

# Neglected ruptures of the patellar tendon: Repair options in a resource poor setting

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## ABSTRACT

**Introduction:** Rupture of the patellar tendon is a disabling injury. Better results are reported in immediate repairs of fresh ruptures. In neglected ruptures, restoration of the structural and functional integrity of the extensor apparatus is difficult. This report highlights the use of an achilles osteotendinous autograft in the repair of an 8-month old neglected rupture of the patellar tendon; and the Mandelbaum technique with open tendon harvest in the repair of a 10-week old neglected rupture. **Case Series:** A 23-year-old male presented with inability to extend the left knee; eight months after a road traffic accident. Physical and radiological findings were consistent with a rupture of the left patellar tendon. The patient was offered tendon reconstruction using an Achilles osteotendinous autograft from the contralateral lower limb. One year later, he was pleased with the outcome. A 29-year-old army officer presented with pain, swelling and inability to extend his right knee since 10 weeks. Physical and X-ray findings were in keeping with a rupture of the right patellar tendon. The patient was offered patellar tendon reconstruction using the Mandelbaum technique. Twenty-eight weeks postoperatively,

the patient had a range of motion of 0–105° in the right knee and has since returned to a functional professional and recreational lifestyle. **Conclusion:** Neglected ruptures of patella commonly yield suboptimal results following repair. In resource-poor settings, an autogenous achilles tendon technique as well as the Mandelbaum technique may prove beneficial in the treatment of this difficult condition.

**Keywords:** Patellar tendon, Neglected rupture, Achilles osteotendinous autograft, Mandelbaum procedure, Resource poor setting

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## INTRODUCTION

Rupture of the patellar tendon is a disabling injury commonly seen in individuals under 40 years of age [1]. The injury is uncommon, can be easily missed in multi-injured patients, in the obese and in knees with hemarthrosis [1]. These ruptures usually occur at the inferior pole of the patella and better results are reported in immediate repairs of fresh ruptures [1, 2].

In our community, late presentation to orthodox care is common and the traditional bone setter is often the first to be consulted after injuries [3–5]. Neglected patellar tendon ruptures are thus only seen when the patient is unwilling to live with the disability that follows unorthodox treatment [4]. Neglected ruptures of

the patellar tendon (defined as ruptures presenting after six weeks) are often difficult to repair. Restoration of the structural and functional integrity of the extensor mechanism is difficult because of the associated muscle contracture, scar tissue formation, proximal patella migration and fibrous adhesions between the patellar and the femur [2, 6].

Many different techniques have been reported in the management of these conditions in long standing cases. End-to-end anastomosis of the tendon ends is often not feasible [2, 7]. Quadriceps lengthening, quadriceplasty, traction (preoperative and intraoperative), and external fixation with pins and wires are some techniques used to relocate the patella to its anatomic position. Autogenous graft augmentation using the fascia lata or hamstring tendons, allograft reconstruction using the Achilles tendon or patellar tendon are the commonly used reconstruction techniques for neglected ruptures. Prolonged postoperative immobilization, loss of knee flexion, residual weakness of the quadriceps and construct failure are complications associated with repair of a neglected rupture [7].

## CASE SERIES

**Case 1:** A 23-year-old male presented to our out-patient department with complaints of inability to extend his left knee. He had been involved in a road traffic accident eight months earlier and had spent the interval in a traditional bone setter's practice.

Examination showed wasting of the left quadriceps muscles, a visible and palpable defect over the left knee, patella alta, loss of active extension and a passive range of motion of 10–60°. X-rays showed a proximally migrated patella with no fractures of the femur or tibia.

The patient was admitted for preoperative traction for two weeks and subsequently offered quadriceplasty and tendon reconstruction. Neither preoperative traction nor intraoperative elongation, and quadriceplasty were successful in restoring the patella to its exact anatomic location. Lack of tendon harvesters precluded the use of the hamstring tendons. The fascia lata was adjudged unhealthy following chronic inflammation from the traditional bone setters scarification. As we did not have access to allograft Achilles tendon graft, a decision to use autogenous Achilles tendon graft was made. Intraoperative findings were a proximally migrated patella, a 10-cm defect in the patellar tendon and marked fibrous adhesions involving the quadriceps femoris muscles.

