Dynamic Horizontal Instability of the Acromioclavicular Joint

A Case Report

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Abstract

Case: A 19-year-old female patient with a history of shoulder trauma 6 years ago presented with dynamic horizontal instability of the acromioclavicular joint (ACJ). She was treated with open ACJ reconstruction using gracilis allograft and showed a satisfactory clinical result at 1-year follow-up.

Conclusion: Dynamic pure horizontal instability of the ACJ is a rare entity with only 6 cases reported in the literature. Till now, all reported patients who necessitated surgical treatment failed because of residual instability and/or pain. We present the seventh case of this type with a successful clinical outcome.

Acromioclavicular joint (ACJ) dislocation is a common injury frequently encountered after shoulder trauma (9%-12%)[1]. Rockwood et al. classified ACJ dislocation based on the severity and direction of the displacement. They defined an injury cascade starting from the lesion of the AC ligament extending to the coracoclavicular ligament (CCL)[2]. Instability of the ACJ can be grouped into 2 categories: horizontal and vertical instability resulting from injury to the AC ligament and CCL, respectively[1]. Recent biomechanical studies defined a third stabilizer of the ACJ, the deltotrapezial fascia. Although it has a low impact on stability of the ACJ, it was demonstrated to have a synergistic stabilizing effect on the ACJ against clavicle rotation[3]. Diagnosis of the vertical ACJ dislocation can be easily made with standard radiographs, such as the Zanca view[4]. However, horizontal instability is difficult to diagnose and necessitates specific radiological studies such as dynamic axillary views and/or the modified bilateral Alexander view[1,4,5]. Failure to recognize horizontal instability of the ACJ can result in chronic instability, which is usually associated with poor outcomes[1].

Most cases necessitating surgical intervention involve vertical instability, which is why most surgical techniques target the reconstruction of the CCL[1]. Although classic dislocation of the ACJ is a very well-known pathology, dynamic horizontal instability of the ACJ (DHIACJ) is a rare pathology with only 6 cases reported in the literature[6–11]. Authors who reported these cases had treated their patients based on their experience and preferences, ranging from patient education and nonoperative treatment to surgical intervention with different techniques. Interestingly, most operated patients have failed to maintain satisfactory outcomes even in the short term[8,10].

In this case report, we present a case of DHIACJ in a 19-year-old female patient who had failed nonoperative treatment. The patient was treated with open reconstruction of the AC ligament using a figure-of-eight gracilis allograft. We also provide a detailed literature review of similar conditions with an analysis of the related data.

The patient was informed that data concerning the case would be submitted for publication, and she provided consent.

Case Report

A 19-year-old female patient was referred to our clinic for evaluation of pain and instability in the right ACJ. Her medical history was significant for a proximal humerus fracture sustained 6 years earlier, which was treated with intramedullary elastic nail fixation at the age of 13 years. After fracture consolidation, she experienced episodes of glenohumeral instability and pain at the level of the ACJ. Glenohumeral instability was addressed with a Latarjet procedure at an outside institution. However, she continued to experience gradually worsening pain and clicking sensation in the ACJ for the past 2 years. On physical examination, she was found to have a dynamic instability during arm abduction of more than 70° (Fig. 1; Video 1).

Her Constant score was 40. Radiographs of the right shoulder were normal and did not show any evidence of ACJ

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Keywords horizontal instability; acromioclavicular joint dislocation; allograft; acromioclavicular reconstruction

