Technical Note

Using a Modified Kirschner Wire to Pass the First Suture Under the Coracoid Base in Coracoclavicular Stabilization

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Abstract: The acromioclavicular (AC) joint injury is a common shoulder injury in sports medicine. Combined coracoclavicular stabilization with AC capsule repair is 1 of 2 preferred treatments in acute high-grade AC joint injury. In East-Asian populations, the surgeon prefers to pass the first suture under the coracoid base, which is difficult using only basic surgical tools. We propose using a modified K-wire to pass the first suture under the coracoid base.

The acromioclavicular (AC) joint injury is a common shoulder injury in sports medicine.[1] There are several treatment techniques that can be used for this repair, such as combined coracoclavicular (CC) stabilization with AC capsule repair, CC ligament reconstruction, hook plate fixation, tension band wiring, or the Bosworth screw.[2]

Currently, the combined CC stabilization with AC capsule repair is the preferred treatment in acute high-grade AC joint injury. To deal with the coracoid process, the surgeon can make either a coracoid tunnel or pass a suture under the coracoid base. In East-Asian populations, the width of the coracoid process is narrow, and there is a chance of coracoid process fracture while creating the coracoid tunnel. Because of the risk of coracoid fracture, most East-Asian orthopaedists prefer to pass the suture under the coracoid base rather than creating a tunnel. There are many commercial products to enable the step of passing the first suture under the coracoid base, but all are costly. We propose a simple and inexpensive technique using a modified K-wire to pass the first suture under the coracoid base.

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Surgical Technique (With Video Illustration)

The patient is placed on the operating table in the supine position. After anesthesia is administered, the patient's position is changed to the modified semilateral decubitus position (Fig 1 A and B).[3] The patient is prepped and draped using a sterile technique.

Before the operation starts, a 2.8-mm K-wire is bent, as shown in Fig 2. A saber incision is created from the clavicle to the coracoid process approximately 5 cm in length. The landmark is 2 cm medial to the AC joint. The incision is through the subcutaneous tissue. The deltoid fascia is incised longitudinally. The deltoid fiber is split. The coracoid base is identified and a No. 2 ETHIBOND suture (Ethicon, Somerville, NJ) is passed under the coracoid base from the medial side to the lateral side using the modified K-wire (Fig 3). In this step, the surgeon must be careful because the neurovascular structure is located medially to the coracoid base.[4] The No. 2 ETHIBOND is replaced with a shuttle loop. Then, the surgical field is moved to the clavicular area. The deltotrapezial fascia is incised in the longitudinal plane and detached from the clavicular bone using a periosteum elevator.

For CC stabilization, we create 2 tunnels at the center of the clavicular bone, 2 and 3.5 cm from the AC joint. A 4-hole small plate is put on the superior surface of the clavicle. One end of the shuttle suture is passed through the first clavicular tunnel and the first hole of the small plate. The other end of the shuttle suture is passed

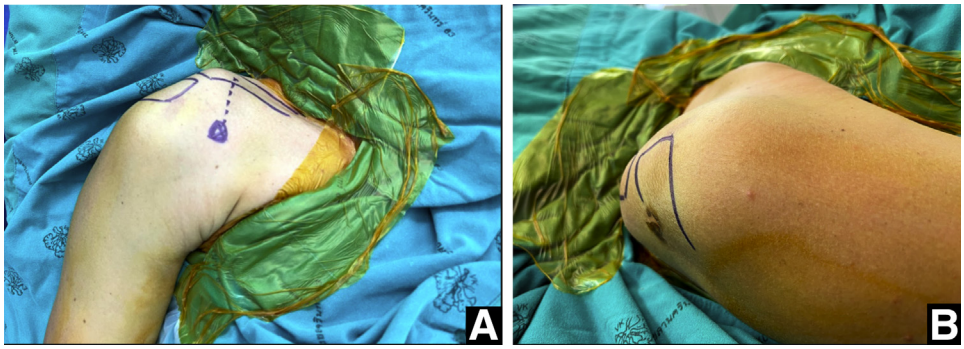
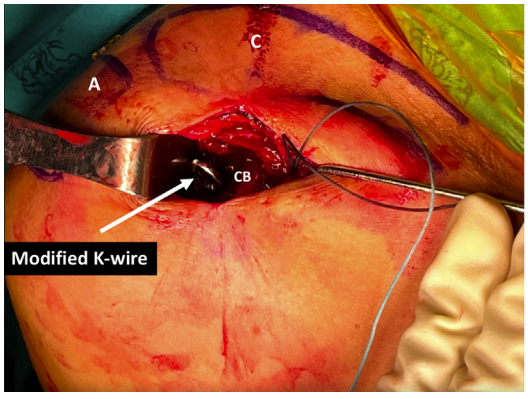


Fig 1. The modified semilateral decubitus position for coracoclavicular stabilization in right shoulder. (A) Frontal and (B) lateral view.