A 1-cm central osteotendinous graft was harvested from the contralateral Achilles tendon. The defect at the donor site was closed with interrupted nonabsorbable sutures. The tendon graft was split into three slips, the central slip being thicker than the medial and lateral slips as described for the Achilles tendon allograft technique. A midline tunnel was drilled in the patella and the central slip passed through and anchored onto the quadriceps tendon from within outwards. The medial and lateral slips were anchored to either side of

the patella and the medial and lateral tendinous expansions of the quadriceps tendon using non-absorbable interrupted sutures. The osseous pedicle was anchored into an appropriately sized window cut into the tibial tuberosity by two 3.5 mm cancellous screws. Quadriceplasty was performed. Postoperatively, patellar traction was continued for two weeks, the left lower limb was encased in a long leg cast after removal of traction and patient was discharged. He was seen at four weeks post discharge, the long leg cast was removed and an exercise programme commenced.

At 16th week postoperatively, the patient was pain free, had improved gait and an active range of motion of 5–95° in the left knee (Figures 1, 2). The ankle range of motion on the right side was normal and power of plantar flexion was grade 4+. He was subsequently lost to follow-up and re-appeared in the clinic one year later. The knee range of motion at this time was 3–105°. He could run and walk normally and was very pleased with his progress.



Figure 1: Showing range of active extension in both the knees. (case 1)



Figure 2: Range of active flexion in the knees. (case 1)

**Case 2:** A 29-year-old male army officer presented to the clinic with a 10-week history of pain, swelling and inability to extend the right knee following a fall onto the right knee while playing recreative basketball. Prior to presentation, he had sought unorthodox treatment with massage and hot fermentations and had lost the partial extension of the affected knee which was present in the early post injury period.

Examination revealed a swollen, mildly tender right knee, with a high riding patella and a distinct defect in the patellar tendon. The quadriceps femoris on the right side was wasted and patient had a range of active extension of 0° in the right knee. The range of right knee flexion was 110° and X-rays showed patella alta. An impression of neglected and mismanaged rupture of the right patella tendon was made.

The patient was admitted and offered patella tendon reconstruction using the Mandelbaum technique. The approach was an anterior midline approach. Intra-operative findings were a transverse rupture of the right patellar tendon and healthy semi-tendinosus and gracilis tendons. Operative technique involved minimal quadriceplasty, mobilization of the patella and relocation to its anatomic position. Owing to a lack of tendon harvesters, the skin flaps were raised until the semitendinosus and gracilis tendons were identified on the medial side. The tendons were traced to their musculotendinous junctions, sectioned at the junctions and their distal ends detached from the tibia. The tendons were then sutured end-to-end. Transverse holes were drilled across the patella and just below the tibial tubercle. The previously anastomosed semitendinosus and gracilis tendinous autografts were passed between the drill holes and used to reconstruct the extensor apparatus in a figure-of-eight configuration (Mandelbaum technique). A 0.5 guage malleable Kirschner wire was used to support the construct. The wound was closed in layers and a plaster of paris long leg cast was applied and worn for five weeks. The malleable Kirschner wire was removed six weeks post-operatively.

Postoperative management included immediate, non-weight bearing, bilateral, axillary crutch aided mobilization and graded range of motion physiotherapy exercises from the sixth week. The patient made a complete recovery with right knee range of motion being 0–105° at the last clinic visit 28<sup>th</sup> week after surgery. He has since returned to full military duties (including an international peace keeping tour of duty and a promotion) and has also returned to regular recreative basketball games.

## DISCUSSION

Ruptures of the patella tendon usually follow long standing irritation. Chronic tendon degeneration due to repetitive micro trauma has been supported by histological evidence consistent with chronic inflammation and degeneration in ruptured tendon specimens [8]. Patella tendon rupture is usually

unilateral when it results from traumatic athletic injuries, road traffic accidents and local steroid injections. When it occurs in association with systemic disorders such as systemic lupus erythematosus, chronic renal failure or diabetes mellitus, the rupture can be bilateral [9, 10]. The condition can also occur in posterior dislocations of the knee.

Suboptimal results have often been reported in the treatment of neglected injuries [1, 2, 6, 7]. In our setting, the combination of inappropriate unorthodox intervention and lack of basic requirements for tendon harvesting presented unique challenges. In our first patient, the fascia lata was also adjudged inappropriate for use due to evidence of chronic inflammation following scarifications by the traditional bone setter on the affected thigh. The combination of (possible) sub-clinical soft tissue infection (from scarifications and herbal fomentations to drain “evil-blood”) [3, 4] and poor nutrition can predispose to an unhealthy fascia lata. In our second patient, the challenges posed by inappropriate unorthodox interventions were obvious. In the immediate postinjury period and up to five weeks thereafter, the patient had weak extension of the right knee but lost that following massage and traditional ‘physiotherapy’. An apparently incomplete injury was converted to a complete rupture when the patient was presented to the clinic.

