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## Case Report

# The surgical repair of a trauma-related sternoclavicular joint dislocation using the musculus gracilis tendon

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## ABSTRACT

Sternoclavicular joint (SCJ) dislocations are rare, and these dislocations may be traumatic or atraumatic. In this study, we will examine the treatment management of a patient whose SCJ was anteriorly dislocated following a traffic accident. We performed open stabilization for SCJ dislocation using the musculus gracilis tendon. Although the first treatment option in acute cases is closed reduction and stabilization, we recommend surgical repair because the probability of recurrence is high. The gracilis tendon is a good option for joint stabilization.

**Keywords:** sternoclavicular joint, trauma, accidents, injuries, joints, surgical procedures

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## Introduction

Dislocations due to trauma can be anterior or posterior, with the former being approximately nine times more common than the latter. In patients who have conditions known to cause collagen deficiency (such as Ehlers-Danlos syndrome, generalized hypermobility syndrome, infection, or arthritis) atraumatic dislocations may occur [1]. In this study, we will examine and discuss the treatment management of a patient whose SCJ was anteriorly dislocated.

## Case Report

A 70-year-old male patient was hospitalized after a traffic accident and presented at hospital with a displaced rib fracture in the right 3rd, 5th, and 6th ribs anteriorly, a non-displaced rib fracture in the left 5th, 6th, 7th, and 8th ribs anteriorly, and a left SCJ dislocation. On physical examination, there was an anterior swelling at the right sternoclavicular junction and tenderness on palpation of the anterior thoracic wall. The patient's chest x-ray is seen in figure 1.

SCJ dislocation was evident in the thorax CT scan (Figure 2).

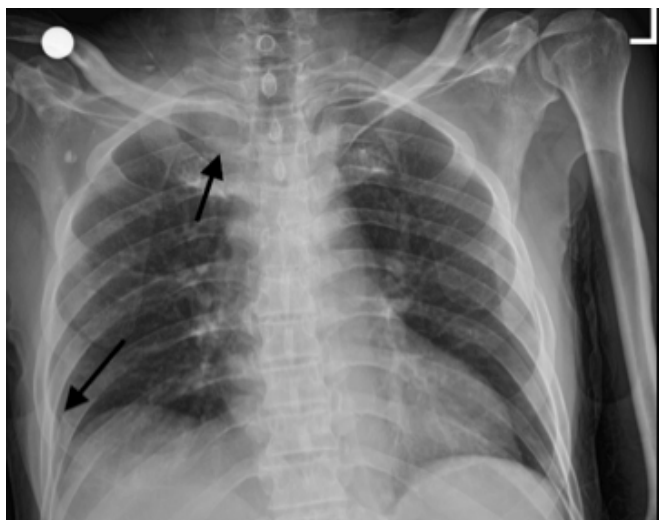


Figure 1. PA x-ray shows rib fracture and sternoclavicular joint dislocation.



Figure 2. Thorax CT scan showing the SCJ dislocation.

The dislocation spontaneously reduced during the first days while the patient was lying down and protruded forward when the patient stood. When offered an operation, the patient declined. Hemothorax and pneumothorax did not develop before the follow-up, and the patient was discharged with a prescription. However, two weeks later, the patient requested surgery because his right arm was very painful and had reduced range of movement, and he felt discomfort due to swelling at the SCJ site. Upon the patient's second admission to hospital, the clavicle head was not reduced, and we operated the patient together with orthopedics. An approximately 8 cm incision was made anterior to the right sternoclavicular joint and it was freed from the surrounding soft tissue. The articular surfaces of the clavicle and sternum were beaten with a rongeur to expose the subchondral bone. An intramedullary canal was drilled on both the clavicular and sternal articular surfaces, two from the sides, and one intramedullary canal. The gracilis tendon graft was then passed through the holes drilled into the clavicle and sternum in the 8 shape, and the joint was reduced and fixed (Figures 3,4). The patient was discharged without any complications on the second post-operative day. Figure 5 shows the technique of passing the gracilis tendon through the holes drilled into the sternum and clavicle. Written informed consent was obtained from the patient for publication of his data.

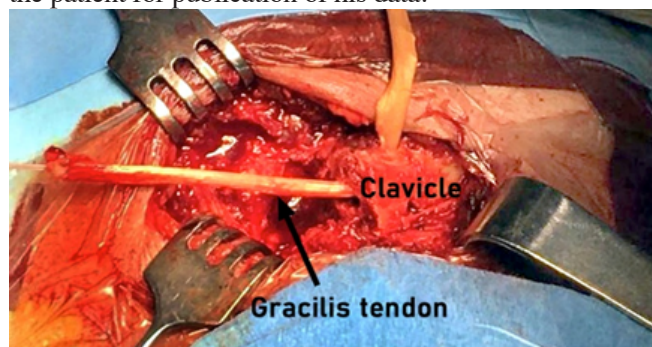


Figure 3. The passage of the gracilis tendon through the holes drilled in the clavicle is shown.