Fig 2. A Modified K-wire in top view.



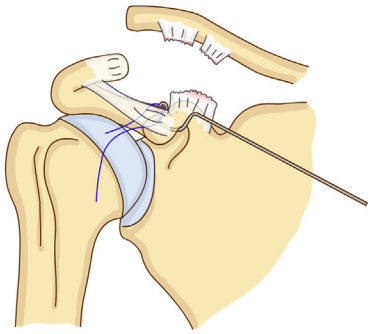


Fig 3. Using the modified semilateral decubitus position for coracoclavicular stabilization in right shoulder, the step of passing the first suture under a coracoid base is performed. A No.2 ETHIBOND (Ethicon, Somerville, NJ) is passed under the coracoid base from the medial side to the lateral side using a modified K-wire. (A, acromion process; C, clavicle; CB, coracoid base)

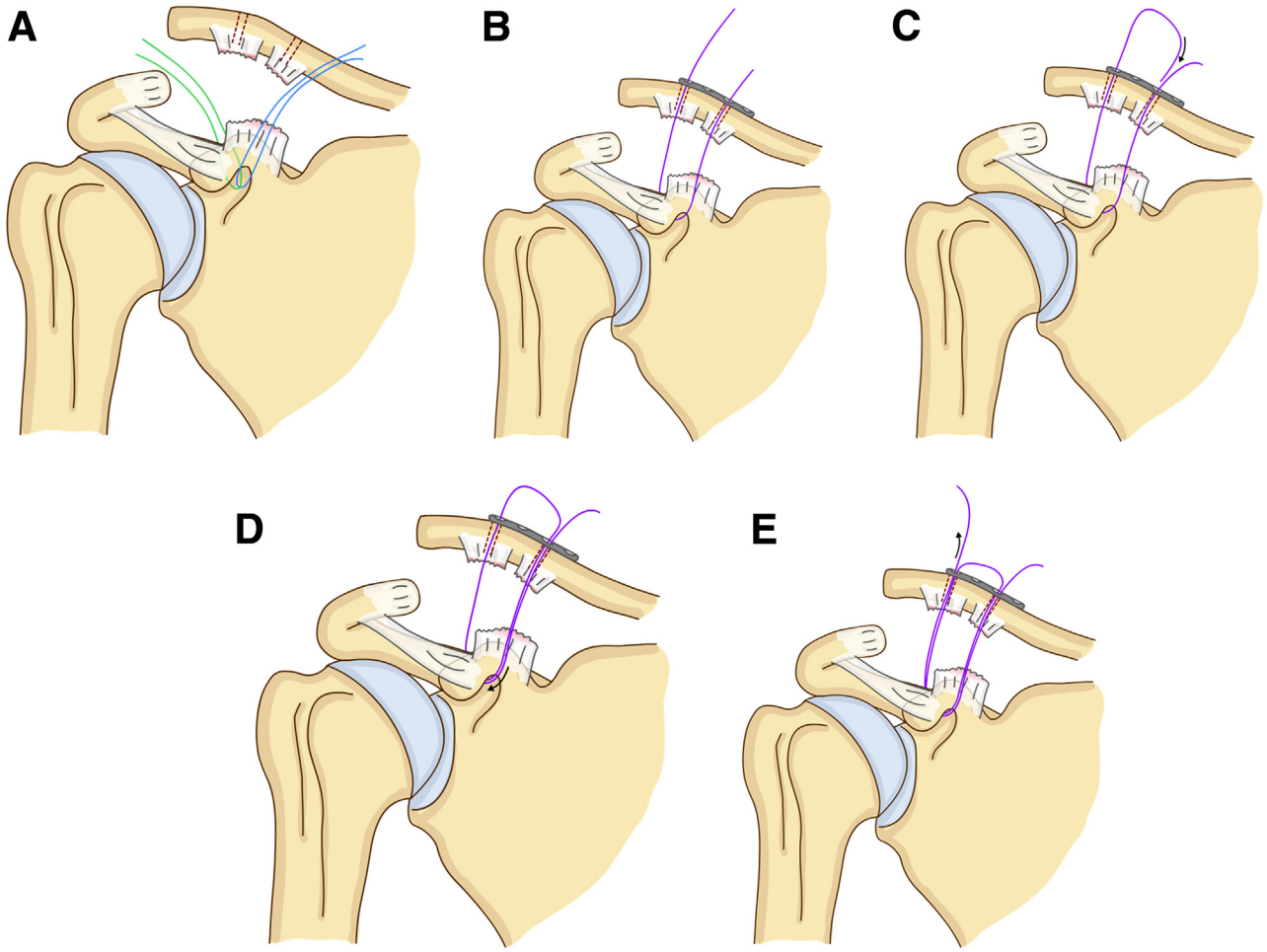


Fig 4. Using the modified semilateral decubitus position in right shoulder, the steps of coracoclavicular stabilization technique. (A) A No. 2 ETHIBOND is replaced with a shuttle loop. (B) One limb of No. 5 FiberWire is passed through the lateral hole of the plate, the lateral