Case report: Rare case of a traumatic isolated rupture of the conoid ligament

JP Ganda,[1] MBBCh, MPhil SEM; **S Roche,**[2] MBChB, FCS Orth; **S Scheepers,**[3] MBBCh, MMed Rad D

[1] *Wits Sport and Health (WiSH), School of Clinical Medicine, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg-Braamfontein, South Africa*
[2] *Groote Schuur Hospital, Department of Orthopaedic Surgery, University of Cape Town, Cape Town, South Africa*
[3] *Winelands Radiology, Stellenbosch, South Africa*

Corresponding author: JP Ganda (janesh@sportdr.co.za)

Acromioclavicular (AC) joint injuries can involve disruption of the AC and coracoclavicular ligaments. We report a case in a professional rugby player of an isolated disruption of the conoid ligament with no injury to the AC and trapezoid ligaments. A 24-year-old professional rugby player fell onto his outstretched hand, injuring his right shoulder. The differential diagnosis was an AC joint injury, coracoid fracture, stress fracture of the coracoid process, or subtle clavicle fracture, which could not be diagnosed on plain film X-ray. An MRI confirmed an isolated rupture of the conoid ligament. No injury to the AC ligament or trapezoid was identified. Five weeks after the injury, the patient returned to full contact training and match play. This case demonstrates that in AC joint injuries, it is possible that the trapezoid ligament and conoid ligament are not simultaneously disrupted, and management is per a Grade II/III AC joint injury.

Keywords: conoid ligament, acromioclavicular joint, coracoclavicular ligament

S Afr J Sports Med 2024; 36:1-4. DOI: 10.17159/2078-516X/2024/v36i1a16854

Due to the nature of contact and collision sports, shoulder injuries have a high incidence in sports such as ice hockey, rugby union, rugby league and Australian rules football. [1] In professional rugby union players, shoulder injuries can account for between 9%-11% of total injuries, and in rugby, this can commonly occur in the tackle scenario, which can result in injury to the tackler or to the ball carrier. [1,2] Injury to the acromioclavicular (AC) joint is a common injury in young athletic individuals who can often suffer direct trauma to the superior aspect of the shoulder. [3]

Anatomically, the AC joint is a diarthrodial joint that primarily rotates in the antero-posterior and superior-inferior planes. [4] The AC joint comprises both static stabilisers (AC ligament and coracoclavicular (CC) ligament) and dynamic stabilisers (deltoid and trapezoid muscles). [4] The CC ligament comprises the conoid and trapezoid ligament, and the function of the CC ligament is mostly determined using cadaver studies. In a single study, it has been shown that the AC ligament acts as a restraint against clavicular retraction, whereas the CC ligament is a restraint against scapular internal rotation. This indicates that injury to the CC ligament can result in scapula dyskinesis and vertical instability of the AC joint, leading to shoulder dysfunction following the injury due to the loss of restraint following the ligament injury. [5] Males are more prone to AC joint injuries than females, and they are more likely to suffer incomplete injuries than complete. [3] The sex variation in clinical presentation is not entirely known; however, it can be related to anatomical and hormonal differences between the male and female counterparts.

AC joint injuries are now commonly classified using the Rockwood classification with the degree of injury to the capsular, extracapsular and surrounding muscular injury guiding the classification system. [4] Grade II and III AC joint injuries involve disruption of the AC ligament and CC ligaments. More commonly, the complete CC complex is disrupted, as opposed to an isolated ligament injury. [4] The variations in the completeness of the injury have significant clinical implications, and rehabilitation should be tailored to address these variations. A focus on shoulder strength and stability, emphasising functional recovery should be used to support a safe return to rugby. We report a case in a professional rugby player of an isolated disruption of the conoid ligament with no injury to the AC ligament and trapezoid ligament.

Case history

A 24-year-old male professional rugby player collided with an opposing player and then fell onto his outstretched hand, injuring his right shoulder. The patient cannot recall the mechanism of injury. He was removed from play following the injury. On examination, he was noted to have pain over the anterior aspect of his right shoulder, coracoid process, and bicipital groove with reduced range of shoulder motion (ROM) in shoulder abduction, forward flexion, external rotation, and internal rotation. No obvious deformity was noted over the AC joint, and no swelling or tenderness over the AC joint. Cross-arm adduction and active compression of the AC joint were negative, with no tenderness on direct palpation over the AC joint. The Hawkins-Kennedy test was negative.

