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Case Report

Posterior sternoclavicular joint dislocation with thoracic costovertebral joints fracture-dislocations: A case report

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ABSTRACT

Case: A 59-year-old man presented with posterior sternoclavicular joint dislocation concomitant with fracture-dislocations of multiple thoracic costovertebral joints caused by traumatic injury. The posterior sternoclavicular joint dislocation was treated using an ultra-high molecular weight polyethylene fiber cable and the joint was stabilized. The degree of malpositioning of the thoracic costovertebral joints was difficult to reduce.
Conclusion: The patient achieved an excellent shoulder range of motion at 12 months post-operatively; however, chronic shoulder stiffness and posterior neck discomfort persisted.

Introduction

Posterior sternoclavicular joint (SCJ) dislocations are rare, accounting for approximately 1 % of all traumatic dislocations. The treatment options for posterior SCJ dislocation vary and have not been established [1]. Posterior SCJ dislocation can cause serious acute or chronic complications because thoracic structures, such as the trachea, esophagus, or great vessels, are located posteriorly [1].

Injuries involving the costovertebral joints are rare [2]. There are few reports of dislocations of multiple thoracic costovertebral joints [2,3]; however, there are no reports of its concomitant occurrence with posterior SCJ dislocation.

Herein, we report a case of traumatic posterior SCJ dislocation concomitant with fracture dislocation of multiple thoracic costovertebral joints. Posterior SCJ dislocation was treated using an ultra-high molecular weight polyethylene fiber cable; however, the degree of malpositioning of the thoracic costovertebral joints was difficult to reduce. Chronic shoulder stiffness and posterior neck discomfort remained at 12 months post-surgery.

Case report

A 59-year-old man with no medical history was injured in a motorcycle-car accident and transferred to our hospital with a high-energy trauma injury. A physical examination revealed pain in the right anterior thoracic region. There were contusions on the right cheek and neck and fingertip amputation of the right middle and little fingers. Palpation revealed an obvious depression and instability

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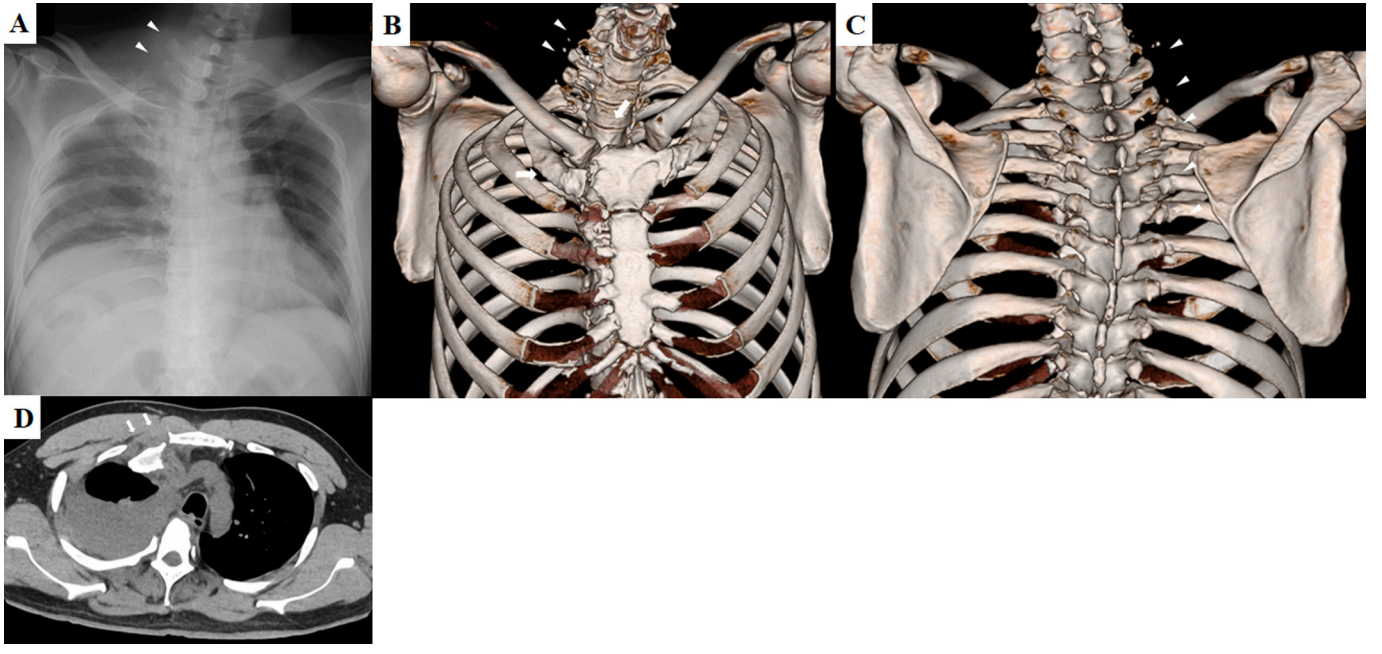