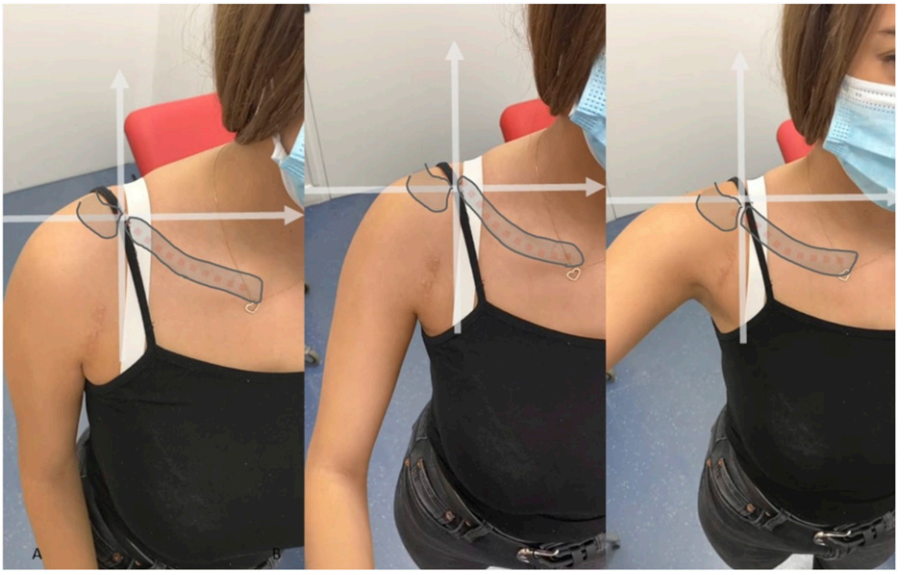

Fig. 1

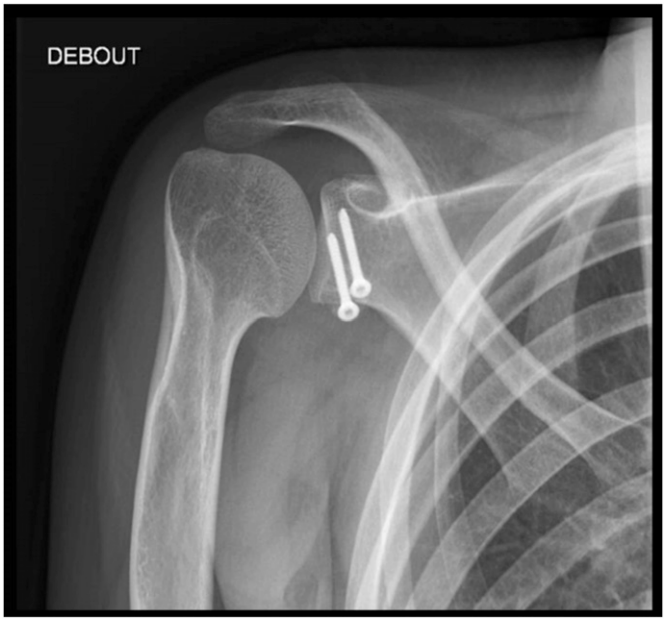

Fig. 2

Fig. 1 Preoperative photographs showing dynamic horizontal instability of the right acromioclavicular joint. **Fig. 2** Anteroposterior radiograph of the right shoulder showing postoperative changes after a previous Latarjet procedure. No abnormalities of the acromioclavicular joint are noted.

pathology (Fig. 2). A magnetic resonance imaging of her shoulder showed evidence of ACJ diastasis without a frank dislocation of the joint (Fig. 3). A dynamic computed tomography scan demonstrated subluxation of the ACJ around 70° of abduction (Fig. 4).

Based on clinical and radiographic findings, a diagnosis of DHIACJ was made. Conservative treatment including patient education, activity modification, and physical therapy was tried for 3 months, but her symptoms continued without improvement.

Surgical intervention was then elected. Under general anesthesia, in the beach chair position, we performed a direct approach to the ACJ through a 6-cm skin incision parallel to the clavicle at the level of the ACJ (Fig. 5). When reaching the joint, we found a loose capsular tissue, which was subsequently resected to expose the ACJ. Then, the lateral 5 mm of the clavicle was resected. Two unicortical holes were made on the anterosuperior and posterosuperior aspects of the lateral clavicle, and 2 unicortical holes were made in a similar fashion on the acromion using a 4.0-mm high-speed burr. The holes in each bone were fashioned in a V-shaped tunnel. A gracilis allograft was prepared with a running locked FiberWire (Arthrex) suture at each end of the tendon. The graft was passed