A week later, the patient was reviewed, and his ROM had markedly improved. However, the tenderness over his coracoid process was still present, and he noted pain when he resisted the internal rotation of the arm.

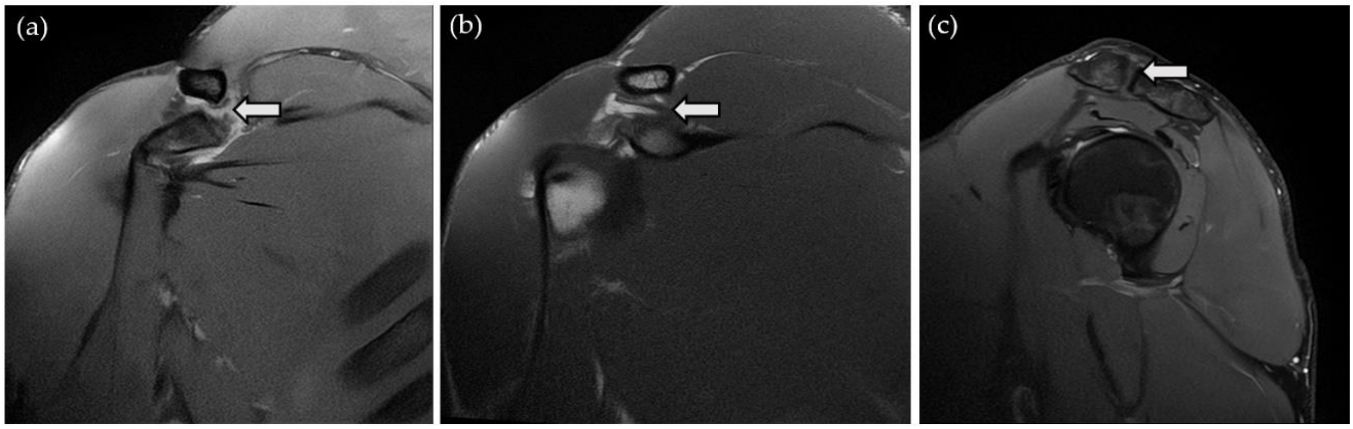

Fig. 1. *(a) Coronal oblique Proton Density (PD) fat saturated image demonstrating an isolated tear of the conoid ligament with extensive oedema in the coracoclavicular space. The biceps short head is intact. (b) Coronal oblique T1 image demonstrating the intact trapezoid ligament. (c) Sagittal oblique PD fat saturated image confirming intact acromioclavicular ligaments*

Imaging

A plain film X-ray was not done following the injury on the advice of the consulting orthopaedic surgeon abroad; however, an MRI was done on the day of the injury, which confirmed an isolated rupture of the conoid ligament. No injury to the AC ligament and trapezoid ligament was identified. Pectoralis minor was also noted to be intact (Figure 1 and 2).

A repeat MRI was done two weeks later which demonstrated residual oedema in the coracoclavicular space, but with significant interval improvement since the initial study (Figure 2).

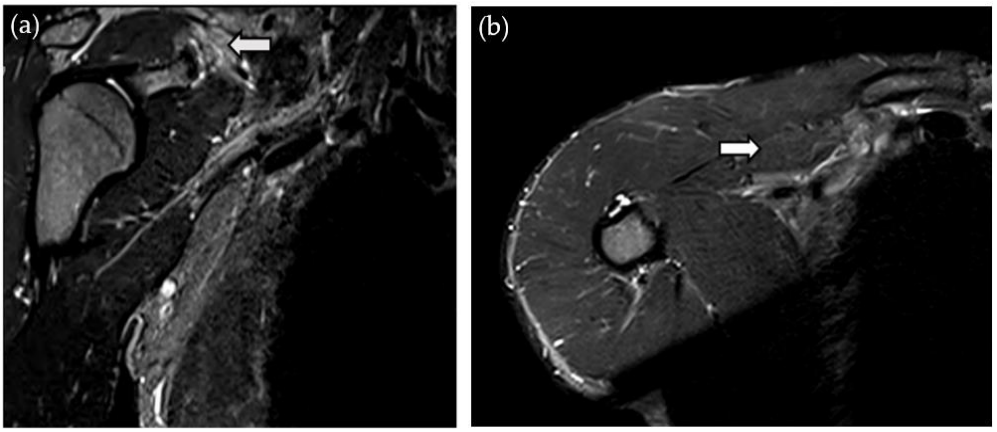

Fig. 2. *(a) Coronal oblique Short Tau Inversion Recovery (STIR) image demonstrating residual but markedly reduced oedema in the coracoclavicular space. (b) Axial STIR image confirmed an intact pectoralis minor muscle belly*

