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CORR Insights®: Does Patient Sex Affect the Anatomic Relationships Between the Sternoclavicular Joint and Posterior Vascular Structures?

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Where Are We Now?

The sternoclavicular joint (SCJ) is a diarthrodial synovial joint consisting of the sternal end of the clavicle, the clavicular notch of the manubrium, an interposed articular disc, and the cartilage of the first rib. Anterior and posterior sternoclavicular ligaments, costoclavicular and interclavicular ligaments, and the joint capsule provide joint stability [5, 7]. Pathologies of the SJC are relatively

uncommon, constituting as little as 3% of shoulder girdle injuries [7] and include atraumatic (subluxation, degenerative arthritis, arthropathies, condensing osteitis, septic arthritis) and traumatic (sprains, subluxations, acute and chronic anterior and posterior dislocations) conditions [7].

Because of the close proximity of vital structures (innominate or brachiocephalic artery and vein, vagus and phrenic nerves, internal jugular vein, trachea, and esophagus) to the SCJ, injuries to this joint can be life-

threatening. Surgical treatment of these disorders, particularly posterior SCJ dislocations, requires knowledge of the location and distances of these vital structures posterior to the SCJ. Several reconstruction options have been described including resection of the medial clavicle, clavicular osteotomy, plate fixation, or reconstruction of the SCJ [6, 7]. Various materials (suture, fascia lata, subclavius tendon, semitendinosus tendon) and methods for SCJ reconstruction have been described [6, 7]. Some of these techniques including the use of free tendon graft requires anterior to posterior drilling on the medial aspect of the clavicle and sternum. Knowing the location and distances from the posterior aspect of the SCJ to these vital structures is useful when performing these procedures.

Using 50 normal postcontrast computed tomograms of the chest, the authors attempted to define the proximity of relevant adjacent major blood vessels to the SCJ. The mean distances from the medial clavicle to nearest

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posterior vessel averaged 2 mm for women and 3 mm for men, with significant gender differences. The average distance to the internal mammary artery was 4 mm for women and 6 mm for men, also with significant gender differences. The authors noted that vascular structures could be directly opposed to the posterior aspect of the clavicle and as close as 0.5 mm to the posterior aspect of the sternum.

Where Do We Need To Go?

Based on these findings, the authors reinforced the importance of protecting the posteriorly located vital structures. They recommended having a cardiothoracic surgeon available during reconstruction of the SCJ. In separate studies by Sinha [4], Li [2], and Ponce [3], the closest vessels posterior to the medial clavicle or sternum averaged around 12 mm, 24 mm, and 7 mm, respectively; reiterating the close proximity of the vascular structures to the SCJ. Ponce [3] found significant right-left differences but no significant gender differences.

Some of the current accepted techniques for SCJ reconstruction still potentially risk injury to the vital structures posterior to the SCJ. We therefore have a relatively rare condition (posterior SCJ dislocation) combined with a relatively high-risk

surgical procedure (SCJ reconstruction). With surgical procedures requiring drilling or passage of structures posterior to the SCJ, what should the surgeon do to minimize complications if he or she was to encounter a condition requiring SCJ reconstruction?

How Do We Get There?

Most surgeons are not familiar with SCJ reconstruction. Patients with stable posterior SCJ dislocations probably should be referred to major centers and/or to surgeons familiar with complex shoulder surgical procedures. The procedure should be performed at medical centers with cardiothoracic surgeons available at the time of the procedure, an important precaution to take in the event a complication should arise. In the absence of these options, it is important to review of the anatomy, review of the surgical literature about SCJ reconstruction, and preoperative surgical dissections on cadaveric specimens would help familiarize the surgeon with the anatomy and the critical aspects of the procedure. Obviously, careful protection of posteriorly located vital structures is critical. In the future, newer techniques, such as arthroscopic resection of the medial clavicle [1], newer fixation techniques (eg, interference

screws), or different surgical techniques that are more anteriorly based that minimize anterior to posterior drilling near the SCJ may be developed.

References

1. Imam S, Low AK, Tytherleigh-Strong G. Sternoclavicular joint arthritis: Arthroscopic and open resection. *Oper Techniques in Sports Med.* [Published online ahead of print June 16, 2014]. DOI: [10.1053/j.otsm.2014.02.019](https://doi.org/10.1053/j.otsm.2014.02.019).
2. Li M, Wang B, Zhang Q, Chen W, Li ZY, Qin SJ, Zhang YZ. Imageological measurement of the sternoclavicular joint and its clinical application. *Chinese Med J.* 2012;125:230–235.
3. Ponce BA, Kundkulam JA, Pflugner R, McGwin G, Meyer R, Carroll W, Minnich DJ, Larrison MC: Sternoclavicular joint surgery: How far does danger lurk below? *J Shoulder Elbow Surg.* 2013;22:993–999.
4. Sinha A, Edwin J, Sreeharsha B, Bhalaik V, Brownson P. A radiological study to define safe zones for drilling during plating of clavicle fractures. *J Bone and Joint Surg Br.* 2011;93-B:1247–1252.
5. Spencer EE, Kuhn JE, Huston LJ, Carpenter JE, Hughes RE. Ligamentous restraints to the anterior and posterior translation of the sternoclavicular joint. *J Shoulder and Elbow Surg.* 2002;11:43–47.
6. Spencer EE, Kuhn JE. Biomechanical analysis of reconstructions for

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- sternoclavicular joint instability. *J Bone and Joint Surg Am.* 2004;86A:98–105.
7. Wirth MA, Rockwood CA. *Disorders of the Sternoclavicular Joint.* 4th Ed. Rockwood CA, Matsen III FA, Wirth MA, Lippitt SB (Eds). Philadelphia, PA: Saunders Elsevier; 2009:527–560.