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One-stage reconstruction of isolated and combined tendon defects with the vascularized adductor magnus tendon graft: Surgical technique and preliminary results

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Summary *Introduction:* Secondary reconstructions of isolated and combined tendon defects are still a challenge for plastic surgeons. Due to its reliable anatomy, reconstructive potential and low donor-site morbidity, the medial femoral condyle is an ideal area for harvesting isolated and combined tendon flaps. This study evaluates our preliminary results with the vascularized adductor magnus tendon flap.
Patient and methods: The study included six patients who received a vascularized tendon flap (upper extremity: three patients; lower extremity: three patients) from 2011 to 2015. For three patients, the adductor magnus tendon was used as a single flap; for the other three patients, the tendon was included in a composite flap. A retrospective chart review provided the patients' demographic data, surgical details and the post-operative course. The further objective and patient-reported outcome was evaluated with a long-term follow-up.
Results: All of the free vascularized flaps healed without complications and with good vascularization upon duplex ultrasonography. One patient did, however, require revision surgery in the late post-operative course. At the end point, all patients showed good functional results without any donor-site morbidity.
Conclusion: For carefully selected isolated and combined tendon defects on the upper and lower extremities, the vascularized adductor magnus tendon flap provides a reliable and versatile method for microsurgical reconstruction.

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Introduction

Due to its reliable anatomy, reconstructive potential and low donor-site morbidity, the area around the medial femoral condyle has gained importance in microsurgical reconstruction in recent years.[1–4] However, most publications focused on the medial femoral condyle flap for reconstruction of bone defects.[4–7] To date, only a very few reports are available on free vascularized adductor magnus tendon flaps.[8–10] Not only does this area represent an ideal donor site for microsurgical reconstruction of various defects,[3] we also believe that a vascularized tendon unit can improve functional outcomes, especially in patients with failed first-line procedures and scarred tendon beds. Our series included six patients who underwent a vascularized adductor magnus tendon flap procedure either for secondary one-stage reconstruction of isolated tendon defects or as a component of a composite flap for reconstruction of complex osteo-tendo-cutaneous defects.

Patients and method

Patients

From 2011 to 2015, six patients underwent secondary tendon reconstruction with a vascularized adductor magnus flap (women: two, men: four). The average age at the time of surgery was 51 years (range: 21—76 years). A vascularized tendon flap was created on the upper extremity in three patients (3/6; 50%), while the other three patients (3/6; 50%) underwent tendon reconstruction on the lower extremity. Three patients (3/6; 50%) underwent vascularized adductor magnus flap reconstruction as a single procedure and three (3/6; 50%) vascularized tendon transfer as part of a composite osteo-tendo-fasciocutaneous flap. Further preoperative details are given in Table 1.

The indications for secondary tendon reconstruction on the upper extremity were a complex hand injury with a tendo-cutaneous defect on the dorsum of the hand, an extensor tendon insufficiency due to severe adhesions after a complex finger injury and an extensor pollicis longus tendon defect after a failed extensor indicis transfer.

On the lower extremity, there were two secondary tendon reconstructions as part of a composite flap for reconstruction of a post-traumatic osteo-tendo-cutaneous defect of the toe and a tendo-cutaneous defect of the Achilles tendon after failed primary repair. A closed rupture required late reconstruction of the Achilles tendon with a single tendon flap.

The average number of surgical interventions before the ultimate reconstruction was 1.5 (range: 0—3 interventions). The mean interval from the day of injury to the definitive reconstruction was 26.1 weeks (range: 3—72.1 weeks; Table 1).

Technique (graft harvest)

Detailed step-by-step instructions for the surgical technique are available as supplementary online content. Our technique was similar to that described by Iorio et al.,[8] with a thigh tourniquet applied for the graft harvest. A longitudinal curvilinear incision is made over the distal part of the medial thigh from the midpoint between the medial border of the patella and the medial femoral condyle proximal to Hunter's canal. The fascia lata underlying the subcutaneous fat is incised longitudinally and the vastus medialis muscle retracted. The distal part of the adductor magnus muscle is exposed and the descending genicular artery (DGA) with its articular branch to the adductor magnus tendon is identified by subfascial dissection (Figure 1). Anterior branches to the vastus medialis are ligated. The vascular pedicle is then followed proximally. Once the vascular pedicle has been dissected, the distal end of the adductor magnus tendon is dissected from the medial condyle and harvested gently from distal to proximal over the desired length. Then the proximal end of the tendon is dissected and the vascularized tendon flap harvested on the common DGA. For a tendo-fasciocutaneous composite flap, a distal cutaneous branch of the DGA as described by Iorio et al.[8] is identified after a curvilinear incision on the ventral margin of the proposed skin island. The cutaneous branch is identified and the dissection of the vascular pedicle and the tendon graft continued. With the perforator centred in the skin island, the flap harvest is completed by an incision of the dorsal margin of the skin island. If a distal cutaneous branch of the DGA is missing or a large skin flap is required, a fasciocutaneous flap based on the saphenous branch of the DGA can be harvested.[8] For an osteo-tendo-fasciocutaneous flap, a vascularized bone graft narrowed by vessels of the DGA is included in the flap, as described in several studies.[5,6] Primary closure of donor sites was always possible.

Methods

The patients' charts were reviewed retrospectively; outcomes were assessed according to the post-operative course, healing rates, post-operative complications and revision surgeries. Post-operative vascularization of all grafts was verified by duplex ultrasound. Long-term follow-up included objective and patient-reported assessment of functional outcome as well as the donor-site morbidity. Functional outcome measurement comprised evaluation of the active and passive range of motion (ROM) of each relevant joint (injured and uninjured side) with a standard goniometer according the neutral-0-method. The collected motion data was used to calculate the total active motion (TAM = total active flexion −total active extension deficits). On the upper extremity, the Geldmacher scoring system was used to evaluate the functional outcome of the reconstructed extensor tendons.[9] For the evaluation of the thumb, the radial abduction angle, the extension deficit, the opposition distance to the base of the little finger and the flexion-extension deficits of the metacarpophalangeal (MCP) and interphalangeal (IP) joint formed the score. For the evaluation of the fingers, the ROM of each joint (MCP, PIP (proximal interphalangeal) and DIP (distal interphalangeal)), the extension deficits of all joints, the flexion—extension deficits of all joints and the pulp-to-palm distance were assessed. A score was assigned for each function. The sum of all sub-points was used to calculate