A Modified Method for Reconstruction of Chronic Rupture of the Quadriceps Tendon after Total Knee Replacement

S Singh, MBBS, SK Choon, FRCS, CC Tai, FRCS (Ortho)
Department of Orthopaedic Surgery, University Malaya Medical Centre, Kuala Lumpur, Malaysia

ABSTRACT

We describe herein a modified technique for reconstruction of chronic rupture of the quadriceps tendon in a patient with bilateral total knee replacement and distal realignment of the patella. The surgery involved the application of a Dacron graft and the 'double eights' technique. The patient achieved satisfactory results after surgery and we believe that this technique of reconstruction offers advantages over other methods.

Key Words:
chronic rupture, Quadriceps tendon, Reconstruction, Dacron, total knee replacement

INTRODUCTION

Rupture of the extensor apparatus of the knee can result in significant morbidity to patients and presents a considerable challenge to the surgeons. Various surgical procedures for repair or reconstruction of the quadriceps tendons have been described in the literature, ranging from Codivilla tendon lengthening to using either autogenous or synthetic grafts for augmentation [1]. In 1976, Levin introduced usage of Dacron graft for reconstruction of the patella tendon [2]. We describe herein a modified technique for reconstruction of a chronic and complex rupture of the quadriceps tendon utilizing a Dacron graft in a patient who previously underwent total knee replacement (TKR).

CASE REPORT

Preoperative Presentation

A 69 year old female who previously underwent bilateral TKR presented with the postoperative complication of recurrent dislocation of both patellae. After four months of conservative treatment without success, she underwent bilateral distal realignment of her patella (modified Elmslie-Trillat procedure). The operation was successful in correcting recurrent the patellar dislocation, however she was noted to have persistent extension lag of 45 degrees of the right knee after the second surgery despite intensive physiotherapy. A palpable gap was noted in the quadriceps tendon approximately 3 cm from the superior pole of the patella. Understandably, the patient was initially reluctant to undergo any further surgery; but, after 6 months of conservative treatment, she agreed to proceed with reconstruction of the quadriceps tendon with a Dacron graft.

Surgery

A longitudinal midline incision was made over the old scar from 8 cm above the superior margin of the patella to 3 cm below the inferior pole. A rupture at the osseotendinous junction resulted in a 5 cm defect in the quadriceps femoris muscle group. After debridement of the frayed ends of the ruptured tendon, using an artery forceps, a 6mm Dacron graft was introduced transversely through the proximal end of the patella tendon close to the inferior pole of the patella. With the knee in extension, the graft was then crossed over the patella and then crossed again through the quadriceps tendon using s 'Figures of Eight' technique, adapted from the Fujikawa technique (Figure 1) [3]. Tension was then applied to the graft and the knee was moved through a range of motion. The ends of the graft were then tied to each other and sutured into the quadriceps femoris muscle group. A double-breasted repair of the freshened ends of quadriceps tendon was performed with non-absorbable sutures (Figure 2).

Post-operative Management

The knee was not splinted and active range of knee movement (from 0º to 90º) was encouraged from the first day after surgery. After two weeks, she was advised to increase the range of motion of her knee to the limit of her pain tolerance. Initially she was allowed to ambulate non-weight bearing with crutches. She was then allowed to walk with partial weight bearing when she was able to perform a straight leg raise, and gradually progressed to full weight bearing with the help of crutches. At the latest follow up (at eight months post-surgery), the patient was able to flex her knee up to 110º and had an extensor lag of less than 10º, mainly due to weakness of the quadriceps femoris muscle group.