The treatment of neglected ruptures of the patellar tendon aims to relocate the patella in its anatomic position and recreate the Insall-Salvati ratio, ensuring mobility and correct tracking of the patella and restore the structural and functional integrity of the extensor apparatus [1, 2, 11]. This is difficult and the results are often sub-optimal [2, 6, 11]. Patellar relocation can be achieved by preoperative and intraoperative traction, quadriceplasty and a V-Y elongation of the quadriceps tendon. The use of external fixators and the Ilizarov technique have also been reported.

Tendon reconstruction involves the use of autogenous fascia lata or hamstring tendons; allograft patellar tendon or Achilles tendon in single or double graft techniques [2, 6, 7]. In our setting, there is no access to allograft tendons and autogenous hamstring or fascia lata grafts were not feasible in the first patient. An Achilles tendon autograft was thus the preferred option.

Autogenous Achilles tendon grafts can potentially present such complications as residual donor site rupture, infection and loss of plantar flexion. These may discourage the routine use of this technique. However, in resource-poor settings with no access to Achilles or patellar tendon allografts, no access to proper harvesting of an adequate length of hamstring tendons and where use of the fascia lata is precluded, our first case shows that an Achilles tendon autograft may be a feasible option. We believe the issues of donor site morbidity and infection can be addressed by ensuring harvest of only the central one cm of the tendon and meticulous attention to surgical technique. Graft take is improved by the inclusion of an osseous pedicle. In our first patient, the gait improved, range of motion in the left knee improved and plantar flexion power was grade

4+. We believe the outcome justifies our technique and may be useful in similar settings.

In our second patient who presented relatively earlier, the issues of sub-clinical infection did not exist. In non-resource challenged settings, the Mandelbaum technique would have been offered with the less risk of donor site morbidity using a tendon harvester. Its absence left the managing team with the option of an open tendon harvest. Though our results support this as a viable option when indicated in resource-challenged settings, the documented donor site morbidities such as infection must be borne in mind and appropriate steps taken to minimize the risk. Overall however, health systems and their managers must work towards the provision of an improved therapeutic armamentarium in our health sector. This will reduce the reported risks that attend orthodox intervention in the repair of this disabling injury. Health education to dissuade unorthodox intervention in orthopaedic maladies remains a credible intervention tool for improved outcomes.

To the authors' knowledge, an Achilles tendon autograft repair for neglected rupture of the patellar tendon has previously not been reported. We report our use of the technique of Achilles tendon autograft in the repair of an eight-month old neglected rupture of the patellar tendon in a 23-year-old male; and the use of the Mandelbaum procedure with open harvest of the hamstring tendons in the repair of a 10-week old neglected rupture of the patella tendon in a 29-year-old male. Both patients had spent eight months and 10 weeks, respectively seeking unorthodox care. In non-resource challenged settings a tendon harvester makes tendon harvest easier with less risk of donor site morbidity.

## CONCLUSION

Neglected ruptures of the patellar tendon present unique treatment challenges especially in resource poor settings. An Achilles tendon autograft may prove beneficial in the treatment of this condition. The Mandelbaum technique using an open tendon harvest procedure is also a feasible option in these settings. Meticulous attention must be paid to the prevention of the possible complications that may occur following these techniques. Provision of appropriate intervention tools and health education to dissuade unorthodox interventions will help improve outcomes.

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## Author Contributions

Ikpeme A Ikpeme – Substantial contributions to conception and design, acquisition of data, Drafting the article, Revising it critically for important intellectual content, Final approval of the version to be published  
Anthonia Ikpeme – Substantial contributions to conception and design, Analysis and interpretation of

data, Drafting the article, Final approval of the version to be published

Innocent Abang – Substantial contributions to conception and design, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published

Paul O Amah – Substantial contributions to conception and design, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published

Ahmed M Achaka – Substantial contributions to conception and design, Drafting the article, revising it critically for important intellectual content, Final approval of the version to be published

## Guarantor

The corresponding author is the guarantor of submission.

## Conflict of Interest

Authors declare no conflict of interest.

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