Fig. 1. Radiographs (A) indicating the dislocations of thoracic costovertebral joints (arrowheads) and right hemothorax. Computed tomography (CT) examination revealed right posterior sternoclavicular joint dislocation (arrows), and fracture dislocations of the right 1st–5th ribs costovertebral joints (arrowheads). B and C are three-dimensional CT and D is axial plane CT.

in the anterior thoracic region. His vital signs on admission were as follows: Glasgow Coma Scale, E3V4M6; temperature, 36.3 °C; heart rate, 97 beats/min; left arm blood pressure, 110/77 mm Hg; respiratory rate, 12 breaths/min; and 100 % oxygen saturation on a 100 % non-rebreather reservoir mask at 10 L/min of oxygen. Radiographs indicated dislocations of the thoracic costovertebral joints and right hemothorax (Fig. 1). Computed tomography (CT) examination revealed dislocations of the right posterior SCJ and right thoracic costovertebral joints (1st–5th ribs), fractures of the posterior rib at the rib neck (1st–3rd ribs) and spinous process of the fifth right cervical vertebra, traumatic subarachnoid hemorrhage, and right hemothorax (Fig. 1). Thoracic structures, such as the trachea, esophagus, and great vessels, were not damaged. The traumatic subarachnoid hemorrhage was conservatively treated, and the right hemothorax was treated with surgical trocar insertion for eight days. Consciousness became clear, and there were no symptoms of paralysis in the upper and lower extremities post-treatment. Fourteen days after the injury, we decided to perform SCJ dislocation repair and stabilization for the residual instability.

Surgical technique

After confirming the infeasibility of closed reduction under general anesthesia, open reduction and stabilization of the SCJ were performed. A curved skin incision of approximately 7 cm was made in the anterior thoracic region in the supine position (Fig. 2A). The sternocleidomastoid and pectoralis major muscles in the proximal aspect of the clavicle and manubrium were incised. Posterior dislocations of the SCJ and the first sternocostal joint were exposed (Fig. 2B). The anterior sternoclavicular and radiate sternocostal ligaments of the first rib were ruptured. The costoclavicular ligament was intact. Dislocations of the SCJ and the first sternocostal joint could be easily repositioned using bone-holding forceps, but the repositioning could not be maintained. While protecting the posterior part of the medial clavicle and manubrium using the finger of the operator or cement spatula, four holes (two on the medial clavicle and two on the manubrium) were created using a 2.5 mm drill (Fig. 2C). The 5 mm diameter ultra-high molecular weight polyethylene fiber cable (NESPLON Cable System, Alfresa Pharma, Osaka, Japan) was woven through the drill holes such that the cable strands were parallel to each other posterior to the SCJ and crossed each other anterior to the SCJ (Fig. 3A, B). Finally, we tightly fastened the fiber and stabilized the SCJ (Fig. 3C). The degree of malposition of the thoracic costovertebral joints could not be reduced after open reduction and fixation of the SCJ. After closure, the right arm was kept in a sling for two weeks.