Treatment

This injury was managed with conservative treatment as per a grade II/III AC joint injury. This treatment plan was favoured as there is no literature to prescribe the management of an isolated conoid ligament injury. Conservative management of grade II/III AC joint injuries typically includes a period of immobilisation in a sling to allow for ligament healing, alongside pain management and gradual physiotherapy following this. The initial focus is on achieving a pre-injury range of motion to prevent stiffness in the shoulder, followed by strength exercises (progressing from open-chain to closed-chain exercises) to enhance stability.

Once the range of motion, strength and proprioceptive parameters are deemed adequate, simulated impact and tackle training should be initiated to aid the player's return to training. [6] Return to train times differ based on the injury severity, with grade II injuries progressing more rapidly than grade III injuries.

The initial management of this patient included immobilising the shoulder for a week, ice, anti-inflammatories, and activity modification as pain allowed. After three weeks, the patient had full range of motion in the affected arm and strength patterns were introduced. The bicep curl was the only exercise that reproduced mild symptoms, likely due to the attachment of the short head of bicep brachii to the coracoid process. The patient was able to run pain-free during this time. After four weeks, the patient was started on passing drills, and non-contact training was done with no reproduction of symptoms. The patient returned to full contact training and match play five weeks post-injury.

Discussion

AC joint injuries are common in contact sports, usually during direct impact to the shoulder or indirectly when the player is hit or tackled and lands on the affected shoulder. [1] According to the Rockwood classification, CC ligament injuries are present with Type II-Type VI AC joint injuries, with varying degrees of injury in each type. In Type II and Type IV injuries, one can expect a sprain of the CC ligament, whereas in Type III, IV, and V injuries, one can expect complete disruption of the CC ligament. [7]

The nature of this type of injury can result in multiple forces

being placed on the AC joint at a single point in time. This results in the dissipation of forces in various directions, straining the complex of ligaments in the AC joint. The AC ligament provides horizontal stability to the AC joint, whereas the CC ligament confers vertical stability. [3] Disruption to these ligaments may present clinically with distinct patterns of instability, which can be confirmed clinically or radiologically.

Rockwood Type I injuries usually involve a sprain of the AC ligament. [4] This presents with a normal X-ray examination and indicates that the AC ligament and CC ligaments are intact. Type II injuries (full-thickness AC ligament injury and partial thickness CC ligament injury) manifest with instability of the clavicle in the horizontal plane. [4] On X-ray examination, this can present with a slight elevation of the lateral end of the clavicle. In scenarios of Type III injuries (full-thickness AC ligament injury and full-thickness CC ligament injury), the clavicle is unstable in both the horizontal plane and the vertical plane. [4] This can be assessed clinically by assessing the stability and degree of movement of the AC joint and with X-rays by assessing the change in separation of the coracoclavicular space. [7] Type IV injuries involve the distal clavicle being displaced posteriorly into the trapezius muscle and may tent the posterior skin. On X-ray, the displaced clavicle is seen primarily on an axillary view with a clear loss of anatomic structure. Type V injuries are a more severe form of a type III injury, and on X-ray evaluation, it is manifested by a 100%-300% increase in the acromioclavicular radiographic distance. [4] Type VI injury involves disruption to the AC and CC ligaments and an inferior dislocation of the clavicle. [4]

The X-ray configuration of the AC joint varies. The normal width of this space is reported to be between 1mm and 3mm; however, with age-related degeneration, this joint space can decrease. [8] The coracoclavicular interspace can also vary significantly, and a high index of suspicion for a complete disruption of the coracoclavicular ligament is present with an increase of the coracoclavicular space by 25%-300% when compared to the unaffected side, with the degree of instability of the AC joint guiding the treatment type. [8]

The main treatment goals, whether surgical or conservatively, are to achieve a pain-free shoulder with full range of motion, normal strength, and no limitation in activities. Most type I and II AC joint injuries are treated conservatively (i.e., rehabilitation only); type III injuries are often managed conservatively or surgically, depending on the individual and are evaluated on a case-to-case basis, taking into account the player's position/sport requirements, scapulothoracic dysfunction and risk of re-injury. [7] Due to the nature and instability of Type IV, V and VI injuries, these are all managed with surgical intervention. [7]

Rehabilitation takes the form of a 4-phase protocol. This includes achieving pain control in the first phase, utilising principles of immobilisation and gentle range of motion to protect the injured joint; isotonic contractions to achieve pain free range of motion and strengthening of the shoulder in the second phase; increasing strength patterns to encourage functional participation (strength, power, endurance, and neuromuscular control) in the third phase; and finally, return to unrestricted activity. The flow through this process is patient and injury-dependent, with surgical interventions requiring a more cautious approach to ensure optimal outcomes and a safe return to play.

