



# Snapping scapular syndrome secondary to rib intramedullary fixation device



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## ABSTRACT

**BACKGROUND:** Scapulo-thoracic joint disorders, including bursitis and crepitus, are commonly misdiagnosed problems and can be a source of persistent pain and dysfunction

**PRESENTATION OF THE CASE:** This article describes an unusual case of a snapping scapula syndrome secondary to a migration through the lateral cortex of a rib splint intramedullary fixation device into the scapulothoracic joint.

**DISCUSSION:** Recently, the operative fixation of multiple ribs fractures with intramedullary fixation devices has become popular. Despite the good outcomes with new rib splint designs, concern remains about the potential complications related to potential loss of fracture reduction with migration of the wire resulting in pain or additional injury to the surrounding tissues.

**CONCLUSION:** Surgeons should pay attention to any protrusion of intramedullary rib implants, especially in the evaluation of routine X-rays following surgical treatment. We should be aware of the possibility of this rare cause of snapping scapula syndrome to avoid delayed diagnosis and consider removing the implant will resolve the pain.

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## 1. Introduction

Scapulo-thoracic joint disorders, including bursitis and crepitus, are commonly misdiagnosed problems and can be a source of persistent pain and dysfunction. Boinet was the first to describe snapping scapula syndrome as a clinical entity in 1867. Previous studies have focused mainly on the crepitus or snapping of the joint [1–4]. Common causes include bursitis, muscle abnormality and bony or soft-tissue abnormalities. Anatomic variations, such as excessive forward curvature of the superomedial border of the scapula, may also be a cause for snapping. Benign tumor conditions of the scapula can also predispose to snapping scapula syndrome and should be thoroughly investigated during the course of treatment [5,6]. Patients typically present with a history of persistent pain that may be exacerbated during overhead activities, usually associated with audible and palpable crepitus near the superomedial border of the scapula [7].

To our knowledge, snapping scapula secondary to a rib hardware migration has not been previously reported. This article describes a case of a snapping scapula syndrome secondary to a migration

through the lateral cortex of a rib splint intramedullary fixation device into the scapulothoracic joint.

## 2. Presentation of the case

A 39-year-old female patient suffered from a high-velocity accident. She scored 15 points on the Glasgow Coma Scale and was experiencing severe chest pain. Clinical examination showed chest deformity, crepitus and subcutaneous emphysema. Reduced air entry and clear symmetrical lung sounds with no wheezes, ronchi or rales.

Plain radiographs of the chest revealed bilateral pulmonary effusion and multiple right rib fractures. The CT-scan showed fractures from the second to the sixth right rib and subcutaneous emphysema (Fig. 1). Associated injuries comprised a right scapular fracture and stable fractures of vertebrae D6 and D9 without neurological deficits. Intracranial, abdominal and pelvic injuries were absent. Three days after the initial trauma an internal fixation of the second and third rib were performed. A rib splint (Matrix-RIB, Synthes CMF, West Chester, PA) was inserted into the entry portal, advanced across the fracture, and secured in the rib with a locking screw through a lateral thoracotomy. Immediate postoperative radiograph showed adequate positioning of the implants. The scapula and spinal fractures were treated conservatively. Three months after the surgery the patient presented with persistent periscapular pain, which was exacerbated by abduction of the arm and a palpable crepitus with motion of the scapula. The antero-

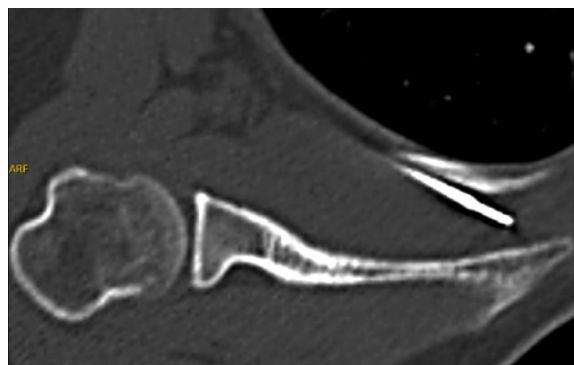
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**Fig. 1.** Chest computed tomography 3D reconstruction showing fractures from the second to the sixth right rib and a non-displaced right scapular fracture.

