographically, is truly required to achieve a favourable clinical result in chronic ACJ instability. From a patient-centred perspective, pain relief, restoration of

shoulder function, and return to activity appear to be more relevant than minor radiographic deviations.

4.4. Graft-Related Morbidity and Surgical Burden

The routine use of tendon grafts in chronic ACJ reconstruction is associated with several disadvantages. Harvesting of autologous grafts, such as the semitendinosus or gracilis tendon, increases operative time and technical complexity and exposes patients to donor-site morbidity, including sensory nerve injury, muscle weakness, and persistent pain [11-15]. Furthermore, graft harvesting may compromise future reconstructive options, for example in anterior cruciate ligament surgery [48].

Allogeneic grafts avoid donor-site morbidity but introduce additional costs and potential risks related to graft incorporation and immune response [31]. Given that reported clinical outcome scores after graft-based reconstructions (ACJIS, Taft Score, SSV) often remain below expectations derived from acute ACJ stabilization [2,7,35], the routine use of tendon grafts in all chronic cases warrants critical reconsideration.

4.5. Rationale of Graft-Free Stabilization

The surgical concept applied in the present study intentionally avoids tendon grafting and instead combines meticulous debridement and tissue refreshment of the coracoclavicular space with a temporarily rigid but passively maintained fixation. Vertical stability is provided by the cortical button system, while temporary acromioclavicular trans fixation addresses horizontal instability during the early healing phase.

This strategy may allow intrinsic biological repair mechanisms, including fibrous scar formation and adaptive soft-tissue remodelling, to contribute to long-term stability once temporary fixation is removed. Importantly, this approach preserves future treatment options and does not preclude tendon graft reconstruction in revision cases if required.

4.6. Comparison with Graft-Based Techniques

When compared with published results of graft-based reconstructions in chronic ACJ instability, the outcomes of the present study are at least comparable. Tauber et al. reported mean ACJIS values of approximately 85 points and SSV values around 84% after triple-bundle tendon graft reconstruction [7]. Jensen et al. demonstrated satisfactory Taft Scores after graft augmentation, although detailed radiological correlations were not provided [35].

In the present series, a mean ACJIS of 85.5 points, a Taft Score of 11.1 points, and an SSV of 87% were achieved without graft use. These results are also comparable to those reported after surgical treatment of acute ACJ injuries using cortical button systems [16,45-47]! This suggests that acceptable outcomes are not necessarily dependent on biological graft augmentation, even in chronic situations.

5. Conclusion

Surgical stabilization of chronic ACJ instability without a tendon graft resulted in high patient satisfaction and favourable

functional outcomes in this case series. The results were comparable to those reported for graft-based techniques while reducing surgical complexity, morbidity, and cost.

Routine use of tendon grafts in chronic ACJ instability may represent overtreatment in selected cases. Graft-free stabilization should therefore be considered a valid treatment option, particularly when balanced against operative risk and resource utilization.

6. Limitations

This study is limited by its retrospective design, small sample size, and lack of a control group. The results should therefore be interpreted as hypothesis-generating. Prospective comparative studies are required to further define optimal treatment strategies.

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