Post-operative course

Two weeks after surgery, the patient started passive and active shoulder motion. The patient was discharged from our hospital four weeks after admission. At 12 months post-surgery, he recovered 170° shoulder elevation and 170° abduction. Chronic right shoulder stiffness and right posterior neck discomfort remained. The repositioning of the SCJ was maintained; however, malpositioning of the thoracic costovertebral joints remained on follow-up CT scan at 12 months postoperatively (Fig. 4).

Statement of informed consent

The patient provided informed consent for treatment and publication of subsequent findings.

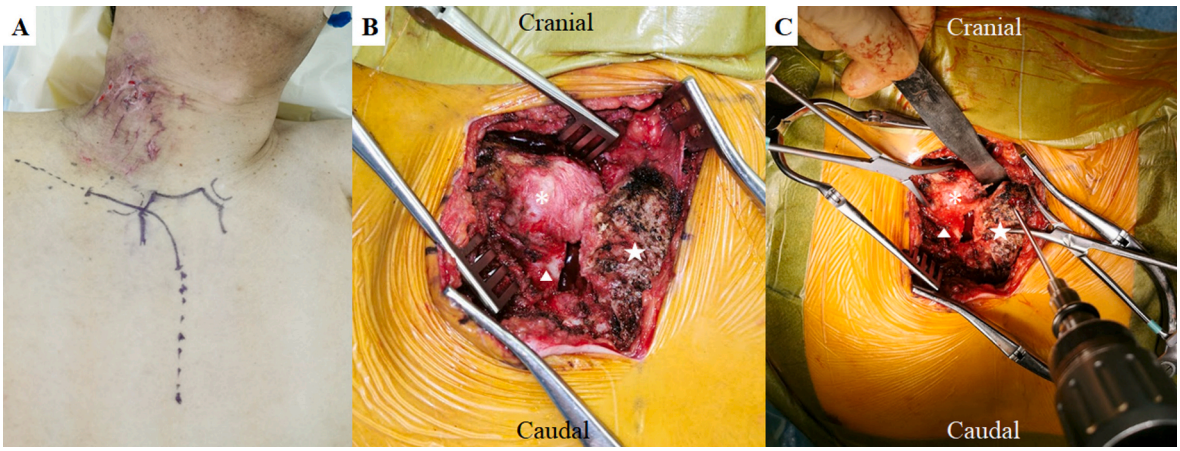

Fig. 2. A: A curved skin incision of approximately 7 cm was made in the anterior thoracic region.
B: Both posterior dislocation of the sternoclavicular joint and the first sternocostal joint and the gap between the first costal cartilage and manubrium are shown.
C: Protecting the posterior part of the manubrium using the cement spatula during drilling is shown.
Asterisk: medical clavicle, star: manubrium, triangle: first costal cartilage.

