

# Unusual Medial-End Clavicle Fracture Combined with Double Disruption of the Superior Shoulder Suspensory Complex (SSSC): A Case Report in Triathlon Athlete

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## What to Learn from this Article?

Management of medial end clavicle fracture in superior shoulder suspensory complex instability.

## Abstract

**Introduction:** Most published floating clavicle report a dislocation or fracture of one or both ends of the clavicle.

**Case Presentation:** We reported a new framework of this injury in a young triathlon athlete; medial-end displaced fracture with co-existent double disruption of the superior shoulder suspensory complex (SSSC) with the anterior shoulder arch wholly disconnected from the nearby structure.

**Conclusion:** The management of these complex fractures remains an open debate. The infrequent publications and the rarity of this type of injuries don't support the surgeon about the choice of the best possible treatment. However, if they are involved Patients with high functional demands, the Authors suggest the surgical management of medial-end clavicle fractures followed by restoration of SSSC complex if damaged on more than two locations.

**Keywords:** medial-end clavicle fracture, floating clavicle, double SSSC disruption

## Introduction

Injuries of the lateral aspect of the shoulder are common. In most cases the force applied to the shoulder girdle is mild, getting an isolated lesions of the acromion-clavicular joint or of the clavicle. High-energy hit trauma that laterally impacts the shoulder is less common and usually it is often associated to other major damages (such as ribs fractures, thoracic injuries, vascular or brachial plexus impairment).

It is also reported an unusual type of fracture-dislocation named floating clavicle with dislocation of both ends, or with a sternoclavicular dislocation and fracture of the middle-third or the lateral end of the clavicle [1-5].

We describe a new type of "floating clavicle" (medial-end displaced clavicle fracture with co-existent double disruption of the SSSC) in young triathlete, as a result of a high-velocity sport fall.

## Case Report

A 33-year-old male triathlon athlete, during a bicycle training fell on his right side, hitting his shoulder on the ground, but with no other trauma associated.

He presented an altered sternoclavicular skin profile with a swollen and bruised area on the lateral surface of his shoulder. He suffered pain in the sternoclavicular joint and in the shoulder, while the abduction and extension of the upper limb was impossible (pre-operative DASH Score: 90.9). No definite neurovascular abnormalities of the upper extremity were reported.

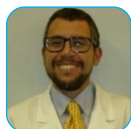
The initial radiographs showed an extrarticular displaced fracture of the medial-end of the clavicle (Robinson Type 1B.1), acromion (Kuhn Type II) and coracoid process (Ogawa type I) fractures. These bone lesions were also confirmed by a computed tomography (CT) scan with 3D reconstruction. The images showed a displaced comminuted extrarticular medial-end clavicle fracture with anterior dislocation, an undisplaced fracture of the coracoid and acromion processes (Fig. 1 and 2).

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## Author's Photo Gallery



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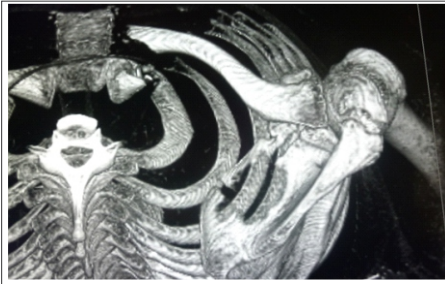
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**Figure 1:** X-ray of the displaced medial-end clavicle fracture.



**Figure 2:** CT-scan shows the displaced medial-end clavicle fracture and co-existent double disruption of SSSC.



**Figure 3:** X-ray check at follow-up.

On the 3rd post-injury day, the patient underwent surgical treatment. Prior to the fixation of SSSC injuries, we treated the clavicle. Under general anesthesia, with the patient in beach chair position with Mayfield headrest, we performed a skin incision directly on the medial-end of the clavicle, respecting the sternoclavicular joint. We exposed the displaced fracture and fixed bone fragments with a T-shape plate 2.5 mm with 5 locking screws (Intrauma®). After the clavicle fixation, we performed percutaneous acromion fracture fixation with two cancellous bone screws with washer (ASNIS®, Stryker™ 5 mm x 55 and 60 mm length) (Fig. 3). We achieved a good clavicle and acromial fixation, while the coracoid process was satisfactorily stable without any other surgical step. After a meticulous reattachment of the platysma, the wound was closed in layers. After that the patient was immobilized in a sling. Thus, the day after surgery, he started active and passive movements of the elbow, wrist and hand. Five days later he started indoor cycling training without load on right upper extremity. Two weeks after the patient started active shoulder mobilization (Codman's pendulums). One month post-operatively, the patient underwent X-Ray that showed fractures in healing. The patient started water rehabilitation with isometric shoulder exercise, active and passive abduction, adduction, flexion and extension shoulder movement, wall crawl, and elastic resistance exercise. He also began running and doing outdoor bike training. He referred no difficulty in performing activities which required little efforts, mild difficulty to performing overhead movements and severe difficulty in performing activities which needed high efforts of the shoulder and the arm (DASH score: 52.3).

