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POST-SURGICAL REHABILITATION

Rehabilitation of ruptured quadriceps tendon complicated by a post-operative wound infection and delayed surgical repair

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Abstract Rupture of the quadriceps tendon is an uncommon but severe injury that has a long recovery period and risk of sequelae especially when repair is delayed. This article presents a case of ruptured quadriceps tendon complicated by a post-operative wound infection causing a six-month delay of definitive surgical treatment. This paper discusses therapy following resolution of the wound infection (to prepare the patient for definitive repair) and therapy following repair (to restore the subject to previous levels of competitive activity).

Introduction

Rupture of the quadriceps tendon superior to the patella is an uncommon but severe injury that has a long recovery period and risk of sequelae such as extension lag and limited flexion. Risk factors and surgical techniques are well described in the literature but rehabilitation that is critical to full recovery, has not been similarly discussed.

Rupture most commonly occurs because of a fall or sports injury, but can also be caused by lifting and non-penetrating blows to the quadriceps (Scuderi, 1958; Rasul and Fischer, 1993; Rougraff et al., 1996). The injury most commonly affects middle-aged men (average 59 years) (Scuderi, 1958; Rasul and Fischer, 1993; Rougraff et al., 1996; Konrath et al., 1998). The risk of quadriceps rupture is elevated in persons with systemic diseases (e.g., diabetes, renal disease, gout). In addition, approximately 20% of persons who rupture a quadriceps tendon will suffer a subsequent contralateral rupture (Rougraff et al., 1996).

Several surgical techniques give satisfactory results for primary repair of a ruptured quadriceps tendon (Scuderi, 1958; Olusola and Ahmad, 1985; Fujikawa et al., 1994; Rhomberg et al., 2000). Immediate repair (within 2 weeks) generally yields excellent results, while delayed repair is associated with poor prognosis (Scuderi, 1958; Rougraff et al.,

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1996; Konrath et al., 1998). The poor prognosis associated with delayed repair reflects technical operative difficulties and associated muscular contracture, atrophy, fibrosis, and anatomic defects of the rectus femoris. Optimal outcome involves recovering preoperative pain-free stability and range of motion (Rasul and Fischer, 1993; Rougraff et al., 1996). Functionally this can be measured by need for ambulatory aids, ability to climb stairs, maximum walking distance, and return to pre-injury activities.

Persons with a ruptured quadriceps tendon may delay several months before seeking medical attention, and misdiagnosis leading to delayed treatment is common (Rougraff et al., 1996). Delay may occur in patients evaluated in an emergency room for a ''knee sprain''. A tendon defect may not be apparent immediately, due to hematoma formation, nor may there be an appreciable drop of patellar level (Scuderi, 1958). Furthermore, radiography is normal, so patients are sent home and advised to consult an orthopedic surgeon if symptoms persist. Considerable time may elapse before the patient realizes his/her symptoms are not improving. Thus, primary care providers should have a high index of suspicion when evaluating patients after acute knee injuries, especially those involving hyperflexion. Evaluation should ascertain the mechanism of injury and risk factors for quadriceps rupture (Table 1). Physical evaluation of such clients must assess the ability to actively extend the knee, a palpable suprapatellar defect, and visible patella-baja when the patient stands.

Table 1 Factors to consider in evaluating thigh/knee injuries for possible quadriceps rupture.

Health history—risk factors
Sex (more common in men)
Age (>40 years usually 6th decade of life)
Comorbid medical conditions
Autoimmune, gout, diabetes, steroid use, hyperparathyroidism
History of injury—mechanism of injury
Slip and fall on a flexed knee
Injuries during activities (e.g., sports)
Motor vehicle accident
Clinical manifestations
Loss of extensor function
Palpable suprapatellar defect
Patella baja
Mass in upper thigh, caused by muscle retraction
Hematoma/hemarthrosis

Case report

The patient was a 58-year-old white male whitewater boater running a class-V river. His past medical history was unremarkable, other than having ruptured his left quadriceps tendon 10 years previously. After approximately 4 h on the river, while portaging, he slipped and fell on a flexed knee. Following the fall, he had swelling, hemarthrosis, inability to extend the right knee, and a palpable suprapatellar defect. Surgery to repair the rupture occurred 2 days later. Ten days following surgery, the wound dehisced revealing an infected hematoma. Treatment involved six surgeries for irrigation and debridement over a 12-day period. Fixtures from the primary repair were removed.

The patient was discharged on IV antibiotics that were continued for 6 weeks. Home physical therapy began 1 week post-surgery and continued twice weekly for 6 months. Massage therapy began 3 months post-surgery and was continued twice weekly alternating with physical therapy. The patient underwent definitive surgical repair 6 months following discharge. Physical therapy twice weekly (for 2 months) was resumed 1 week following surgery. Massage therapy twice weekly (alternating with physical therapy) began 1 month post-operatively, and the patient began a daily training program in conjunction with massage therapy 2 months following the final surgery. One year following repair the patient had resumed all previous activities that include class-V whitewater boating, vertical and horizontal caving, and orienteering (albeit at a somewhat reduced efficiency).

Therapy of untreated quadriceps rupture prior to definitive repair

In general, massage therapists do not treat patients prior to surgical repair of a ruptured muscle. However, in this case intensive therapy following treatment of the post-operative infection, prior to the final repair, was essential to attain an optimal outcome. The goal of this initial therapy program, coordinated by the orthopedic surgeon, was to reduce scar tissue and regain range of motion in the knee.

Physical therapy began immediately following surgery (phase-1 of rehabilitation). Intensive therapy began 3 months later during phase-2 when massage therapy was initiated and the patient began self-assisted motion using an ERMI Knee Flexionator (ERMI, Inc., Decatur, GA). The patient