



# Reconstruction of the chronic anterior unstable sternoclavicular joint using a tendon autograft: medium-term to long-term follow-up results

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**Background:** Chronic symptomatic anterior sternoclavicular (SC) instability is a rare condition with sparse treatment options. Owing to the rarity of the condition and the potential risk of fatal complications, only a few reports on treatment of this condition have been published. We evaluated a prospective series of patients with chronic anterior SC instability who underwent minimally open reconstruction with an autologous tendon graft.

**Methods:** From 2002 to 2010, 32 consecutive patients underwent minimally open SC ligament reconstruction using a tendon autograft. A palmaris longus was used in 7 patients and a gracilis tendon autograft was used in 25. All patients with at least 2 years of follow-up were reviewed. Five were lost to follow-up. The remaining 27 patients (84.4%) were a median age of 35 years (range, 11-61 years) at surgery. Patients were evaluated with the Western Ontario Shoulder Instability (WOSI) score preoperatively and at follow-up at a median 54 months (range, 24-120 months) postoperatively.

**Results:** The total WOSI score improved from a median of 44% (range 6%-62%) preoperatively to 75% (range, 13%-93%) at follow-up ( $P = .0001$ ). Two failures (7.4%) occurred; after revision, both patients remained stable. After the operation, 17 of 25 patients (68%) complained of donor site morbidity, and 10 (40%) still had some discomfort at follow-up. No infections or local vascular complications occurred.

**Conclusions:** Miniopen SC joint reconstruction using a tendon autograft results in prolonged improvement in shoulder function in most patients with symptomatic anterior SC instability.

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

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**Keywords:** Sternoclavicular joint; instability; tendon autograft; reconstruction

Traumatic dislocation of the sternoclavicular (SC) joint is rare, the most common direction of the dislocation being anterior.<sup>4,13</sup> Castropil et al<sup>6</sup> reported that traumatic SC joint dislocation corresponds to less than 5% of all injuries of the shoulder region. Closed reduction is seldom successful in anterior dislocations, whereas posterior dislocations require

immediate reduction due to the risk of serious vascular complications or tracheal erosion.<sup>4,6,13</sup> The mechanism of injury is often indirect and may occur after a motor vehicle accident or a fall on the shoulder.<sup>4</sup> Instability may also occur after a minor traction injury or with an atraumatic etiology.

Anterior SC instability is characterized by subluxations and discomfort during motion and is an uncommonly reported condition.<sup>5,7,25</sup> In a series of 13 patients with acute traumatic SC dislocation, de Jong et al<sup>7</sup> found good results with nonoperative treatment. A persistent anterior

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prominence after an anterior dislocation is often not of any functional importance. Symptomatic anterior instability can be seen with or without a persistent prominence and may significantly affect daily functions, despite long-term nonoperative intervention. Most patients complain of discomfort, clicking, and pain when using the arm overhead, behind the sagittal plane of the body, and during cross-body movements, in which instances the joint is often in a dislocated position. Most patients report significant restrictions in normal daily activities as well as during leisure and sports activities.

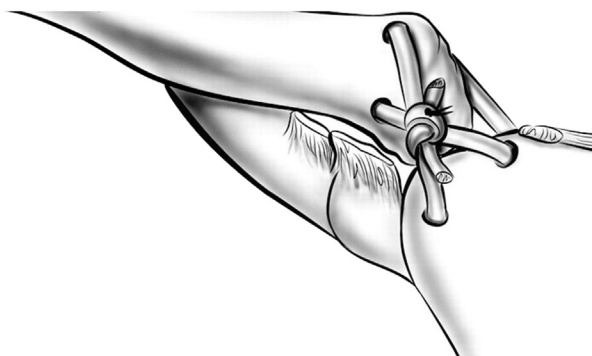
The pathomechanical rationale resembles that of symptomatic acromioclavicular joint stability, with an unstable fulcrum for the base of the shoulder girdle during active movements. The SC joint, however, is responsible for a larger degree of motion of the clavicle, which may render it more prone to symptoms from ligamentous injury and result in shoulder dysfunction.<sup>16</sup> Scapular dyskinesis is therefore commonly present. Clinical findings include decreased active abduction and flexion in the scapular plane as well as discomfort with cross-body arm movements. Most patients exhibit visible pop out of the joint during abduction exceeding 90° and behind the frontal plane of the body.