After two months, the patient performed a new X-Ray control that proved bone consolidation. The patient recovered full ROM of the shoulder without stiffness and reported no pain in performing active movements, mild efforts of the shoulder and during sport activities, such as running and riding a bike, but on the other hand, he reported persisted moderate pain during swimming training (DASH Score: 29.5). In spite of this, he returned to sport activities.

The clinical evaluation at the follow up 12 months after the operation showed the patient had recovered full shoulder function (no limitation if compared with contralateral side) and was able to perform triathlon races with no pain or limitations (DASH Score: 11.4).

### Discussion

Most reports of a floating clavicle comprise of a dislocation of both ends of the clavicle, while other Authors document a different clinical presentation: Thomas *et al.* document a patient with a sternoclavicular dislocation associated to the fracture of the middle-third, while Serra *et al.* [2] report an anterior sternoclavicular dislocation with a nondisplaced fracture of the lateral end of the clavicle.

Our case is an exceptional injury in that it was the result of a high-velocity fall with a displaced medial-end clavicle fracture and a co-existent double disruption of SSSC (acromion and coracoid processes) without other major lesions. We hypothesized the injury as a side shoulder impaction syndrome. Usually it is due to a direct trauma with an impact occurred on the lateral side of shoulder and it is often associated to other major damages: ribs fractures, thoracic injuries, vascular or brachial plexus impairment [2-4].

Ordinarily a low-energy trauma directed anteriorly may strike only the acromion-clavicular joint or clavicle, but if the vector of the force steers posteriorly the acromion, glenoid or scapular spine may be involved. However, high-energy lateral impaction forces can disrupt both the anterior and the posterior arches and usually causes internal lesions [4, 5].

As suggested by Scarlat, in our case the trauma action began laterally on the shoulder with a vector directed from an external to an internal direction [5]. At the time of the fall, the forces divided their journey along two ways. The first one displayed an anterior and superior trend (Antero-Superior force: ASF) involving the anterior shoulder arch, thus causing the medial-end clavicle fracture, while the second one took a posterior-inferior direction (Posterior-Inferior force: PIF) arousing the acromion, and the base of coracoid process lesions (co-existent double disruption of SSSC) [2, 5].

The coracoclavicular ligament, the acromion-clavicular joint and the connection between coracoid and clavicle (conoid and trapezoid ligaments) remained undamaged. Then, the anterior shoulder arch was wholly disconnected from the nearby structure; in short, it was just floating.

To explain the absence of other major lesions and the soft tissue damage, we hypothesized the damping effect played by the lateral shoulder hypertrophic muscles (deltoid and rotator cuff muscles) in the young triathlon athlete and secondly the direction and the partition of the trauma forces.

Furthermore, we hypothesized that the absence of the ribs fractures was due to the angle of the ASF and PIF vectors; they resulted justly tangential to the chest wall, splitting the injury's energy towards the costoclavicular and the scapulothoracic spaces.

The infrequent publications and the rarity of this type of injuries didn't support the surgeon about the choice of the best possible treatment [1, 6].

Non-operative treatment has been recommended by many Authors for close fractures, though others recommend only clavicular osteosynthesis as a stabilizing procedure (especially in case of open fractures), whereas various papers support a double osteosynthesis of clavicular and scapular fractures, [7, 8].

Some Authors believe that the stability of the shoulder girdle depends on the integrity of the superior shoulder suspensory complex (SSSC) [8]. If SSSC is intact and the shoulder girdle is not medially displaced more than 20 mm, a nonsurgical treatment for scapula and all ipsilateral clavicle fractures may be recommended [5].

However, studies report a worse outcome for patients with SSSC double lesion treated with non-surgical management and other authors speak of a better recovery in those who were operated for a lesion of the medial end of the clavicle. In this specific case in order to restore biomechanical function and to ensure the best and fastest recovery of the young triathlon athlete's shoulder it was mandatory to maintain the length of the anterior and the posterior arches.

We chose a stable internal fixation in order to stabilize the displaced medial clavicle fracture and the acromion. The reason for a surgical management of the clavicle at first was due to avoid possible common sequelae from unstable clavicular fractures, such as Nowak *et al.* stated [7]. We decided not to manage the coracoid process and scapular fractures after evaluating their stability.

### Conclusion

Although the management of medial-end clavicle fractures is an open debate, most of the authors supports the surgical indication for displaced fractures and in the case of neurovascular compromise; even in the case of a complete SSSC breakage on more than two locations in structures with the ring concept (such as the pelvis) some authors agree that it causes instability, and surgical intervention is usually indicated [8-10].

In this paper we reported a variant type of this injury (medial-end displaced fracture with co-existent double disruption SSSC) in a young triathlon athlete. The management of these complex fractures remains an open debate. The infrequent publications and the rarity of this type of injuries don't support the surgeon about the choice of the best possible treatment.

The clinical results described in this case report encourage further studies to draw a standardized surgical approach for the medial clavicle fracture.

### Clinical Message

In case of medial-end clavicle fracture and complete SSSC breakage in more than two locations (the ring concept, such as the pelvis) the shoulder is unstable and surgical intervention is indicated. This case has never been reported in scientific meeting or scientific papers. The manuscript has been read and approved by all the authors. The manuscript represents honest work. The authors declare that they have no competing interests.

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