



Use of the clavicular part of the pectoralis major in treatment of failed revision osteosynthesis of the clavicle

Alexander Van Tongel, MD^{a,*}, Lore Kegels, MD^a, Bart Berghs, MD^b,
Anne Karelse, MD^{a,c}, Tom Van Isacker, MD^d, Lieven De Wilde, MD, PhD^a

^aDepartment of Orthopaedic Surgery and Traumatology, Ghent University Hospital, Ghent, Belgium

^bDepartment of Orthopaedics and Traumatology, Upper Limb Unit, AZ Sint-Jan AV Brugge–Oostende, Campus Brugge, Brugge, Belgium

^cDepartment of Orthopaedics and Traumatology, ZorgSaam Terneuzen, Terneuzen, The Netherlands

^dDepartment of Orthopaedics and Traumatology, AZ Sint-Lucas Brugge, Brugge, Belgium

Background: Symptomatic atrophic nonunion after multiple clavicle osteosynthesis can be difficult to treat. The aim of this study was to evaluate the results of a transfer of the clavicular part of the pectoralis major muscle as augmentation of osteosynthesis of these nonunions.

Materials and methods: A retrospective study included all patients who were treated between 2001 and 2010 (minimum 2-year follow-up). The indications for primary surgery, the number of operations, and the indication for a pectoralis major transfer were evaluated. Time of radiologic consolidation and postoperative complications were assessed. Clinical evaluation was performed with preoperative and postoperative satisfaction ratings and Constant-Murley scores.

Results: The study included 11 patients. The indications for a primary osteosynthesis were acute displaced fractures (7), delayed union (2), nonunion (1), and malunion (1). On average, 3.7 procedures were performed (range, 2-6) before the tendon transfer. At revision, there were 2 patients with infection and 9 without infection. Of the 11 clavicles, 10 showed radiologic consolidation after a mean time of 10 weeks (6-20 weeks). The mean follow-up was 62 months (24-132 months). The mean Constant-Murley score increased from 37 (24-55) preoperatively to 59 (43-98), and the satisfaction rating increased from 2 (1-3) to 7 (2-10). Complications included nonunion (1), hardware removal (2), hardware irritation (4), and donor site pain (1).

Conclusion: The use of the clavicular part of the pectoralis major transfer as an augmentation in revision for symptomatic atrophic nonunion after multiple clavicle osteosynthesis showed good radiologic and acceptable clinical results.

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

© 2014 Journal of Shoulder and Elbow Surgery Board of Trustees.

Keywords: Clavicle; nonunion; atrophic; soft tissue envelope; failed osteosynthesis; pectoralis major

This study has been reviewed by the ethics committee; a positive advice was given for this protocol on January 31, 2013. Ethics committee UZ Ghent, Chairman: Prof. Dr. Rubens. Registration number: 86702013116429.

*Reprint requests: Alexander Van Tongel, MD, Department of Orthopaedic Surgery and Traumatology, Ghent University Hospital, De Pintelaan 185, B-9000 Ghent, Belgium.

E-mail address: Alexander.vantongel@uzgent.be (A. Van Tongel).

Approximately 2% to 5% of all fractures in adults involve the clavicle. More than two thirds of these injuries occur at the diaphysis of the clavicle, and these injuries are more likely to be displaced compared with medial- and lateral-third fractures.^{25,27} Recent evidence suggests that this specific subset of patients may be at high risk for nonunion, shoulder dysfunction, or residual pain after nonsurgical management.^{22,24,37,41} In these patients, acute surgical intervention may minimize suboptimal outcomes.

Open reduction and internal fixation of clavicle fractures can be performed with either plate or intramedullary pin.³¹ Although high success rates have been shown for both techniques, bone healing problems (nonunion and symptomatic malunion), infection (deep or wound), implant-related problems (breakage, mechanical failure, irritation, angulation), plate débridement, removal or revision, neurovascular problems (transient or persistent brachial plexus symptoms, regional pain syndrome), refracture after plate removal, and other complications have been reported.^{8,11,18,20,24,29,38} Major complications like symptomatic nonunion and deep infection after clavicular osteosynthesis can be difficult to treat, and revision may be necessary.^{20,24,29,34}

In 2000, Williams et al⁴⁰ described a good result after the use of a rotational flap consisting of the clavicular portion of the pectoralis major in a patient with poor soft tissue coverage after multiple operations for a clavicular fracture complicated by nonunion and infection.