tunnel of the clavicle, looped around the coracoid base, and passed through the medial tunnel of the clavicle and the medial hole of the plate. (C) The other limb of the No. 5 FiberWire is passed through the medial hole of the plate, the medial tunnel of the clavicle, and (D) looped around the coracoid base a second time, then (E) passed through the lateral tunnel of the clavicle and the lateral hole of the plate using the shuttle loop technique.

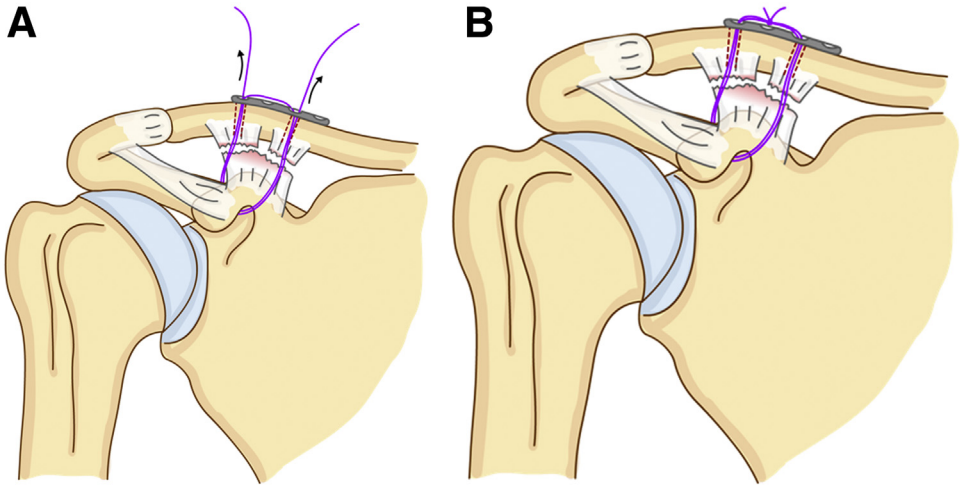


Fig 5. The fiber wire is (A) pulled up and (B) tightened over the small plate.

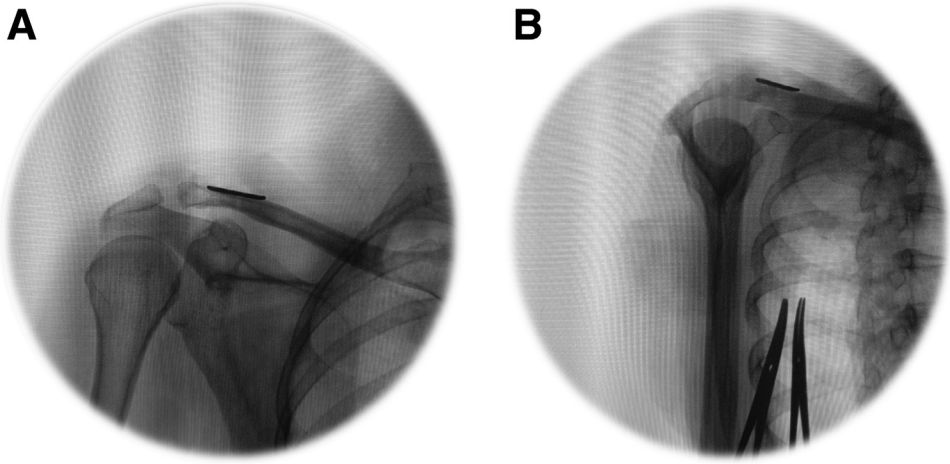


Fig 6. The alignment of the acromioclavicular joint of right shoulder is checked under fluoroscope in the (A) anteroposterior and (B) lateral transcapular views.