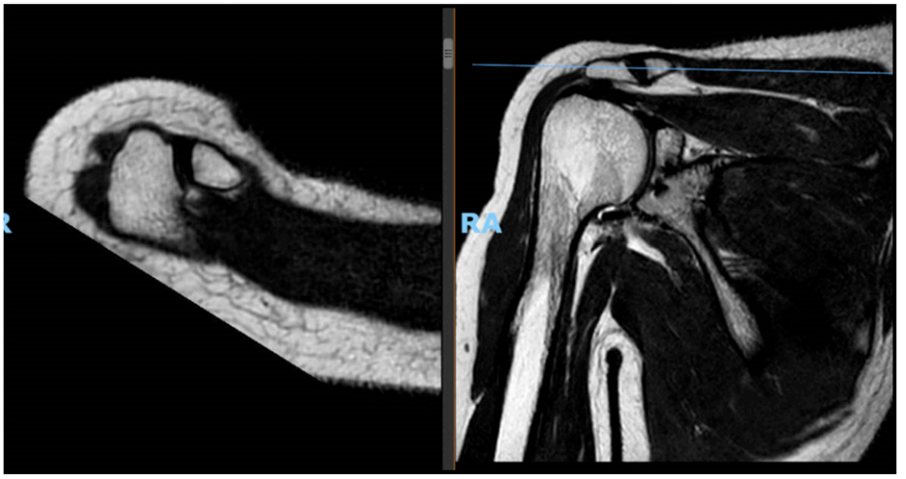

Fig. 3
Axial and coronal T2-weighted magnetic resonance imaging of the right shoulder showing diastasis at the level of the acromioclavicular joint without dislocation.

through the bone tunnels using a docking technique. One end of the graft was inserted into the medullary canal of the clavicle, exited through the anterior hole, and re-entered through the posterior hole. This resulted in 2 ends of the graft exiting the medullary canal of the clavicle. Both ends of the graft were passed into the ACJ under the acromion, and the 2 ends were separately retrieved through the anterior and posterior holes on the superior cortex of the acromion. With the arm abducted at 70°, traction was applied to both ends of the graft, and #2 sutures were placed through the ends of the graft to tie them together. The shoulder was immobilized postoperatively. Passive range of motion started at 2 weeks with limited abduction/elevation to 60°. Active motion started at 6 weeks. One month after surgery, the patient was feeling mild-to-moderate residual pain but reported that her ACJ felt stable during elevation/abduction. Significant improvement in pain (from 7 of 10 to 3 of 10) and a Constant score of 75 were reported at the 1-year follow-up. Postoperative radiographs are shown in Figure 6.

Discussion

To our best knowledge, 6 cases of DHIACJ have been documented in the literature (Table I)[6–11]. The first case was reported in 1977 by Janecki and involved a 19-year-old female patient who experienced pain and DHIACJ from a maneuver that involved retraction and protraction of the scapula. Advising the patient to avoid the maneuver and undergo physical therapy resulted in pain relief[6]. In 1986, Richards et al. reported a case of a 14-year-old adolescent boy with spastic hemiparesis who

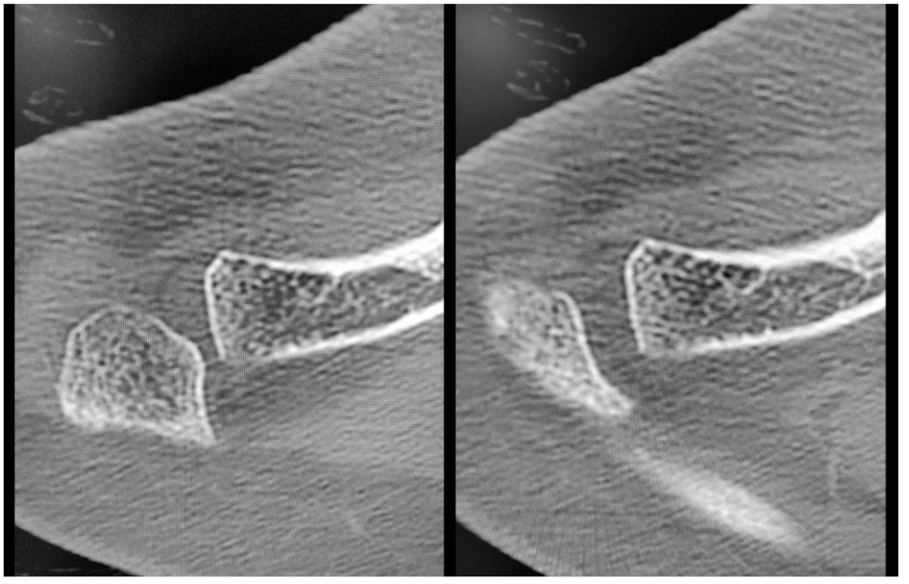

Fig. 4
Axial view during dynamic computed tomography scan of the right shoulder showing anterior acromioclavicular joint dislocation.

