



ELSEVIER

ORIGINAL ARTICLE

A new local muscle flap for elbow coverage—the medial triceps brachii flap: anatomy, surgical technique, and preliminary outcomes

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Background: The medial triceps brachii is vascularized by the middle collateral artery and the arterial circle of the elbow. This vascularization allows a distal pedicled use to cover soft tissue defects of the elbow. We report our experience using this flap to cover traumatic and postsurgical wounds.

Methods: Patients who underwent a pedicled medial triceps brachii flap procedure between 2008 and 2015 were included. Data concerning characteristics of the patients, wound size, surgical technique, and complications were retrospectively reviewed. An independent observer examined patients and assessed outcome of the coverage procedure: wound healing, scar length, range of elbow motion, and patient satisfaction.

Results: Eight patients were included (70.6 ± 17.7 years old at the time of surgery). All patients had serious comorbidities and risk factors of poor wound healing. Defects were due to postoperative healing complications (5 patients), skin necrosis secondary to an underlying olecranon fracture (1 patient), and direct open fractures (2 patients). Soft tissue defects had a median surface of 17 (14-22) cm². The olecranon was exposed in 7 cases and the medial humeral epicondyle in 1 case. Mean procedure duration was 83 ± 14 minutes. There was no intraoperative or postoperative complication. All patients healed properly at 3 weeks of follow-up. No wound recurrence or surgery-related complication was reported after a median follow-up of 40.5 (21.5-69.5) months.

Conclusion: Favorable outcomes in all of our 8 patients make this flap an interesting option to cover small to medium-sized defects of the posterior aspect of the elbow.

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

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Keywords: Elbow; medial triceps brachii; flap; wound; complication; arthroplasty; fracture

The elbow joint is covered by a thin, elastic, soft tissue envelope that can withstand and allow repetitive flexion and extension. This envelope can be compromised by an infected elbow prosthesis or open fracture. A number of soft

tissue procedures to cover the elbow region have been described.^{10,13,22} These procedures consist of fasciocutaneous flaps,^{12,17} pedicled muscle flaps, perforator flaps,³ and free tissue transfers.⁶ Described pedicled flap techniques use different muscles, including the anconeus,^{9,20} the brachioradialis,¹⁹ the flexor carpi ulnaris,^{1,2,21} the extensor carpi radialis longus, and the latissimus dorsi. In patients with serious comorbidities or multiple traumas, the coverage technique has to be safe, quick, and reliable.

The medial triceps brachii (MTB) is 1 of the 3 heads of the triceps brachii muscle. It extends from the posterior aspect

Approval of the institutional ethics committee was received. All patients provided written informed consent.

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of the humerus to the tricipital tendon. Its vascularization comes mainly from the middle collateral artery (a branch of the deep brachial artery) but also from the arterial circle of the elbow.^{11,20} This vascularization allows a distal pedicled use of the MTB as a local flap to cover a soft tissue defect of the elbow.

It can provide coverage for small to medium-sized defects about the elbow without requiring any microvascular anastomosis. It has previously been shown to have acceptable donor site morbidity when it is harvested as a free transfer.⁷

The aim of this study was to report our experience using this flap to cover soft tissue defects of the elbow. We analyzed procedural indications and long-term outcomes.

Materials and methods

Study design

This was a single-center retrospective study. All consecutive patients who underwent a pedicled MTB flap between 2008 and 2015 in our institution were included.

Data concerning characteristics of the patient at the moment of surgery, wound size, surgical technique, and complications were retrospectively retrieved from our institution's electronic medical record system. An independent observer examined patients and assessed outcome of the coverage procedure: wound healing, scar length, range of motion of the elbow, and patient satisfaction.

Statistical analyses

All analyses were performed using MATLAB (R2014a; MathWorks, Natick, MA, USA). Quantitative data are presented as mean \pm standard error for normal distributions and as median [1st-3rd quartiles] for non-normal distributions.

Results

Population

The procedure was carried out on 8 patients (3 women, 5 men). Subjects were 70.6 ± 17.7 years old at the time of surgery. All patients had serious comorbidities and risk factors of poor wound healing (Table I).

Causes of the defect were postoperative scar complications (4 patients for traumatic surgery and 1 patient for a chronic olecranon bursitis), skin necrosis secondary to an underlying olecranon fracture (1 patient), and direct open fracture (2 patients). Soft tissue defects had a median surface of 17 (14-22) cm². The olecranon was exposed in 7 cases and the medial humeral epicondyle in 1 case. Median delay between wound and soft tissue coverage was 24.5 (12-39.5) days.

Surgical technique

All patients underwent a similar procedure. Patients were in dorsal position, shoulder at 90° of abduction, elbow at a right angle on an arm rest. The skin was incised vertically on the posterior aspect of the arm, from the depression between the lateral and long heads of the triceps (posterior to the deltoid tuberosity) to the olecranon fossa. The tendinous part of the triceps muscle was directly exposed and longitudinally incised, separating the long and lateral heads.

A cleavage plane was found, superficially separating the lateral and long heads from the medial head. Using retractors placed on the lateral and the long heads, the medial head was exposed.

The pedicle origin was easily localized within the radial groove and followed up to the muscle surface. It was ligated at its proximal part, immediately distal to the radial groove.

Table I Characteristics of the patients

Patient	Gender/ age	Comorbidities	Cause of defect and associated injuries	Wound size (cm ²)
1	M/60	Tobacco, diabetes	Polytrauma, distal humerus open fracture Gustilo II, secondary skin necrosis after ORIF	13
2	M/80		Polytrauma, open elbow dislocation	18
3	M/40	Tobacco, alcohol abuse	Polytrauma, distal humerus fracture, secondary skin necrosis after ORIF	20
4	F/78	Tobacco, aortic prosthesis, cardiac insufficiency, rhabdomyolysis	Closed olecranon fracture with skin necrosis	24
5	M/53		Open distal humerus fracture multioperated, infection of a TEA	15
6	F/92	Tobacco, diabetes, arrhythmia, hypertension, coronary heart disease, osteoporosis	Closed humerus fracture treated with TEA, postoperative infection	12
7	F/78	Diabetes, severe Parkinson disease	Open olecranon fracture	16
8	M/84	Tobacco, diabetes, atrial fibrillation	Osteomyelitis after surgery for a hygroma	24

ORIF, open reduction-internal fixation; TEA, total elbow arthroplasty.

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