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ORIGINAL ARTICLE

Minimum 2-year outcomes and return to sport following resection arthroplasty for the treatment of sternoclavicular osteoarthritis

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Hypothesis: The aim of this study was to assess the effect of open resection arthroplasty for osteoarthritis of the sternoclavicular (SC) joint on pain levels, functional outcomes, and return to sport.

Methods: Patients from a single surgeon's practice who underwent open resection arthroplasty (maximum 10-mm resection) for SC osteoarthritis or prearthritic changes between November 2006 and November 2013 were retrospectively reviewed. This was an outcomes study with prospectively collected data. Preoperative and postoperative American Shoulder and Elbow Surgeons score, Quick Disabilities of the Arm, Shoulder, and Hand score, Single Assessment Numeric Evaluation score, several pain scores, and level of sport intensity were assessed.

Results: Seventeen SC joints in 16 patients (9 female, 7 male) met inclusion criteria. Mean age at time of surgery was 41.1 years (range, 12-66 years). One patient refused participation in the study. Three SC joint resections (17.7%) required SC joint revision surgery. Minimum 2-year outcomes data were available for 11 of the remaining 13 SC joints (84.6%). The mean time to follow-up was 3.3 years (range, 2.0-8.8 years). Pain at its worst ($P = .026$), pain at competition ($P = .041$), the Quick Disabilities of the Arm, Shoulder, and Hand score ($P = .034$), and the ability to sleep on the affected shoulder ($P = .038$) showed significant improvement postoperatively. The average postoperative American Shoulder and Elbow Surgeons score was 83.3. The level of sports participation ($P = .042$) as well as strength and endurance when participating in sport ($P = .039$) significantly increased postoperatively.

Conclusion: Resection arthroplasty of the medial end of the clavicle in patients with osteoarthritis of the SC joint without instability results in pain reduction, functional improvement, and a high rate of return to sport at midterm follow-up.

Level of evidence: Level IV; Case Series; Treatment Study

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Keywords: Sternoclavicular joint; open; resection arthroplasty; osteoarthritis; outcomes; return to sport

Research performed at the Steadman Philippon Research Institute, Vail, CO, USA.

Institutional Review Board approval was obtained from the Vail Valley Medical Center.

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Injuries of the sternoclavicular (SC) joint are rare and usually caused by high-energy mechanisms, such as collision sports or motor vehicle accidents.^{11,20,22} Until the mid-1990s, most symptomatic conditions of the SC joint refractory to conservative management were treated with resection arthroplasty.^{2,3,5,8,15,19,28} With increasing awareness that SC joint resection for instability following anterior and posterior SC joint dislocation resulted in poor outcomes, the treatment of disorders of the SC joint became more differentiated.²⁰ Symptomatic instability of the SC joint is best treated with surgical ligament reconstruction, whereas stable conditions with degenerative SC joint disease can be successfully treated with resection arthroplasty.^{1,7,11,12,16-18}

In the past 20 years, there have been limited studies reporting outcomes of SC joint resection arthroplasty. Most of these reports include mixed operative indications and varying amounts of medial clavicle resection, ranging from 1 cm up to 4 cm.^{1,2,7,12,16,18,21,23,24,27} Recent anatomic and biomechanical studies have suggested that minimizing bone resection in performing SC joint resection arthroplasty may be advantageous for preservation of ligamentous joint stabilizers.^{9,10,14} Although functional improvement has been reported following SC joint resection for osteoarthritis, the effect on return to sports in active patients remains unknown from published literature.^{2,12,18,22,24,27} The purpose of this study was therefore to assess functional outcomes and return to sport following resection arthroplasty for osteoarthritis of the SC joint, with a maximum resection of 10 mm. Significant improvements in functional outcome scores and high rates of return to sport were hypothesized.

