Therapeutic results and function of conoid ligament on the basis of postoperative radiographic findings of arthroscopic stabilization for the distal clavicle fractures

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I have no financial relationships to disclose
According to Neer’s or Craig’s classification, a type 2 or type 2b fracture with rupture of the conoid ligament is a type of distal clavicle fracture in which the proximal fragment of the clavicle is significantly displaced superoposteriorly to the acromioclavicular joint. Because conoid ligament rupture is greatly involved in the pathology of this type of fracture, we performed indirect fracture reduction by arthroscopically reconstructing the conoid ligament. Although conoid ligament function has been well studied in terms of the biomechanics of the acromioclavicular joint, there have been only a few reports on its role in stabilizing the posterior displacement of the clavicle. In this paper, we report our surgical procedure for conoid ligament reconstruction and its therapeutic outcomes, with a discussion on the function of the reconstructed conoid ligament. Moreover, we used preoperative and postoperative diagnostic imaging to investigate whether arthroscopic conoid ligament reconstruction alone is sufficient to retain the posteriorly displaced proximal fragment of the clavicle in its reduced position.
Acromioclavicular ligament

Fukuda K et al. (1986): Posterior displacement and posterior axial rotation
Debski RE et al. (2000): Anterior and posterior displacement
Saccomanno MF et al. (2014): Stabilization for horizontal plane with normal function of the coracoclavicular ligaments

* Main function is stabilization for horizontal instability
Function of stabilization for ACJ

Conoid ligament (CL)
Fukuda K et al. (1986): Anterior and superior rotation and anterior and superior displacement
Debski RE et al. (2000): Superior displacement
Debski RE et al. (2001): Anterior displacement after resection of the AC joint capsule including acromioclavicular ligament
Mazzocca AD et al. (2008): Superior and posterior displacement of the clavicle after resection of the AC joint capsule including acromioclavicular ligament

* Main function is stabilization for vertical instability
The other function might be stabilization for posterior displacement of the clavicle (horizontal plane)
Conoid ligament

Superior view

Tuberculum conoideum

Conoid ligament

Tip of the coracoid process

Posterior view
Because conoid ligament rupture is greatly involved in the pathology of this type of fracture, we performed indirect fracture reduction by arthroscopically reconstructing the conoid ligament, rather than open reduction.

We report our surgical procedure for conoid ligament reconstruction and its therapeutic outcomes, with a discussion on the function of the reconstructed conoid ligament. Moreover, we used preoperative and postoperative diagnostic imaging to investigate whether arthroscopic conoid ligament reconstruction alone is sufficient to retain the posteriorly displaced proximal fragment of the clavicle in its reduced position.
Surgical methods

A graft for the CL

The site and direction of a bone tunnel for anatomical CL reconstruction
Materials and methods

Materials: Distal clavicle fracture 18 patients (16 male and 2 female)
(type 2 using Neer’s criteria and type 2b using Craig’s criteria)
The age at the time of surgery: 35 ~ 62 years old (mean: 43.5)
The affected side: right in 9 patients, left in 9 patients
The duration from injury: 2 ~ 7 days (mean: 4.1)

Follow-up periods: 12 months ~ 4 year and 11 months
(mean: one year and 8 months)

Postoperative therapy
Operation ~ one week: Desault bandage to immobilize upper extremity
One week ~ two weeks: Change to a sling and Start a pendulum exercise
From three weeks: All immobilizations were discontinued
From four weeks: Start stretching exercise of the shoulder joint
Results

The bony union was achieved in all patients at final follow-up.

JOA score: 96.7 (91 to 100) points
UCLA score: 29.4 (24 to 30) points
Range of motion
  - Forward flexion: 174 (160 to 180) degrees
  - Abduction: 170 (150 to 180) degrees
  - Internal rotation: Th10 (L3 to Th6)
  - Horizontal adduction: 134 (120 to 140) degrees

There was no intra-operative complication, such as fixation failure or coracoids fracture.
Distal clavicle fracture (Neer type2, Craig type2b)
The displacement of the proximal fragment was superoposterior but the acromioclavicular joint was maintained

*Takase K et al. (2012): Arch Orthop Trauma Surg*
The preoperative superoposterior displacement of the proximal fragment of the clavicle reduced. The reconstruction of the conoid ligament along its original anatomical course may stabilize the posterosuperiorly displaced proximal fragment of the clavicle.
Conclusions

We achieved good results by indirectly reducing fractures of the distal clavicle with conoid ligament damage using the minimally invasive surgical technique of arthroscopic conoid ligament reconstruction. Our study suggests that reconstruction of the conoid ligament along its original anatomical course may stabilize the posterosuperiorly displaced proximal fragment of the clavicle. However, further biomechanical studies are required to confirm whether the conoid ligament functions to restrict the posterior translation of the clavicle.