Radiographs are best taken using the Serendipity view with a direction of 40° distally.<sup>1</sup> Computed tomography (CT) is the preferred radiologic diagnostic tool. Primary treatment is nonoperative, with restoration of motion and scapular kinematics.

Surgical intervention may require extensive exposure and implies a risk of fatal complications.<sup>5</sup> The surgical options might be technically difficult because they may require dissection deep to the joint, under which are located the trachea, the brachiocephalic vein, the brachiocephalic trunk, the subclavian artery, and the common carotid artery.<sup>5</sup> Previous methods include resection arthroplasty, excision of the medial part of the clavicle, with or without Balser-plate fixation, or arthrodesis of the joint.<sup>5,8</sup> Bicos and Nicholson<sup>5</sup> stated in a that “there is a high risk of both intraoperative catastrophic and postsurgical complications when performing surgery in this region” and that surgical treatment could not be recommended.

Owing to the rarity of the condition, no larger series have been reported on the results of these methods, but recently, authors reported good results of less invasive procedures involving nonaugmented or graft-augmented reconstruction.<sup>1-3,11,12,14,23</sup> In a biomechanical study, Spencer and Kuhn<sup>20</sup> showed that graft augmentation in a figure-of-eight fashion through drill holes on both sides of the joint (Fig. 1) gave superior results for stability over other methods.<sup>20</sup> A recent series of 6 patients treated with this method reported a good outcome.<sup>19</sup>

One critical part of the technique may be making the drill holes behind the sternal bone. To avoid dissection behind the sternum while making the drill holes, a technique was developed using a small, self-tapping metallic



**Figure 1** The figure-of-eight plasty, as evaluated by Spencer and Kuhn. (Reproduced with permission from J Bone Joint Surg: Spencer EE Jr, Kuhn JE: Biomechanical analysis of reconstructions for sternoclavicular joint instability. J Bone Joint Surg Am 2004;86(1):98-105.)

anchor to fix the graft to the anterior-lateral part of the sternum. The purpose of this study is to report medium-term to long-term results of a prospective study on the first consecutive 32 patients.

## Materials and methods

From 2002 until 2010, 32 consecutive patients with more than 6 months of symptoms from a clinical and radiologically proven anterior instability underwent reconstruction of the SC joint. All had undergone physiotherapy treatment with emphasis on restoration of normal movement and scapular kinematics for at least 6 months before the operation. Exclusion criteria were patients with posterior SC instability or associated physal injury.

Five patients were lost to follow-up. The remaining 27 (84.4%) patients (10 males, 17 females) were a median age of 35 years (range 11-61 years) at surgery. The median duration of symptoms before the operation was 12 months (range, 6-156 months). In the follow-up group, 6 patients received a palmaris longus autograft, and 21 patients underwent reconstruction with a gracilis autograft. Twenty patients (8 males, 12 females) were traumatic cases (all minor injuries), whereas 7 patients (2 males, 5 females) were atraumatic. None of the cases derived from a major trauma.

## Postoperative assessment

The primary outcome measures were recurrent instability and the Western Ontario Shoulder Instability (WOSI) score.<sup>11</sup> WOSI scores were obtained preoperatively and at a mean of 54 months (range, 24-120 months) of follow-up. Secondary outcome measures were possible donor site morbidity (DSM). A Serendipity view or a CT scan was available in all patients to exclude other pathology such as physal injuries and medial clavicular fracture.

## Operative technique

The operation is performed with the patient under a general anesthetic, supine, and the ipsilateral arm or knee draped for harvesting of the autograft. Vascular and thoracic surgery backup

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