DISCUSSION

Rupture of the extensor apparatus after TKR is an uncommon complication but it can pose a significant challenge to the surgeons. There are several published

Corresponding Author: Cheh Chin Tai, Department of Orthopaedic Surgery, University of Malaya, 50603 Kuala Lumpur, Malaysia
Email: tai.chehchin@gmail.com

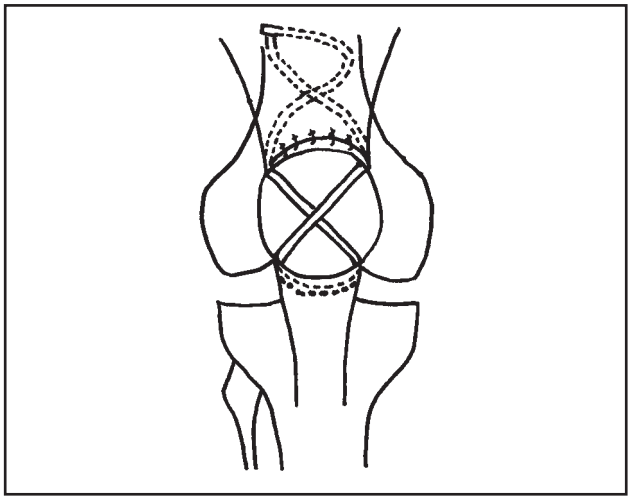

Fig. 1: A 6 mm Dacron graft was placed transversely through the proximal end of the patella tendon just below the inferior pole of the patella. The graft was then crossed over the patella and the quadriceps tendon with 'Figures of Eight' technique. The two ends are tied together with tension.

Fig. 2: The ruptured quadriceps was repaired with sutures and reinforced with a Dacron graft.

surgical procedures for repair or reconstruction of chronic or neglected quadriceps tendon rupture, but most require lengthy postoperative immobilization in the cast. Due to the complications associated with prolonged immobilization, some authors have advocated the usage of synthetic grafts to augment the reconstruction to allow for early movement of the knee after surgery 1. Levin introduced the usage of Dacron graft for reconstruction of neglected re-rupture of patella tendon [2]. We opted for the same material to reconstruct the quadriceps tendon, as we believe that it provides enough strength to allow immediate mobilization of the knee joint in this complex case of recurrent disruption of the extensor apparatus.

Levy *et al* used Dacron grafts for both quadriceps and patella tendons repair in six patients, and excellent results were obtained in all patients [4]. However, they used a different graft size and a different technique for reconstruction of the quadriceps tendons. We developed 'double eights' technique as a modification of the method initially described by Fujikawa *et al* [3]. The modification was designed to increase the strength of the reconstruction and to prevent pull out of the graft through the muscle.

The most important advantage of this method of reconstruction is that it eliminates the need for prolonged cast immobilization, and allows active physiotherapy to begin in the immediate postoperative period. This was particular important in the current case since the patient underwent three knee surgeries within one year, and also because early knee movement is crucial for optimum strengthening of the quadriceps and to ensure early recovery of knee function. Within two months after surgery, the patient's range knee motion improved from between 45º to 90º flexion preoperatively to between 10º and 110º flexion after quadriceps repair. In addition, this procedure is technically simple to perform, and does not involve any tunnels through osteoporotic bone which might result in cut through or 'cheese wire' effect. No significant risk or complications were encountered with this technique.

Dacron graft is a viable option that offers benefits over other reconstruction procedures. We described herein a modified 'double eights' technique utilizing a Dacron graft to strengthen the repair and allow for immediate postoperative mobilization of the knee. Satisfactory results were achieved with use of this technique even in a patient who had two previous knee operations, one of which involved the extensor apparatus.

ACKNOWLEDGMENT

The authors would like to thank Dr Faisham WI, Prof Zulmi Wan, Dr Ahmad Sukari Halim from Hospital Universiti Sains Malaysia for providing clinical material and involvement in the treatment of this patient.

REFERENCES

1. Azar FM. In: Campell's Operative Orthoapedics. Tenth edition.: Mosby, 2003.
2 . Levin PD. Reconstruction of the patellar tendon using Dacron graft. *Clin Orthop* 1976; 118: 70-2.
3. Fujikawa K, Ohtani T, Matsumoto H, Seedhom BB. Reconstruction of the extensor apparatus of the knee with the Leeds-Keio Ligament. *J Bone Joint Surg* 1994; 76(2): 200-3.
4. Levy M, Goldstein J, Rosner M. A method of repair of the quadriceps tendon or patella tendon ruptures without cast immobilization. *Clin Orthop* 1987; (218): 297-301.