Materials and methods

Patients who underwent SC resection arthroplasty and who were living in the United States with minimum 2-year follow-up were included in this study. Between November 2006 and November 2013, open resection arthroplasty was performed in 18 SC joints (17 patients) for painful osteoarthritis (n = 14) or painful prearthritic changes

with chondral lesion and tear of the intra-articular disk (n = 4) without instability by a single surgeon. All patients had undergone an unsuccessful period of nonoperative management with nonsteroidal anti-inflammatory medication and physical therapy of at least 3 months. For preoperative planning, radiographs (Fig. 1) and a computed tomography or magnetic resonance imaging scan (Fig. 2) were obtained to assess the morphology of the SC joint and to define the closely related vascular structures.^{10,11,20,26} An infectious cause of the SC joint arthritis was ruled out in all patients.^{1,7}

Surgical technique

The patients were placed supine on the operative table under general anesthesia. The entire chest, including both SC joints, was prepared for optimal anatomic and topographic orientation. A skin incision approximately 5 cm in length was made, beginning directly above the medial aspect of the clavicle and extending at the anterior-superior aspect of the sternum. The overlying soft tissues and sternocleidomastoid tendon were protected.¹⁰ A longitudinal incision was then made through the anterior SC joint capsule. The anterior capsule was then dissected with the periosteum off the medial portion of the clavicle.

The costoclavicular ligament was preserved to maintain SC joint stability (Fig. 3). Blunt retractors were placed to protect the soft tissues and neurovascular structures cephalad and posterior to the medial clavicle. A maximum of 10 mm of the medial clavicle was resected with an oscillating saw parallel to the SC joint line (Fig. 4). Whereas the anterior-inferior portion of the medial clavicle was the main articulating part within the SC joint and was included in the resection, the amount of resection of the medial clavicle was always limited to a maximum of 10 mm to preserve the ligamentous joint stabilizers, particularly the costoclavicular ligament.^{4,6,10,14,25} Lee et al showed that the costoclavicular ligament attaches approximately 12 mm lateral to the SC joint.¹⁰

To ensure protection of the main vessels posterior to the SC joint, the posterior SC joint capsule was protected throughout the procedure. The final resection plane was smooth, with the resected medial clavicle carefully contoured with a rongeur and bone rasp. The intra-articular disk was also completely resected. The medial end of the clavicle was sealed with bone wax to prevent bleeding and heterotopic bone formation, and the wound was copiously irrigated (Fig. 5).

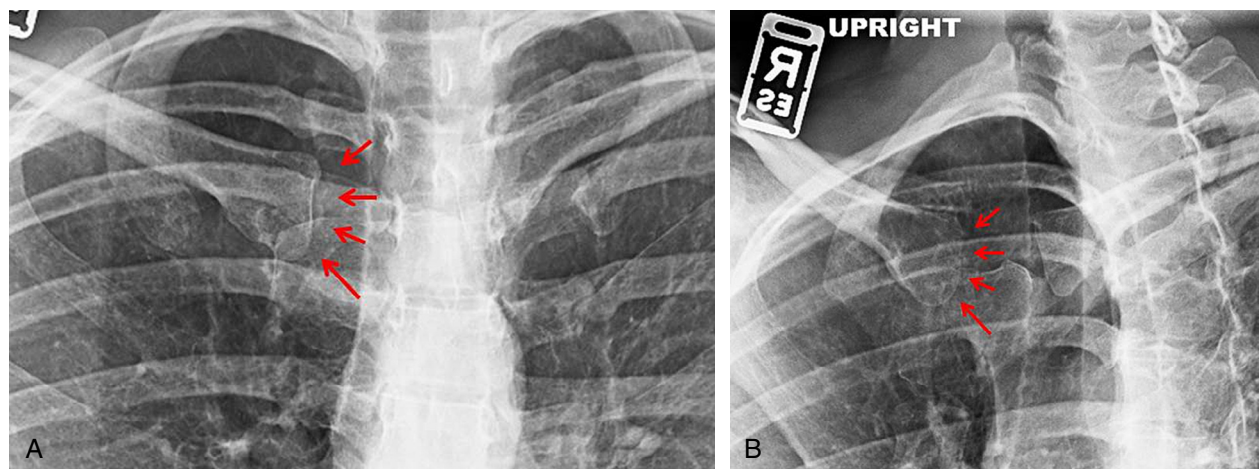


Figure 1 (A and B) Post-traumatic osteoarthritis of the right SC joint (arrows); 24-year-old male patient.

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