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# Management and functional outcomes following sternoclavicular joint dislocation

J.C. Kirby *, E. Edwards, A. Kamali Moaveni

*Department of Orthopaedic Surgery, The Alfred Hospital, Melbourne, VIC, Australia*

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ABSTRACT

*Introduction:* The aim of this study is to describe the demographics, management and functional outcomes of patients presenting with a sternoclavicular joint (SCJ) dislocation.
*Methods:* A retrospective medical record review was conducted examining patients with SCJ dislocation admitted to an adult level 1 trauma centre between 2004 and 2012. Patient demographics, symptoms, associated injuries, imaging technique used in diagnosis, surgical data and neurovascular complications were recorded. Patients received a single-page questionnaire to assess physical function using two validated shoulder questionnaires.
*Results:* A total of 22 patients were identified, out of which 77% sustained a posterior dislocation. Mean age was 30 years (range 16–65), and the most common cause of injury was a direct blow during sport ($n = 11$). Open reduction and internal fixation were performed in 13 patients, definitive closed reduction used in seven and two patients were managed expectantly. Functional outcomes for patients were excellent, with American Shoulder and Elbow Society (ASES) and Subjective Shoulder Value (SSV) scores >80 in 87.5% of cases. There were preoperative symptoms consistent with mediastinal compression in 50% and one delayed presentation with thoracic outlet syndrome. No patient had neurovascular compromise or functional deficit post-operatively, regardless of joint congruency.
*Conclusion:* This is the largest case series from a single institution currently available examining SCJ dislocation. We recommend an initial trial of closed reduction, followed by open reduction and internal fixation if there is joint instability or malreduction. Functional outcome following both closed and open reduction of the SCJ is excellent.



## Introduction

Dislocation of the sternoclavicular joint (SCJ) is a rare but potentially serious traumatic injury [1]. Usually as a result of high-energy trauma associated with motor vehicle accidents or contact sports [2–4], this injury is reported in the literature to account for < 3% of all injuries to the shoulder girdle. Anterior dislocation is reported to be up to three times more common than posterior dislocation [5–7]. Using the same mechanism, a younger patient (up to 25 years) may not sustain a true dislocation, rather a physeal disruption with clavicle displacement [4]. The presentation, potential complications and acute management in these cases are however the same as that which occurs with a true SCJ dislocation [3,8].

The medial clavicle epiphysis appears in late adolescence (age 18–20 years) and the physis is the last of the long bones to close, remaining open until around 25 years [2,7,9]. The SCJ is classified as a diarthroidal saddle articulation and is made up of the clavicular notch of the manubrium and the medial clavicle [2,9–11]. These two articular surfaces are incongruent with < 50% of the clavicular head actually contacting the notch rendering the joint potentially unstable [2,12,13] (see Fig. 1). Both the intra-articular disc, the strong anterior and posterior ligamentous/capsular complex, and the costoclavicular (rhomboid) ligaments compensate for this innate instability [9,12]. The posterior capsule is the most important structure in preventing anterior and posterior translations of the medial clavicle, and the intra-articular disc prevents superior and medial displacement [7,14]. There are multiple important structures in close proximity to the SCJ, including the subclavian vessels, the great vessels of the neck, the brachial plexus, trachea, oesophagus, vagus nerve and the superior aspect of the pleura [15]. An anatomical study from 2013 examining the distance of critical mediastinal structures from the SCJ reported that the closest at-risk structure is the brachiocephalic vein which had an average distance of 6 mm (range 1–10 mm) [15].

* Corresponding author at: 25 Wrights Terrace, Prahran, VIC 3181, Australia. Tel.: +61 0418141668.
*E-mail address:* c.kirby@gmail.com">julia.?c.kirby@gmail.com (J.C. Kirby).

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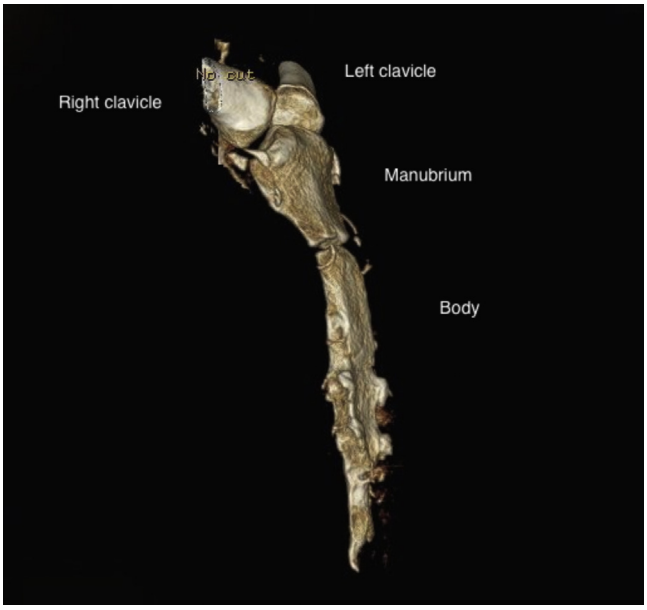


**Fig. 1.** CT 3D reconstruction of normal sternoclavicular joints (oblique). CR, closed reduction; ORIF, open reduction and internal fixation.