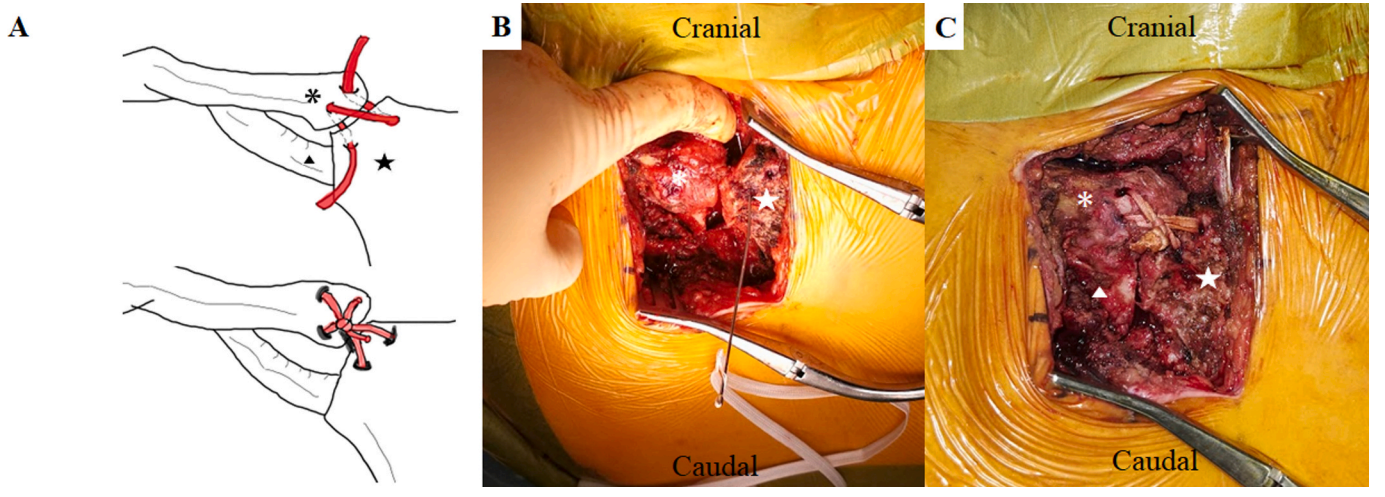

Fig. 3. A: The figure-of-eight weaving procedure with a 5 mm diameter ultra-high molecular weight polyethylene fiber cable is shown.
B: The procedure of weaving through the hole while protecting the posterior part of the manubrium using the finger of the operator is shown.
C: The stabilization of the sternoclavicular joint and first sternocostal joint is shown.
Asterisk: medical clavicle, star: manubrium, triangle: first costal cartilage.

