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CASE REPORTS

Free functional rectus femoris muscle transfer for restoration of knee extension and defect coverage after trauma

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Summary In March of 2000 and May of 2002, two patients underwent restoration of knee extension with a free neurovascular rectus femoris flap. The female patient was 10 years and the male patient 19 years old. Both patients sustained a complex trauma of the thigh with fracture of the femur and posttraumatic loss of quadriceps femoris muscles.

Follow up of the patients was 51 and 27 months. After 8 months reinnervation were detected by Electromyography (EMG) in both patients and contraction became visible 2 months later. The female patient obtained a good and the male patient a very good functional result. Both patients were able to walk unaided.

The authors concluded that free functional rectus femoris transfer can obtain excellent results in treating knee extension and soft-tissue defect due to trauma and loss of the quadriceps femoris muscles.

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Posttraumatic loss of the quadriceps femoris muscles and subsequent loss of knee extension can be disabling. Soft-tissue coverage and simultaneous

replacement of muscle function can be achieved using the contralateral rectus femoris muscle. The first clinical use of the rectus femoris muscle as a free transplant in humans was reported by Schenck in 1977 to repair traumatic loss of all forearm flexors.^{1,2} Fu-Chan Wei's group³ reported on 26 patients who received reinnervated free rectus femoris muscle transplantation for limb

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reconstruction after traumatic or obstetrical brachial plexus injury (22 patients) or traumatic muscle loss (five patients). Doi et al.^{4,5} used seven rectus femoris muscles as donors in brachial plexus palsy and for functional limb salvage in cases of traumatic muscle loss or radical excision of a malignant soft-tissue tumour. Koshima et al.^{6,7} employed it for facial paralysis and for dynamic reconstruction of large abdominal wall defects.

Initially we used the rectus femoris muscle for restoration of foot dorsiflexion after lower leg compartment syndrome.⁸ Additionally donor-site morbidity in four patients after reconstruction with free neurovascular rectus femoris muscle was examined through a series of strength tests in which the leg with harvested rectus femoris muscle was compared with the contralateral leg with an intact rectus femoris muscle.⁹ Due to our good results with the rectus femoris muscle we expanded our indication and used this flap for restoration of knee extension and soft-tissue coverage after trauma.

Two patients suffered a posttraumatic soft-tissue defect with loss of the quadriceps femoris muscles that necessitated function reconstruction and soft-tissue coverage. The indication, the surgical technique and the results obtained are presented.

Patients and methods

Patients

Between March of 2000 and May of 2002, two patients underwent restoration of knee extension with a free neurovascular rectus femoris flap from the controlateral thigh. The female patient was 10 years and male patient 19 years old. Both patients sustained complex trauma to the thigh with fracture of the femur (Figs. 1 and 2). The result was an extensive soft-tissue defect, necrosis and loss of all quadriceps femoris muscles and subsequent loss of knee extension. The time period between injury and the reconstructive procedure was 12 months in the female patient and 2 months in the male patient.

Methods

Anatomy and flap design

The rectus femoris muscle originates in two heads from the upper crest of the acetabulum and inserting conjointly into the patellar tendon with the vastus lateralis, medialis, and intermedius. The skin island is outlined as an ellipse directly

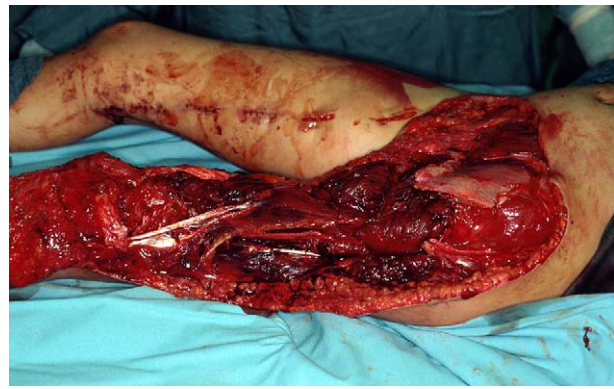


Figure 1 Ten-year-old female patient with traumatic loss of the left quadriceps muscle and extensive soft-tissue defect, rupture of the femoral vessels and nerve, multiple pelvis and thigh fractures.

over the central axis of the proximal two thirds of the muscle. We raised flaps with skin paddles up to 9 cm in width and 35 cm in length and achieved primary wound closure.

The vascular supply is from the descending branch of the lateral circumflex femoral artery that is 1.5–2.0 mm in diameter, accompanied by paired venae comitantes and located approximately 8 cm below the level of the inguinal ligament. It enters the muscle on its deep surface. A branch of the femoral nerve innervates the muscle and enters the muscle at the same level as the vascular pedicle.

Surgical technique

The patient is placed in a supine position. A radical debridement is performed, intact neurovascular



Figure 2 Nineteen-year-old male patient with thigh fracture and extensive soft-tissue defect, necrosis and loss of quadriceps femoris muscle.

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