posterior chest radiographs showed appropriate positioning of the intramedullary implants. The pain became disabling at 5-months without response to conservative treatment. Radiographs of the shoulder, specially the scapular “y” view revealed a protrusion of the intramedullary device into the scapulothoracic joint (Fig. 2). Computed tomography confirmed the posterior migration of the rib splint through the lateral cortex of the second right rib (Fig. 3) and the magnetic resonance of the right shoulder evidenced bursitis and fluid accumulation around the serratus anterior with high signal in T1-weighted images (Fig. 4). The patient was reoperated, an extraction of the osteosynthesis material and excision of the supra and infraserratus bursa were performed by the same approach. After six months of the hardware removal the MRI revealed absence



**Fig. 3.** Axial view of the computed tomography showing protrusion of the intramedullary device through the lateral cortex of the second right rib.

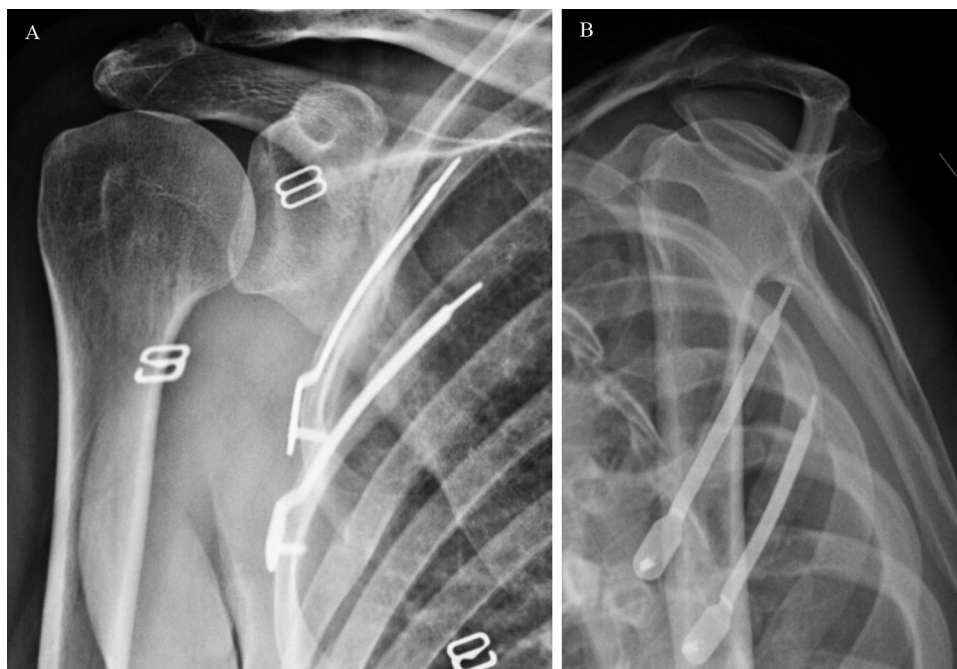
of edema or bursitis around the scapulothoracic joint (Fig. 4). The patient reported no pain and the shoulder examination was normal.