through the second tunnel and the fourth hole of the small plate. We use a double O loop technique for the CC stabilization by passing a No. 5 FiberWire (Arthrex, Naples, FL) through the first clavicular tunnel, underneath the coracoid base, and the second clavicular tunnel 2 times (Fig 4 A-E).[5] The AC joint is reduced by elevating the arm. The FiberWire is pulled up and tightened over the small plate (Fig 5 A and B). The alignment of the AC joint is checked under fluoroscope in the anteroposterior and lateral transcapular views (Fig 6 A and B). In this type of case, we prefer to do an overreduction.[6] The AC capsule is repaired using two 2.8-mm metal suture anchors (Arthrex) (Fig 7). The deltotrapezial fascia and deltoid fascia are repaired using VICRYL 3-0. The skin is closed layer by layer. The entire surgical technique is shown in Video 1, with audio narration. Tables 1 and 2 present tips, pitfalls, key points, advantages, and disadvantages of using this technique.

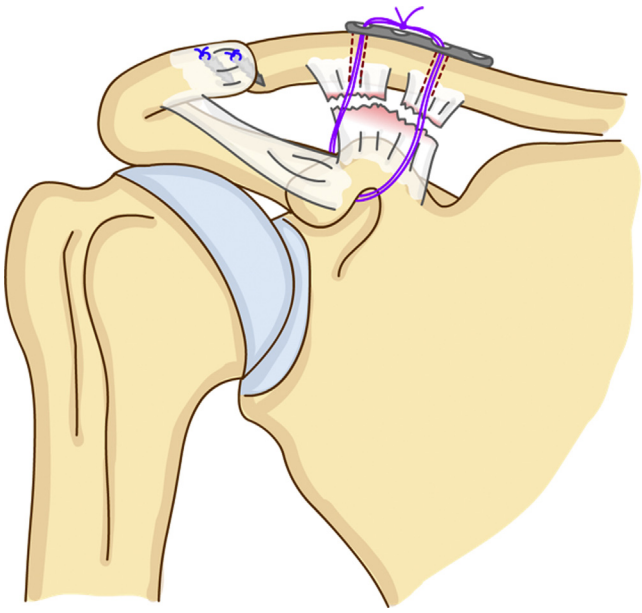


Fig 7. The acromioclavicular capsule is repaired using two 2.8-mm metal suture anchors.

Postoperative Care

An arm sling is used for immobilization for 6 weeks. Pendulum exercise is allowed on postoperative day 2. Active assisted exercise is started sixth weeks after surgery.

Discussion

High-grade AC joint injury is one of the most common injuries around the shoulder joint that occurs after a high mechanism injury.[1] There are many surgical techniques to treat this kind of injury, such as combined CC stabilization with AC capsule repair, CC ligament reconstruction, hook plate fixation, tension band wiring, and a Bosworth screw. Combined CC stabilization with AC capsule repair is one of the popular techniques in treating the case of high-grade AC joint injury. The hardest step of this technique is to pass the suture under

Table 1. Pearls and Pitfalls

Pearls
• The distance between both clavicular tunnels should be at least 1.5 mm to prevent the risk of iatrogenic clavicular fracture.
• The modified K-wire must pass the suture under the coracoid base from medial side to lateral side to avoid an iatrogenic neurovascular injury.
• The modified K-wire is easy to control when using with a Shanz pin introducer.
• The reduction alignment should be evaluated with a fluoroscope in both anteroposterior and transcapular views.
• The deltotrapezial fascia should be repaired after finishing a coracoclavicular stabilization.
Pitfalls
• There is a chance of broken K-wire if the surgeon uses a small K-wire.
• There is a chance of iatrogenic neurovascular injury if the surgeon loops around the coracoid base from the lateral to the medial side.

Table 2. Advantages and Disadvantages

Advantages
• K-wire is cheap and available in most hospitals.
• The shape of the modified K-wire can be adjusted according to the shape of the coracoid process in each patient.
Disadvantage
• It is hard to control K-wire in the step of passing underneath the coracoid process. We suggest using a Shanz pin introducer to control the modified K-wire.

the coracoid base. All basic instruments are not suitable to pass the suture under the coracoid base because the curve of the instrument does not match the shape of the coracoid base. To solve this problem, there are several instruments from many companies that are designed according to the shape of the coracoid process. It is east to pass the suture under the coracoid base using these instruments, but all of them are expensive. We propose to use a modified K-wire to pass the suture under the coracoid base. K-wires are cheap and available in most hospitals. The surgeon can use simple surgical tools such as a needle holder and a Frazier suction tip to bend K-wire. The shape of K-wire can be designed individually according to the shape of the coracoid process, which may be different in each patient.

Conclusions

K-wires are cheap, are available in most hospitals, and easy to use. The surgeon can use the modified K-wire to pass the suture underneath the coracoid base.

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