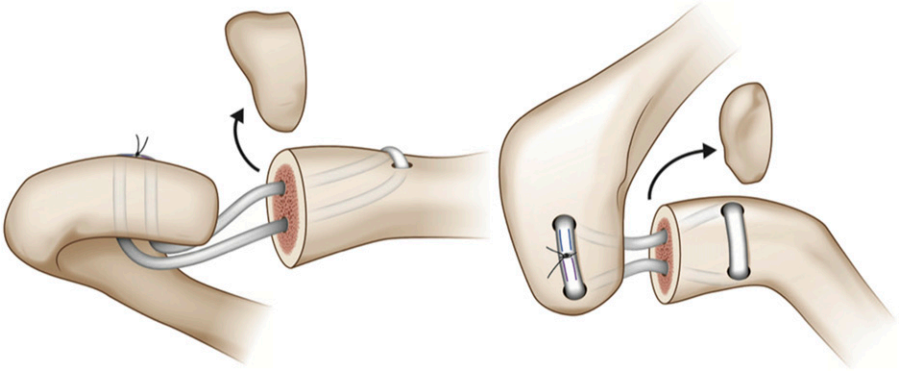

Fig. 5

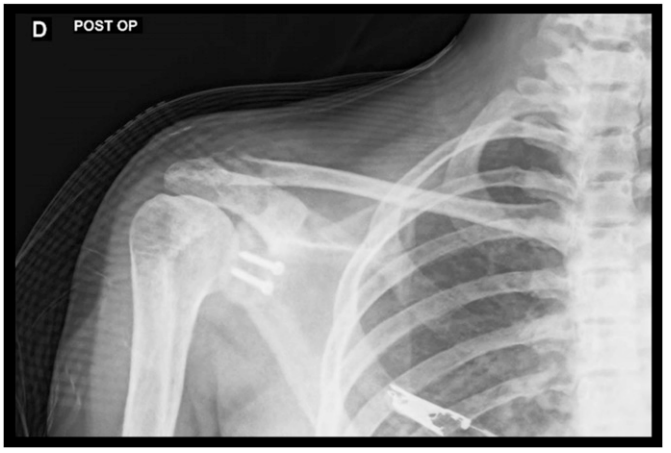

Fig. 6

Fig. 5 Illustration of the surgical technique used for the stabilization of acromioclavicular joint dislocation. **Fig. 6** Anteroposterior radiograph of the right shoulder at 1 year after surgery.

had painless ACJ dislocation with anterior elevation of the arm. Advising him to stop the dislocations was sufficient. In 2005, Sahara et al. reported a 19-year-old patient who was able to relocate his right ACJ through contracting the anterior deltoid fibers, but dislocation reoccurred after elevating the arm over 90°. He underwent distal clavicle resection and coracoid tip transfer, but the treatment failed to maintain stability at 2-year follow-up[8]. Sadeghi et al. reported a 17-year-old female patient in 2017 who produced dislocations through abduction-external rotation. Advising her to avoid the maneuver led to adaptation at 1-year follow-up[9]. Barchick et al. treated a 16-year-old female patient with arthroscopic augmentation of the CCL, which relieved her pain but failed to maintain stability[10]. Afonso and Agneskirchner treated a 20-year-old female patient through open AC ligament reconstruction using a gracilis autograft and achieved a successful outcome at 1-year follow-up[11].

