



Outcomes of augmented allograft figure-of-eight sternoclavicular joint reconstruction



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Background: Sternoclavicular joint (SCJ) instability is a rare condition resulting in impaired function and shoulder girdle pain. Various methods for stabilizing the SCJ have been proposed, with biomechanical analysis demonstrating superior stiffness and peak load properties with a figure-of-8 tendon graft technique. The purpose of this study was to evaluate the clinical outcomes of SCJ reconstruction with an interference screw figure-of-8 allograft tendon technique.

Methods: A retrospective analysis of a consecutive cohort of patients from 2007 to 2011 was performed for all patients undergoing SCJ reconstruction for instability. All patients were treated for SCJ instability with a figure-of-8 allograft reconstruction augmented by 2 tenodesis screws. Outcomes were performed with the American Shoulder and Elbow Surgeons (ASES) score, the shortened Disabilities of the Arm, Shoulder, and Hand (QuickDASH) score, and the visual analog scale (VAS) for pain score for all patients. Intraoperative and postoperative complications were recorded.

Results: A total of 10 patients were included in the study, with an average follow-up of 38 months (range, 11.6-66.8 months). Preoperatively, the mean ASES score was 35.3 points (range, 21.7-55 points), whereas the postoperative mean ASES score increased to 84.7 points (range, 66.6-95 points). The mean VAS score improved from 7.0 (range, 5-10) before surgery to 1.15 (range, 0-3) at follow-up, and the QuickDASH score average was 17.0 points (range, 0 to 38.6 points). Minor postoperative complications were noted in 2 patients.

Conclusion: Patients who underwent repair of SCJ instability by an augmented figure-of-8 allograft tendon reconstruction report marked improvements in both shoulder function and pain relief.

Level of evidence: Level IV, Case Series, Treatment Study.

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Keywords: Sternoclavicular joint; sternoclavicular joint instability; sternoclavicular joint reconstruction; sternoclavicular joint dislocation; interference screw

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The sternoclavicular joint (SCJ) is one of the most stable joints in the body. Robust ligamentous reinforcements and an intra-articular disk make injuries to the joint itself exceedingly rare, with SCJ dislocations accounting for 3% of all upper extremity dislocations.^{5,14} However, when

injuries do occur, significant morbidity may result because of the proximity of the clavicle to important mediastinal vascular and visceral structures.²⁰ Whereas injuries to the SCJ are often traumatic, atraumatic mechanisms can also result in recurrent instability.¹³ Acute and chronic anterior and posterior SCJ instabilities are potential sequelae of injury, which in rare cases may require surgical ligamentous reconstruction.

Anterior dislocations are the most common and are often the result of an indirect force on the shoulder with the arm abducted.^{18,31} Anterior dislocations frequently will remain chronically unstable but generally do not deteriorate to debilitating symptoms.^{22,31} Good results have been shown with nonoperative treatment of asymptomatic anterior instability by physical therapy and activity modification. In rare instances, patients may develop painful crepitus with arm motion and pain that radiates into the neck, altering their ability to work and to participate in athletics.³

Dislocations in the posterior direction are usually prevented by the high strength of the posterior joint capsule, which acts as the primary stabilizer.^{6,27,28,31} Posterior dislocations caused by an overwhelming anteroposterior force require immediate reduction because of the risk for mediastinal injury but are often stable after reduction.^{23,24,31} Recurrent or chronic posterior dislocations have the potential to damage underlying vascular and visceral structures over time. Surgical indications for stabilization of the SCJ include both symptomatic chronic anterior instability and recurrent or irreducible posterior dislocation.

Several different methods have been described for stabilization of the SCJ, including medial clavicle resection and various ligamentous reconstruction techniques.^{1,7,8,11,28} Most hardware fixation approaches have been strongly contraindicated secondary to hardware loosening and migration into mediastinal structures; but in the setting of acute trauma, provisional hardware has been used effectively in the treatment of irreducible or loosely reducible dislocation early in the healing process.^{8,31} In the setting of chronic instability, ligamentous reconstruction by a figure-of-8 technique has been shown to demonstrate superior stiffness and peak load properties compared with other reconstruction methods.²⁸ Whereas several small case series have been published describing positive results with this technique, the authors are unaware of any series reporting the use of allograft tendon or tenodesis screw augmentation for ligamentous reconstruction of the SCJ.^{11,19} The goal of this article was to report outcomes of 10 patients treated for symptomatic SCJ instability by a modified figure-of-8 allograft tendon technique with tenodesis screws.

Methods and materials

Review of the senior author's (B.P.) case log between 2007 and 2011 revealed 12 patients treated with SCJ reconstruction with allograft for chronic SCJ instability. In total, 11 of the 12 met

Table I Demographics of patients presenting for SCJ reconstruction

Identifier	Age (years)	Gender	Affected side	Mechanism	Follow-up (months)
Patient 1	57	M	Left	Trauma	67
Patient 2	32	F	Left	Trauma	52
Patient 3	59	F	Right	Degenerative	35
Patient 4	51	F	Right	Degenerative	28
Patient 5	49	M	Right	Trauma	25
Patient 6	21	F	Left	Trauma	24
Patient 7	50	F	Right	Trauma	47
Patient 8	22	F	Right	Trauma	27
Patient 9	51	M	Left	Trauma	37
Patient 10	18	F	Right	Idiopathic	35

inclusion criteria that stipulate symptomatic SCJ instability of at least 3 months in duration with demonstrable limitation of daily activities and documented failure of conservative treatment. Clinical notes for each patient were reviewed to characterize the initial presentation and physical examination findings. Preoperative computed tomography (CT) or magnetic resonance imaging was performed on all patients. Procedural and follow-up notes were also reviewed to identify any intraoperative or postoperative complications as well as to document postoperative function. Patients completed self-evaluation surveys including the American Shoulder and Elbow Surgeons (ASES), the shortened Disabilities of the Arm, Shoulder, and Hand (QuickDASH), the visual analog scale (VAS) for pain, and the Armstrong stability grading scale. One patient was lost to follow-up, resulting in a final census of 10 patients.

Demographics

The mean age of the 10 patients with SCJ reconstruction was 40.1 years (range, 18-59 years). Three were male and 7 were female; 4 involved the left SCJ, and 6 involved the right. The average symptom duration was 18.2 months (range, 3.0-54.7 months), and the average time to follow-up was 38 months (range, 24-66.8 months). SCJ instability from traumatic mechanisms was observed in 7 patients, including 3 motor vehicles accidents, 1 bicycle vs. vehicle, 1 pedestrian vs. vehicle, 1 fall from a chair, and 1 fall down a flight of stairs. The remaining 3 cases resulted from nontraumatic mechanisms, 1 from laxity with open physes, 1 from a sternotomy nonunion, and 1 from an idiopathic cause (Table I).

Surgical technique

The exposure for this technique is similar to what has been previously described.^{2,9,22,33} Briefly, the patient was placed in a supine position and prepared and draped (left shoulder and anterior chest), with the assistance of a cardiothoracic surgeon; a slightly angled transverse incision was made from the medial aspect of the clavicle to the manubrium. This area was then dissected, and the platysma was incised and raised, followed by elevation of periosteum off of the clavicle. The SCJ was visualized and the capsule reflected superiorly and inferiorly, providing room for the reconstruction.

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