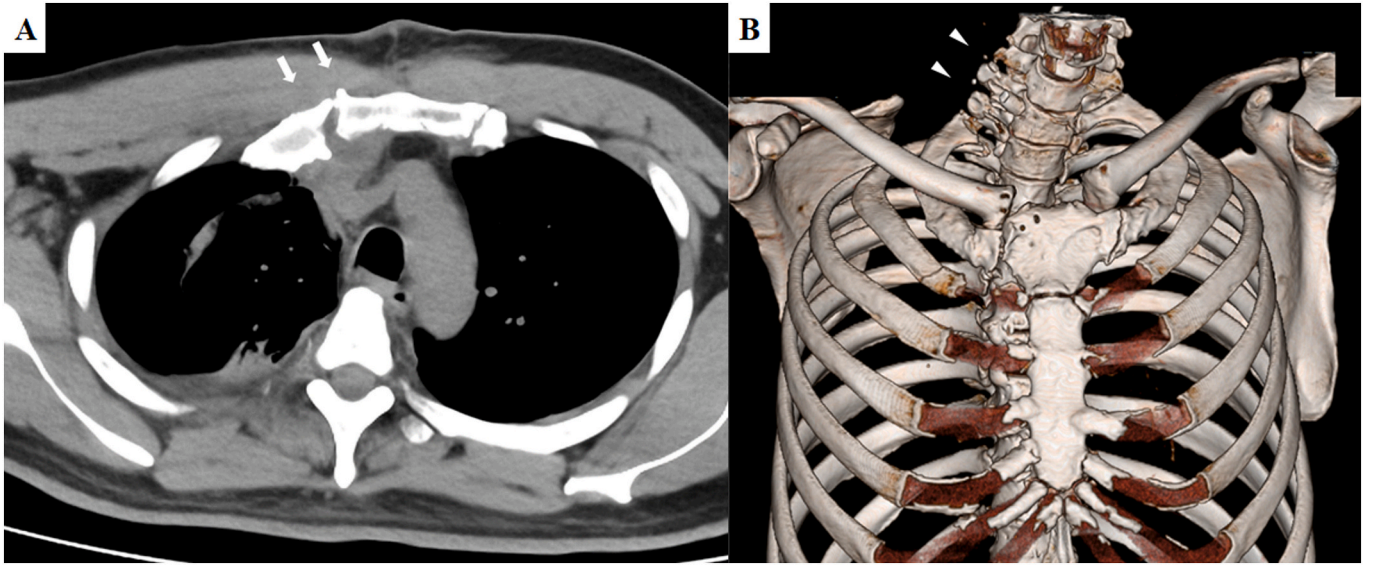

Fig. 4. A: Computed tomography examination revealed the repositioning of the right posterior sternoclavicular joint (arrows).
B: The degree of malposition of thoracic costovertebral joints could not be reduced (arrowheads).

Discussion

The SCJ is the only joint connecting the upper limb to the trunk and is important for shoulder girdle stabilization and strength [4]. The costovertebral joints and their ligaments are important for both respiratory function and thoracic spinal stability [3]. We were unable to find any other reports of traumatic posterior SCJ dislocation concomitant with fracture-dislocations of multiple thoracic costovertebral joints.

In this study, we used an ultra-high molecular weight polyethylene fiber for posterior SCJ dislocation and observed two important clinical issues. First, the ultra-high molecular weight polyethylene fiber cable was useful for providing sufficient fixation for posterior SCJ dislocation. Second, the degree of malposition of the thoracic costovertebral joints was difficult to reduce, and chronic shoulder stiffness and posterior neck discomfort persisted at 12 months post-surgery.

When treating acute posterior SCJ dislocation, closed reduction should be attempted; however, the success rate of closed reduction is relatively low, and open reduction should be performed if closed reduction fails [4,5]. Operative management of posterior SCJ dislocation has not yet been standardized. Several surgical treatments for stabilization of SCJ instability have been reported, such as suturing with suture anchors or tendon grafts [4,5], resectioning of the medial aspect of the clavicle [6], and temporary fixation using a plate or Kirschner wires [4,7]. In particular, the method of using Kirschner wires carries the risk of aberrant wire migration into the thoracic structures, such as the lungs or blood vessels, and this results in serious complications, including death [4,8]. The merits of our method are that it does not require tendon harvesting and is relatively safe. Regarding intraoperative safety, safe procedures during the drilling of the manubrium and clavicle are of utmost importance. The finger of the operator or cement spatula is important to prevent the drill from protruding from the contralateral side of the bone [9].

The malposition of multiple thoracic costovertebral joints (1st–5th ribs) may have affected the residual symptoms of the right shoulder and neck that were experienced by the patient at 12 months post-surgery. Dislocation of the costovertebral joint can be safely managed with conservative treatment and seldom leads to complications, and the reported mortality is never due to dislocation [2,3]. Complications of costovertebral joint dislocation include compression of the brachial plexus and/or vascular structures, such as subclavian arteries, carotid arteries, or its side branches. Decompressive interventions should be considered [10]. Although the anterior and posterior ends of the first rib were injured and unstable in our case, there were no symptoms of neurological deficits of Th1 and no signs of arterial or venous compression clinically or on CT. Therefore, conservative treatment for costovertebral joint dislocation was justified. Although costovertebral injuries, including dislocations, usually occur in concurrence with thoracic spine injuries [2], there was no spinal injury, vertebral body fracture, or neurological deterioration in our case. Regarding posterior rib fractures at the neck of the 1st–3rd ribs, the majority of posterior rib fractures occur at the rib neck because of the strong costovertebral ligamentous attachment to the rib head and tubercle [3].

Conclusion

We report a novel method for sufficient fixation for posterior SCJ dislocation using an ultra-high molecular weight polyethylene fiber cable. We chose conservative treatment strategy for fracture-dislocations of multiple thoracic costovertebral joints, as in previous literature; however, chronic shoulder stiffness and posterior neck discomfort remained.

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Conflict of interest

None.

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