Clinical tool

The observation that the trapezoid and conoid ligaments may not be simultaneously disrupted has important diagnostic implications. Identifying isolated disruptions of these ligaments by assessing the joint's stability clinically and using X-ray imaging to assess the coracoclavicular interspace, one can guide treatment goals based on the specific deficits found, ultimately improving patient outcomes. An MRI can be done to assess detailed soft tissue visualisation regarding the integrity of the CC ligament, should this be suspected. Developing more targeted assessment and treatment strategies, particularly in AC joint injuries, facilitates more effective rehabilitation and ensures a safer return to play.

Conclusion

Identifying isolated disruptions of the CC ligaments can provide valuable insights into the severity and stability of the injury, guiding treatment decisions and post-treatment rehabilitation. Treatment goals can be tailored based on the specific ligament injury by addressing deficits and restoring optimal joint stability and function. Understanding this variability in ligamentous injury patterns is essential for developing targeted assessment and treatment strategies, ultimately optimising patient outcomes in AC joint injuries.

Conflict of interest and source of funding: The authors have no conflicts of interest and no source of funding to declare.

Acknowledgements: The authors would like to thank our patient for his consent to use his clinical data in this case study.

Author contributions: JG for conception and design. JG, SR, SS for drafting and critical revision. SR and SS for approval of the published version.

References

1. Headey J, Brooks JH, Kemp SP. The epidemiology of shoulder injuries in English professional rugby union. Am J Sports Med. 2007 Sep;35(9):1537-43. [doi:10.1177/0363546507300691] Epub 2007 Apr 23. [PMID: 17452514].
2. Brooks JH, Fuller CW, Kemp SP, Reddin DB. Epidemiology of injuries in English professional rugby union: part 1 match injuries. Br J Sports Med. 2005 Oct;39(10):757-66. [doi: 10.1136/bjsm.2005.018135] [PMID: 16183774; PMCID: PMC1725032].
3. Frank RM, Cotter EJ, Leroux TS, Romeo AA. Acromioclavicular joint Injuries: Evidence-based treatment. J Am Acad Orthop Surg. 2019 Sep 1;27(17): e775-e788. [doi: 10.5435/JAAOS-D-17-00105] [PMID: 31008872].
4. Mazzocca AD, Arciero RA, Bicos J. Evaluation and treatment of acromioclavicular joint injuries. Am J Sports Med. 2007 Feb;35(2):316-29. [doi: 10.1177/0363546506298022] [PMID: 17251175].
5. Oki S, Matsumura N, Iwamoto W, Ikegami H, Kiriyama Y,

Nakamura T, Toyama Y, Nagura T. The function of the acromioclavicular and coracoclavicular ligaments in shoulder motion: a whole-cadaver study. Am J Sports Med. 2012 Nov;40(11):2617-26. [doi: 10.1177/036354651245857] Epub 2012 Sep 11. [PMID: 22967825]

6. Geldenhuys AG, Burgess T, Roche S, Hendricks S. Return to rugby following musculoskeletal injuries: A survey of views, practices and barriers among health and sport practitioners. Phys Ther Sport. 2023 Jan;59:49-59. [doi: 10.1016/j.ptsp.2022.11.009] Epub 2022 Nov 30. [PMID: 36508771].
7. Hassebrock JD, Stokes DJ, Cram TR, Frank RM. Arthroscopic repair and reconstruction of coracoclavicular ligament. Clin Sports Med. 2023 Oct;42(4):599-611. [doi: 10.1016/j.csm.2023.05.004] Epub 2023 Jul 1. [PMID: 37716724].
8. Flores DV, Goes PK, Gómez CM, Umpire DF, Pathria MN. Imaging of the acromioclavicular joint: Anatomy, function, pathologic features, and treatment. Radiographics. 2020 Sep-Oct;40(5):1355-1382. [doi: 10.1148/rg.2020200039] Epub 2020 Aug 7. [PMID: 32762593].