### 3. Discussion

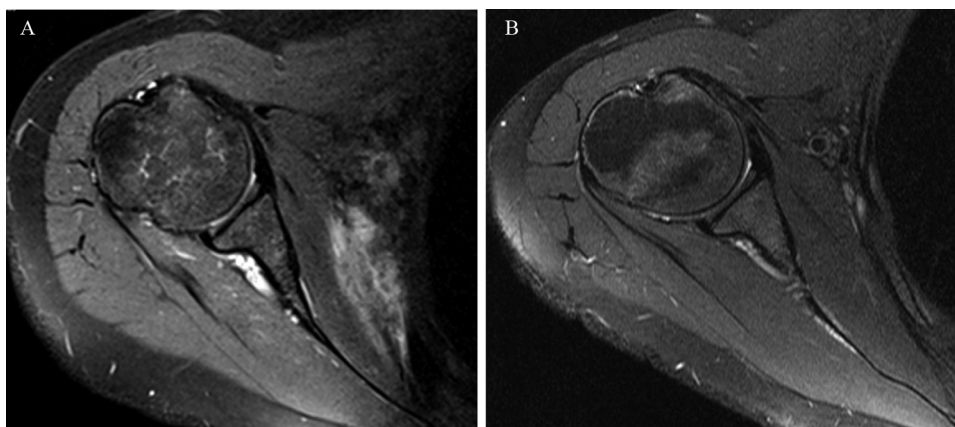
Recently, the operative fixation of multiple ribs fractures with intramedullary fixation devices has become popular. It has been indicated for acute pain in patients with multiple rib fracture, fixation of chronically painful nonunions, reduction of overriding ribs, reconstruction of congenital deformities and for stabilization of flail chest injuries [8].

The hypothetical advantage of surgical stabilization is that in selected patients it can shorten the duration of ventilator support to reduce the morbidity and mortality associated with prolonged mechanical ventilation. Moreover, surgical stabilization can decrease long-term pain and disability of flail chest injury due to mal-unions, non-unions and progressive collapse of the flail segment [9,10].

However, fixation of rib fractures is challenging for several reasons: first, the cortex of ribs is on average less than 1 mm thick, providing little interface for reliable fixation of osteosynthesis implants, particularly in osteopenic bone [11]. Second, ribs



**Fig. 2.** Anteroposterior (A) and scapular “Y” view (B) radiographs demonstrating the protrusion of the rib splint into the scapulothoracic joint.



**Fig. 4.** Axial view of the magnetic resonance. (A) Preoperative showing fluid accumulation between the subscapularis and the serratus anterior muscle and (B) six months after the hardware removal without edema or bursitis.

are highly flexible due to their ovoid cross-section with a typical width of 6–8 mm [12]. Standard osteosynthesis implants that do not restore the high flexibility of the native rib induce stress risers, are prone to fixation failure, and can lead to chest wall tightness [13]. Third, the geometry of the rib surface is conical and twisted, making intraoperative contouring of generic plates time-consuming and difficult [9,14].

Favorable results have been previously reported with Kirchner wire (k-wire) fixation of rib fractures. The major concern regarding intramedullary k-wire fixation is the potential for loss of fracture reduction with migration of the wire resulting in pain or additional injury to the surrounding tissues [15].

Rib splint constructs have recently been developed in order to reduce implant related complications and to simplify the surgical technique [9,12]. This implant system entails anatomically contoured rib plates to reduce the need for intra-operative contouring, and intramedullary splints to enable less-invasive fixation of isolated or posterior fractures [14].

Biomechanical analysis of this implant showed significant benefits relative to simple k-wire fixation. Specifically, rib splint constructs were 48% stronger than Kirschner wire constructs. Furthermore, rib splints prevented cut-out and migration seen with Kirschner wires. Therefore, rib splints are an attractive intramedullary solution for less-invasive stabilization of rib fractures, especially in case of posterior rib fractures where access for plating is limited [16].

Rib fractures treatment with intramedullary nailing has been increasingly reported in the literature. Most of reported complications were implant-related, including screw pull-out, implant breakage, pain related to prone hardware and chest wall rigidity attributed to stiff implants [15]. To our knowledge, this case is unique because it presents an unreported complication, that could be easily detected with the appropriate radiographic controls and successfully treated the implant removal.

#### 4. Conclusion

Surgeons should pay attention to any protrusion of intramedullary rib implants, especially in the evaluation of

routine X-rays following surgical treatment of rib fractures. We should be aware of the possibility of this rare cause of snapping scapula syndrome to avoid delayed diagnosis and consider that removing the implant will resolve the pain.

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