Based on the available case reports (Table I), it was found that DHIACJ most commonly affects young patients with a mean age of 17.8 years and a female-to-male ratio is 2.5. Dislocations can occur in either an anterior or posterior direction, with 57% of cases being bilateral. Some cases are preceded by a history of trauma, and only 1 patient had generalized hyperlaxity. Pain is present in 71% of cases and is the primary reason for consultation. In addition, 2 patients had concomitant instability in the glenohumeral joint[6–11]. Based on the information and decisions made by the authors in the cited reports, the treatment approach for patients with DHIACJ varied depending on the characteristics of their baseline condition. For patients who had a dislocated joint at baseline that reduced with movement but then redislocated on returning to the resting position, surgical treatment was recommended. These patients were less likely to respond to nonsurgical measures. On the other hand, patients who had a reduced baseline ACJ that dynamically dislocated with movement, were managed with nonsurgical treatments, primarily involving physical therapy and avoidance of maneuvers that could lead to dislocation. Three patients successfully adapted and had reduced pain but have not resolved instability. All other patients failed nonsurgical treatment and could not adapt[6–11]. The frequency of the maneuver causing DHIACJ in the patient's lifestyle can predict their ability to adapt to their condition. An over-the-head worker may not be able to adapt to dislocations occurring with shoulder elevation or abduction.

Studies have shown that the failure rate after surgical stabilization of ACJ instability is 15% for acute dislocation and

TABLE I List of All Cases of Voluntary Horizontal Instability of the AC Joint Described in the Literature*

Author	Year	Age (yr), Sex	Medical History	Trauma	Side	Direction of Clavicle Instability	Voluntary Maneuver	Pain	Treatment	Outcome	Author Conclusion
Janecki[6]	1977	19, F	Marfanoid feature, no generalized hyperlaxity	No	Bilateral	Anterior	*Subluxation* by retraction of the scapula *Relocation* by protraction of the scapula	Only during subluxation	Advised to stop subluxation	Pain-free at 1 month	Successful strategy
Richards et al.[7]	1986	14, M	Spastic hemiparesis	No	Bilateral	Posterior but termed anterior in their article†	*Dislocation* by anterior elevation over 90 *Relocation* by returning to the resting position	No	None because asymptomatic	None	Successful strategy
Sahara et al.[8]	2005	19, M	Hyperlaxity Glenohumeral instability	Weight lifting 2 yr ptp	Right‡	Posterior	*Relocation* by contracting the anterior fibers of deltoid muscles *Dislocation* by anterior elevation over 90	Yes	Distal clavicle resection (1 cm) followed by coracoid tip-to-clavicle bone transfer (1.5 cm of the tip)	Improved pain control Clicking with arm elevation Posterior displacement reduced from 18-8 mm at 5 mo after surgery but returned to 15 mm after 22 mo postoperatively	Pain relief attributed to distal clavicle resection, failure to maintain stability
Sadeghi et al.[9]	2017	17, F	None	No	Right	Posterior	*Dislocation* by abduction external rotation of the shoulder *Relocation*	Yes	Nonoperative, avoiding abduction external rotation	Avoidance decreased pain At 1 yr, patient was still able to dislocate her AC joint	Patient adapted to her condition Successful strategy Consider surgery for a resistant case
Barchick et al.[10]	2019	16, F	Softball shortstop player	No	Bilateral	Anterior	*Dislocation/relocation* by differential firing of the shoulder girdle muscle	Yes	Arthroscopic augmentation of the CC ligament	Initially resolved pain and subluxation; subluxation and pain returned by the 6-mo visit	Not successful. The cause was attributed to the loss of fixation or graft failure
Afonso and Agneskirchner[11]	2021	20, F	None	No	Left	Anterior	*Dislocation* by anterior elevation of the arm *Relocation*	Yes during relocation	Failed 6-mo nonsurgical treatment ″ Open AC ligament reconstruction by gracilis autograft in a figure-of-eight configuration	Resolved pain and stability	Satisfactory at 1-yr follow-up
Current case	2023	20, F	Proximal humerus fracture 6 yr ptp, Latarjet 5 yr ptp	MVA 4 yr ptp	Unilateral	Anterior	*Dislocation* by shoulder abduction over 70° *Relocation* by returning to resting postion	Yes	Open AC ligament reconstruction	Resolved pain and stability	Satisfactory at 1-yr follow-up

*AC = acromioclavicular, CC = coracoclavicular, F = female, M = male, MVA = motor vehicle accident, and ptp = prior to presentation. †They termed the dislocation as "anterior" because the clavicle is anatomically more proximal than the acromion. ‡Left side was also dislocated but not voluntarily reduced.