The aim of this study was to evaluate our results with this surgical technique in patients with symptomatic atrophic nonunion after multiple clavicular osteosynthesis.

Materials and methods

This retrospective study included all patients who were treated in our department with the use of the clavicular part of the pectoralis major muscle for symptomatic atrophic nonunion after multiple clavicular osteosynthesis between 2001 and 2010. Demographics of the patients and comorbidities were analyzed. The indications for primary surgery, the number of operations, and the indication for a pectoralis major transfer were evaluated. Preoperatively, clinical evaluation was performed with the Constant-Murley score and satisfaction rating (0, not satisfied–10, satisfied).

Surgical technique (video)

All surgeries were performed by the senior author (L. D. W.). The procedure was performed under general anesthesia with the patient in the beach chair position. First, the clavicle was approached by the original incision. All hardware still in place was removed and the nonunion was débrided to freshen the ends of the bone at the fracture site. A 2-mm drill was used to open the medullary canal to encourage fresh bleeding from the bone ends, and an intramedullary K-wire of 2.5 mm was introduced as a temporary fixation of the clavicle. Next, a plate and screw fixation was applied to the superior surface of the clavicle. The

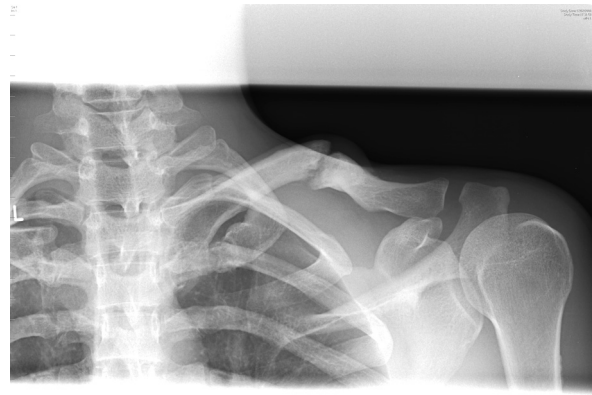


Figure 1 Radiograph of the right clavicle shows nonunion after failed clavicular osteosynthesis and removal of hardware.

K-wire was left in place if it did not disturb the plate and screw fixation. If there was inadequate local autograft after débridement of the fracture, cancellous autograft from the iliac crest was used. If there was more than 2 cm of bone loss, a tricortical autograft of the iliac crest was used.

After débridement and fixation of the nonunion, the incision was lengthened distally and the pectoralis major was dissected. Medially, the interval between the pars clavicularis and the pars sternalis was visualized, and the muscle was split distally and laterally in line with its fibers. The next step was to free the pars clavicularis from its attachment at the humerus. A second longitudinal incision was made at the attachment of the pectoralis major on the humerus, and a subcutaneous tunnel between the 2 incisions was made. The insertion of the clavicular head was carefully separated from the deeper insertion of the sternocostal head and was transected. The superior border of the muscle was then separated from the medial border of the anterior part of the deltoid by dissection of the deltopectoral interval, leaving only the origin of the clavicular head intact. The tendon was taken through the subcutaneous tunnel, and the deep surface of the clavicular part of the pectoralis major was dissected from lateral to medial until the vascular pedicle was seen. The muscle was dissected, with care taken of its vascular bundle. The muscle was then rotated superiorly around its long axis so that the deep surface was superficial. Next it was confirmed that the muscle transfer could cover the clavicle, and then the tendon was attached with an absorbable suture to the posterior part of the clavicle. Any muscle tissue that was extraneous to covering the clavicle was removed. The wound was closed in layers and no drain was used.

The extremity was placed in a sling for comfort, and active motion was allowed as tolerated thereafter. Patients were followed up regularly until union was achieved, as determined by clinical examination and radiographic assessment. Union was defined as bridging bone and remodeling on 2 radiographic views (anteroposterior and 45°), stable hardware position, and no detectable motion by the patient with shoulder movement.

All patients were evaluated at least 24 months after surgery. At their latest follow-up, in addition to radiologic and clinical

Download English Version:

<https://daneshyari.com/en/article/4074435>

Download Persian Version:

<https://daneshyari.com/article/4074435>

[Daneshyari.com](https://daneshyari.com)