With posteriorly directed SCJ dislocation, there is a significant risk of devastating complications such as brachial plexus compression, vascular compromise, pneumothorax and ultimately death [5,16]. Worman and Leagus were the first, in 1967, to report up to 25% incidence of intrathoracic injury associated with posterior SCJ dislocation, including two deaths following operative management [17]. That article described common intrathoracic injuries would be laceration of the innominate vein and artery, tracheal laceration, pneumothorax and symptoms of dysphagia and dyspnoea [17]. Given the potential implications of these complications, it is imperative to identify these injuries accurately and provide timely management to avoid complications and gain optimal results [5]. Late presentation of brachial plexopathy and thoracic outlet syndrome has also been reported in the literature with missed SCJ pathology [5].

Method of diagnosis has not been clearly defined, but generally consists of appropriate clinical suspicion in all patients presenting with pain, swelling or deformity over their medial clavicle following trauma and subsequent confirmatory imaging with plain radiographs and/or computed tomography (CT) [12]. Visualisation of the SCJ with plain radiographs can be technically challenging and it provides anatomical detail. Hence the use of CT has become the gold standard whenever there is doubt regarding the diagnosis. In addition, CT can give information to discern true SCJ dislocation from a physeal injury in younger patients with an open physis [2,18,19]. The patients' age and previous radiation exposure must be considered when using this modality. CT can also provide information relating to surrounding structures and associated potential complications, and aid with operative planning [3,15,20].

The purpose of this study is to improve understanding of this rare and potentially devastating injury. Furthermore, we aim to identify management strategies that may influence functional outcomes following SCJ dislocations.

## Methods

### *Setting*

The Australian state of Victoria has a population of 5.7 million people with an annual growth rate of 1.9%. The state has a highly organised and centralised trauma system with two major trauma centres. The Alfred Hospital Emergency and Trauma Centre located in the city of Melbourne, Victoria, is a 300-bed university-affiliated tertiary referral and level 1 trauma centre, which manages more than 1200 major trauma (Injury Severity Score (ISS) $>$ 15) admissions annually.

### *Data collection*

A retrospective medical record review was conducted examining patients with SCJ dislocations admitted to the Alfred Hospital from January 2004 to December 2012. All cases were identified from the Victoria Orthopaedic Trauma Outcomes Registry (VOTOR) using ICD-10 codes. Imaging was reviewed to confirm diagnosis prior to data collection. Patients were contacted directly by mail and requested to participate in a self-administered questionnaire regarding functional outcomes assessing physical function and ability to return to work. This survey was based on two validated shoulder questionnaires, the Subjective Shoulder Value (SSV) and the American Shoulder and Elbow Society (ASES) scoring systems. The SSV is the percentage function of the injured shoulder, compared to a normal shoulder. The ASES combines a pain score on a visual analogue scale (VAS) and ability to perform various activities of daily living (ADL) to create a score out of 100 [21]. A follow-up phone call was made to patients who had not responded to the survey and the questionnaire surveys were completed over the phone. A data collection sheet was also formatted and data were captured from the medical records. This included patient demographics, presenting symptoms, direction of dislocation, associated fracture, other injuries and imaging modality used in diagnosis. In addition, surgical data and neurovascular complications were also recorded. One patient was excluded from analysis as the patient demonstrated a chronic posterior SCJ dislocation with the injury sustained before presentation at our institution with no intervention required, 100% function and no symptoms reported.

### *Management*

A CT scan was performed in all patients to confirm the diagnosis and assess the adjacent anatomical structures. Management at our institution took two general approaches dependent on the on-call surgeon. The first approach was to attempt an initial closed reduction under general anaesthesia with intraoperative assessment of joint stability ($n = 12$). If the joint was persistently unstable or irreducible, open surgical stabilisation was undertaken. If a stable successful closed reduction was achieved, then a post-operative CT scan or plain radiograph was performed to confirm the relationship of the clavicle to the sternum with further management being based on the CT appearance or clinical picture. The second approach was to view the dislocated SCJ as an innately unstable injury requiring open reduction and joint stabilisation ($n = 8$).

### *Surgical technique*

The method of closed reduction used for posterior dislocations was the classically described abduction–traction technique [5,11,13]. Under appropriate anaesthesia, the patient is positioned supine with a bolster between the scapulae. Traction is applied to the abducted ipsilateral arm whilst gradually extending the limb. Simultaneously, a towel clip is applied percutaneously to the clavicle to provide anterior traction [11] (see Fig. 2).

Our recommended technique for open reduction of the SC joint involves a 6-cm transverse incision extending from the medial clavicle to the manubrium. The clavicle has frequently undergone a