can reach as high as 80% for chronic dislocation[1]. This may be attributed to the failure of diagnosis of concomitant horizontal instability and/or failure to address it in the surgical stabilization[1]. Several techniques have been used to improve the results of ACJ surgery, particularly for horizontal instability. These include the triple-button technique, single-tunnel technique with ACJ cerclage, arthroscopic reconstruction of the AC ligament and CCL, and interference screw fixation with clavicle resection. However, there is limited information on surgical techniques for pure horizontal instability[1,12]. Of the previously reported 6 patients

with DHIACJ, only 3 patients with DHIACJ have undergone surgical treatment, with mixed results. Afonso and Agneskirchner had successful results using open AC ligament reconstruction with a gracilis autograft, whereas Sahara et al. and Barchick et al. had unsatisfactory results[8,10,11]. Our technique is similar to that of Afonso and Agneskirchner, but we used an allograft instead of an autograft because of the beneficial effect of allograft on biomechanics, as demonstrated by Lee et al. in 2004[13]. A similar technique was also proposed by Aliberti et al. in 2020 for the treatment of type II ACJ dislocation for patients in whom extensive conservative treatment has failed[12].

Conclusion

DHIACJ is a rare shoulder pathology, and its treatment is challenging. Patient education and physical therapy remain an essential part of the initial management approach. We report a case of DHIACJ where open reconstruction of the AC ligament was performed using a gracilis allograft in a figure-of-eight configuration and resulted in a satisfactory clinical result at 1 year after surgery. ■

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References

1. Aliberti GM, Kraeutler MJ, Trojan JD, Mulcahey MK. Horizontal instability of the acromioclavicular joint: a systematic review. Am J Sports Med. 2020;48(2):504-10.
2. Rockwood C, Wirth M. Injuries to the acromioclavicular joint. In: Rockwoood CA, Green DP, Buchholz RW, Heckmann JA, eds. Fractures in Adults. Philadelphia, PA: Lippincott-Raven; 1996:1341-414.
3. Pastor MF, Averbeck AK, Welke B, Smith T, Claassen L, Wellmann M. The biomechanical influence of the deltotrapezoid fascia on horizontal and vertical acromioclavicular joint stability. Arch Orthop Trauma Surg. 2016;136(4):513-9.
4. Tauber M, Koller H, Hitzl W, Resch H. Dynamic radiologic evaluation of horizontal instability in acute acromioclavicular joint dislocations. Am J Sports Med. 2010; 38(6):1188-95.
5. Minkus M, Hann C, Scheibel M, Kraus N. Quantification of dynamic posterior translation in modified bilateral Alexander views and correlation with clinical and radiological parameters in patients with acute acromioclavicular joint instability. Arch Orthop Trauma Surg. 2017;137(6):845-52.
6. Janecki CJ Jr. Voluntary subluxation of the acromioclavicular joint. A case report. Clin Orthop Relat Res 1977;125:29-31.
7. Richards RR, Herzenberg JE, Goldner JL. Bilateral nontraumatic anterior acromioclavicular joint dislocation. A case report. Clin Orthop Relat Res 1986;209:255-8.
8. Sahara W, Sugamoto K, Miwa T, Tanaka H, Yoshikawa H. Atraumatic posterior dislocation of the acromioclavicular joint with voluntary reduction. Clin J Sport Med 2005;15:104-6.
9. Sadeghi N, Haen PS, Onstenk R. Atraumatic acromioclavicular dislocation: a case report and review of the literature. Case Rep Orthop 2017;2017:8450538.
10. Barchick SR, Otte RS, Garrigues GE. Voluntary acromioclavicular joint dislocation: a case report and literature review. J Shoulder Elbow Surg. 2019;28(7):e238-44.
11. Afonso J, Agneskirchner J. Monoplanar horizontal instability of the acromioclavicular joint: case report and stabilization surgical technique. JSES Int. 2020;5(2):194-7.
12. Aliberti GM, Mulcahey MK, Brown SM, O'Brien MJ. Restoring horizontal stability of the acromioclavicular joint: open acromioclavicular ligament reconstruction and repair with semitendinosus allograft. Arthrosc Tech. 2020;9(10):e1619-26.
13. Lee SJ, Nicholas SJ, Akizuki KH, McHugh MP, Kremenic IJ, Ben-Avi S. Reconstruction of the coracoclavicular ligaments with tendon grafts. Am J Sports Med 2003;31:648-54.