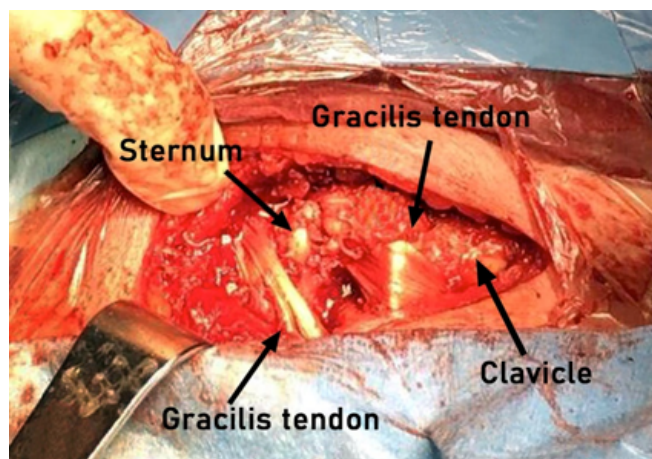
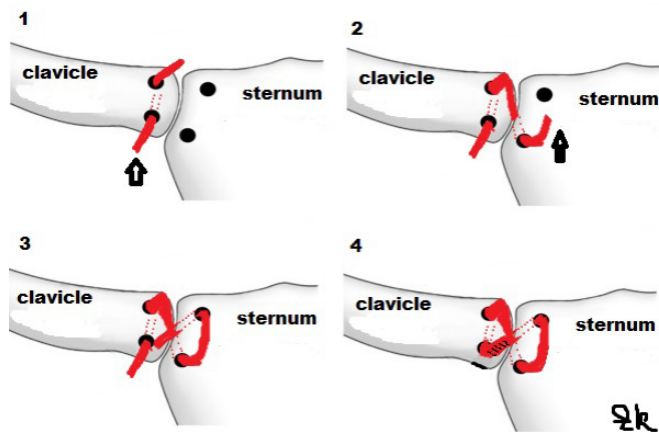


Figure 4. The sternoclavicular joint is fixed with the gracilis tendon.



**Figure 5.** This illustration shows the technique of passing the gracilis tendon through the holes drilled into the sternum and clavicle.

### Discussion

SCJ is an inherently unstable diarthrodial synovial joint. Less than 50% of the medial clavicular surface comes into contact with the corresponding articular surface on the manubrium sterni. Therefore, joint stability is achieved through internal and external ligament structures. In addition, the subclavius muscle rises from the first rib just lateral to the costoclavicular ligament and attaches to the lower surface of the clavicle. It is believed that this muscle performs a protective function in terms of SCJ stability by reducing the rate of upward displacement of the clavicle against the pressure from the sides [2]. Anterior dislocation of the SCJ is usually due to the lateral compressive force to which the shoulder is exposed, which results in the preservation of the posterior capsule, although rupture of the anterior capsule and often the costoclavicular ligament can occur [2,3]. Those with anterior dislocation of the SCJ will complain of a painful lump just lateral to the sternum, as with our patient. In patients who present with localized swelling in this area, care should be taken to determine whether they have a dislocation or have a medial clavicle fracture [3]. On examination, patients show swelling at the level of the SCJ and a decrease in the range of movement of the upper extremities. They may also present with new-onset paresthesia of the upper extremity and/or weakened pulses or signs of venous occlusion. In our patient, there was swelling at the level of the SCJ and a decrease in the range of movement of the upper extremity.

Dislocations of the SCJ are very difficult to detect on plain radiographs, but pneumothorax, pneumomediastinum, or hemopneumothorax can sometimes be seen in posterior dislocations [2]. CT

imaging has superior image resolution and allows 3D reconstruction to determine the exact position of the SCJ [4]. MRI is superior to CT in assessing ligament injury and the condition of other soft tissue behind the SCJ. If an intimal tear is suspected in the subclavian artery, CT angiography may be necessary [2].

If the patient presents with acute anterior dislocation in his SCJ (within 7–10 days of onset), a closed reduction can be performed in the operating room with either sedation or under general anesthesia. The patient is placed in the supine position and a pillow is situated between the shoulders. Traction is then applied to the affected upper extremity at 90° of abduction and flexion, and pressure is directly applied to the medial clavicle. After reduction, the patient uses an arm sling for up to four weeks. After this procedure, re-dislocations occur between 21% and 100%, which raises the question of whether simple closed reduction without ligament reconstruction is sufficient [5-7]. We also suspect that closed reduction alone will not suffice due to the arthrodial nature of the joint.

If closed reduction is not possible or if symptomatic instability of the SCJ persists, numerous surgical techniques have been described in literature and there is no evidence that one method is superior to another. Martínez et al described the stabilization technique that was used in our case, using the 8-shaped gracilis tendon and passing it through the holes in the manubrium and clavicle [8]. The use of autologous tendon grafts is preferred because it has a high healing potential and facilitates long-term tissue integration. Different tendon graft options are available for sternoclavicular joint reconstruction. However, the length and diameter of the gracilis tendon are ideal for transverse stable reconstruction. In addition, the morbidity rate in the postoperative knee joint region is low [9].

Conversely, Booth et al and Bae et al used a strip of the sternocleidomastoid muscle to separate it from its sternal attachment, pass it under the first rib and back through a drill hole in the collarbone, and then tie it back on itself. This way, they effectively reconstructed the costoclavicular ligament [10,11]. Abiddin et al performed capsule repair by passing sutures through the holes in the medial clavicle and manubrium [12]. Franck et al used a plate [13], but due to the spongy structure of the sternum and the vital structures behind the joint, we elected not to do this. Kocsis et al used a technique

to stabilize the SCJ by restructuring the costoclavicular ligament using a braided polyester mesh and found that this mesh also locally stimulated fibroblast activation. They achieved good functional results in all patients and found that patient satisfaction was high [14].

In conclusion, SCJ dislocation should be treated both cosmetically and functionally because of symptoms such as pain. Although the first treatment option in acute cases is closed reduction and stabilization, we recommend surgical repair because the probability of recurrence is high. The gracilis tendon is a good option for joint stabilization.

### Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

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### Authors' contributions

SK, FD, SK; conceived and designed the current case report, co-wrote the paper, collected the clinical data. The authors discussed the case under the literature data together and constituted the final manuscript.

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