Rectus Femoris Rupture Following Knee Arthroscopy

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Abstract

A rectus fermoris rupture following pneumatic tourniquet use during knee arthroscopy is reported. The patient noted a painful swelling in the proximal thigh of the operated limb in the immediate postoperative period. This complication was managed conservatively with complete resolution of symptoms over a 12 week period. Through a process of elimination the pneumatic tourniquet used at surgery was identified as the cause of injury. Through a review of the literature we discuss the role and complications of tourniquet use during arthroscopic surgery of the knee.

INTRODUCTION

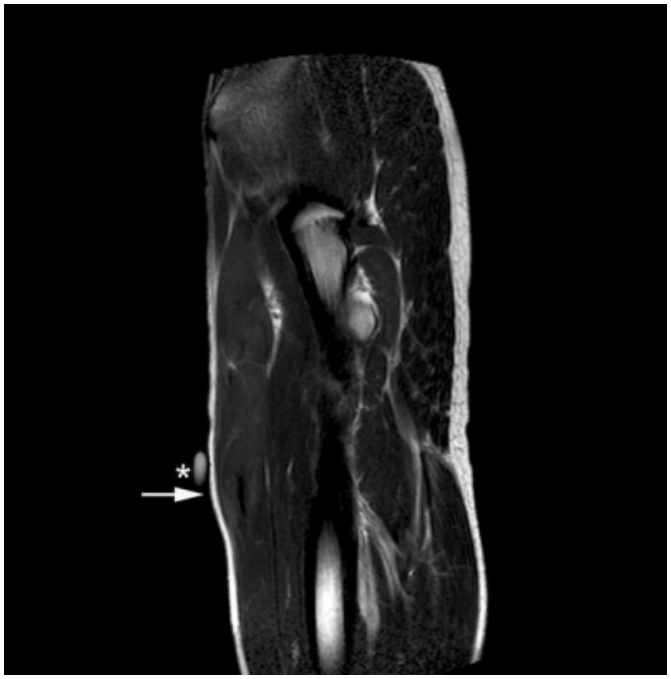
Pneumatic tourniquet use for open extremity surgery was first described by Cushing in 1904 with obvious benefits of working in a field with limited blood loss[1]. As arthroscopic procedures are performed widely throughout the world, often with use of pneumatic tourniquet, there is risk of increased incidence of tourniquet related complications. A recent survey on tourniquet use amongst American orthopaedic foot and ankle surgeons, highlights wide differences in practice, thus pointing to an urgent need for further investigation of this important and surgical tool[2]. We describe a case of tourniquet related rectus femoris muscle rupture following an elective arthroscopic procedure of a knee in a fit young male.

CASE REPORT

An 18-year old male tree surgeon presented with a two-year history of left knee pain following a sport injury. Arthroscopy was planned due to failure of conservative management. Surgery was performed under general anaesthesia in supine position with a 100 mm wide pneumatic tourniquet (Anetic Aid Ltd, Queensway, Guisley, West Yorkshire LS20 9LB, United Kingdom) applied over sufficient soft foam padding to the proximal ipsilateral thigh. The systolic blood pressure was 110 mm Hg and tourniquet inflation pressure 300 mm Hg and the limb was exsanguinated using Rhys Davies exsanguinator (Anetic Aid Ltd, Queensway, Guisley, West Yorkshire LS20 9LB, United Kingdom). At surgery a medial plica was excised, intra-articular local anaesthetic injection administered and patient discharged the same day. Total tourniquet occlusion time was 30 minutes. Immediately following discharge the patient noted his pre-operative knee pain had resolved, but was affected by a painful swelling over his left proximal thigh which impaired his rehabilitation. The patient significantly disabled and anxious about his symptoms sought earlier post-operative review at one-week via his physical therapist. On examination the patient required two elbow crutches for ambulation and had a tender 3 cm x 3 cm swelling over the left proximal thigh with associated localised pain of the quadriceps, restricting ipsilateral hip and knee movements. Knee examination demonstrated healing arthroscopic portal site wounds and was otherwise unremarkable. An ultrasound scan performed the same day revealed quadriceps muscle rupture though failed to identify its extent or the precise muscle. Magnetic Resonance Imaging (MRI) scan was therefore arranged. Symptomatic improvement was noted at two week review with continued physical therapy. The MRI scan (Fig 1.) eventually performed 6 weeks from surgery, revealed rupture of the rectus femoris. At eight weeks, with continued physical therapy, the patient had returned to work with significant improvement in his symptoms. At final review at 12 weeks the lump though still evident was asymptomatic and the patient had full quadriceps power and range of movement in the left hip and knee.

Figure 1

MRI scan demonstrating swelling (white arrow) and underlying tear of the rectus femoris muscle. An oil capsule marks the skin surface (asterisk).



DISCUSSION

By a process of elimination, the tourniquet was identified as the cause of muscle rupture in our case. Skin, muscle and nerve damage secondary to the use of tourniquets have been reported [3-11]. Though upper limb muscle tendon rupture is described following application of tourniquet for elective upper limb surgery[7], to our knowledge there is no previous report on muscle rupture following tourniquet use in lower limb surgery.

The authors routinely use tourniquet during arthroscopic procedures to the knee for benefits of a clearer operative field, though Tibrewal questioned the perceived benefits of tourniquet use during knee arthroscopy[12].

In this case the tourniquet inflation pressure was 90 mm Hg above recommended by the tourniquet manufacturer, who advise a lower limb tourniquet pressure of 100 mm Hg above systolic pressure[13]. Corroborative cadaver studies indicate pressures of more than 300-350 mm Hg are seldom required in patients of normal size, blood pressure and vasculature[14]. Previous authors using a rabbit models have demonstrated impairment of isometric muscle contraction force and a greater extent of functional recovery in animals with lower tourniquet pressures[15], and also significant skeletal muscle necrosis beneath the tourniquet at clinically relevant cuff inflation pressures[16]. In a retrospective review of over 1100 primary or revision total knee arthroplasties with tourniquet times greater than 120 minutes, Horlocker et al concluded that neurologic injuries increased with total tourniquet time, and only a modest decrease in risk of nerve injury was achieved by a reperfusion interval[11]. In a clinical setting it would therefore be prudent to use the lowest possible inflation pressure for the shortest duration to maintain a bloodless field, minimize tourniquet induced tissue injury and possibly enhance postoperative recovery. A nomogram published by Shaw et al using data from a cadaveric experiment may be a useful adjunct to determining appropriate tourniquet pressures in the clinical setting[14].

Previous reports allude to incorrectly calibrated tourniquet manometers indicating lower than true inflation pressures[5,6]. In our hospital an annual calibration and fault check of all tourniquet manometers is performed by the medical engineering department. All theatre tourniquet manometers were rechecked following this case and no faults were identified.

Magnetic resonance imaging delineated precise details of the injury and may be helpful and decisive in diagnosing muscle injury and aiding therapy[17].

Tourniquet related complications may perhaps not be given quite the attention it warrants. Constant vigilance must be maintained with the use and maintenance of tourniquets. Clinicians must maintain a high index of suspicion for tourniquet related complications in the immediate and early postoperative period. We recommend clinicians routinely reset tourniquet inflation pressure to the lowest possible based on individual patient systolic blood pressure and minimise the duration of tourniquet inflation.

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