



Case Report

Anchor proximal migration in the medial patellofemoral ligament reconstruction in skeletally immature patients^{☆,☆☆}

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ABSTRACT

The medial patellofemoral ligament (MPFL) injury has been considered instrumental in lateral patellar instability after patellar dislocation. Consequently, the focus on the study of this ligament reconstruction has increased in recent years. The MPFL femoral anatomical origin point has great importance at the moment of reconstruction surgery, because a graft fixation in a non anatomical position may result in medial overload, medial subluxation of the patella or excessive tensioning of the graft with subsequent failure. In the pediatric population, the location of this point is highlighted by the presence of femoral physis. The literature is still controversial regarding the best placement of the graft. We describe two cases of skeletally immature patients in whom LPFM reconstruction was performed. The femoral fixation was through anchors that were placed above the physis. With the growth and development of the patients, the femoral origin point of the graft moved proximally, resulting in failure in these two cases.

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Migração proximal de âncora na reconstrução do ligamento patelofemoral medial em pacientes esqueleticamente imaturos

RESUMO

O ligamento patelo-femoral medial (LPFM) é a estrutura mais lesada com a luxação aguda da patela e tem sido considerada a lesão essencial na instabilidade lateral-patelar. Consequentemente, o enfoque no estudo da reconstrução desse ligamento tem aumentado nos últimos anos. O ponto anatômico da origem femoral do LPFM recebe grande importância no momento da reconstrução, pois a fixação do enxerto em uma posição não anatômica pode

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acarretar sobrecarga medial, luxação medial da patela ou tensionamento excessivo do enxerto, com sua posterior falha. Na população pediátrica, a localização dessa origem femoral ganha destaque pela presença da fise do fêmur distal. A literatura ainda é controversa com relação ao melhor posicionamento do enxerto. Descrevemos dois casos em que foi feita a reconstrução do LPFM em pacientes esqueléticamente imaturos. A fixação femoral se deu por meio de âncoras que foram posicionadas acima da fise. Com o crescimento e o desenvolvimento dos pacientes, o ponto de origem femoral do neoligamento migrou proximalmente e acarretou a falha do enxerto nesses dois casos.

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Introduction

Reconstruction of the medial patellofemoral ligament (MPFL) is the preferred procedure for patients with chronic lateral patellar instability who have normal alignment of the extensor apparatus and deficiency of the proximal medial restrictors.¹ A variety of techniques have been described, with different types of grafts and fixation methods. However, nonanatomical reconstruction leads to alteration of the kinematics and load distribution in the patellofemoral joint.²

In skeletally immature patients, locating the correct point for the femoral origin gains even greater importance because of the presence of the growth plate line in the distal portion of the femur. Controversy still exists in this regard in the literature.³

The aim of this report was to describe two cases of MPFL reconstruction in which femoral fixation was performed by means of anchors that were proximal to the distal growth plate of the femur.

Case 1

The patient was a schoolgirl who was 12 years old at that time. She had undergone bilateral MPFL reconstruction using the medial third of the patellar tendon and metal anchors in the femur.

After approximately three years of evolution, she suffered a sprained right knee with injury to the anterior cruciate ligament (ACL) and to the reconstructed MPFL. She was treated surgically with reconstruction of the ACL and revision of the MPFL, and she evolved well.

Two years later, at a reassessment consultation, she was seen to be free from symptoms in the right knee but reported some pain in the left knee, which was alleviated through medication. In the physical examination, she presented lateral subluxation of the left patella. In the control radiographs (Figs. 1 and 2), it could be seen that the anchors had migrated through the medial cortical bone of the left femur because of their positioning above the growth plate and the patient's growth.

Case 2

The patient was a schoolgirl who underwent left-side MPFL reconstruction at the age of 12 years, before the menarche. For this patient too, the technique consisted of using the medial

third of the patellar tendon, with femoral fixation done using a bioabsorbable anchor. The patient had already been treated for patellar instability conservatively and using surgical techniques other than MPFL reconstruction, but without success.

The patient evolved well and maintained patellar stability for around two years. Upon reassessment after this period, she presented slight patellar subluxation at the start of flexion. One year later, the patient again presented instability and lateral subluxation of the patella. In imaging examinations (Fig. 3), proximal migration of the anchor could be seen. This had led to graft failure. Revision surgery was indicated.

Discussion

To treat patellar instability, more than one hundred procedures have so far been described. This demonstrates the



Fig. 1 – AP radiograph of the knee showing the proximal migration of metal anchors from reconstruction of the medial patellofemoral ligament (MPFL) with positioning above the growth plate in a skeletally immature patient.



Fig. 2 – Lateral radiograph of the knee showing the proximal migration of metal anchors from reconstruction of the medial patellofemoral ligament (MPFL) with positioning above the growth plate in a skeletally immature patient.



Fig. 3 – Magnetic resonance imaging of the left knee demonstrating the proximal migration of the bioabsorbable anchor to the medial cortical bone of the femur. The anchor had been positioned proximally to the growth plate in reconstructing the medial patellofemoral ligament (MPFL).

complexity of achieving stability for this joint, which depends on a variety of factors.⁴ Recently, the focus on MPFL reconstruction has increased. Several studies have demonstrated that the MPFL is the anatomical structure that is most often injured following patellar dislocation and that this is the essential injury for this pathological condition.⁵

In a manner analogous to anatomical reconstruction of the ACL, the ideal is to correctly locate the origin of the MPFL. No reconstruction will be anatomically perfect, but attention needs to be paid to making this as close as possible.¹

In the literature, the method for locating the femoral origin of the MPFL that is most used is the one described by Schöttle et al.,⁶ as modified by Servien et al.⁵ On a lateral-view radiograph of the knee, a straight line along the posterior cortical bone of the diaphysis is traced out. Another straight line is traced out perpendicularly to the first line, in the region of the posterior origin of the femoral condyle. This point is located one millimeter anteriorly to the straight line of the posterior cortical bone and 2.5 mm distally to the straight line of the posterior portion of the condyle.⁶

Schöttle's description was made through studying adult cadavers. Shea et al.⁷ adapted the radiographic parameters for the pediatric population and found from evaluating lateral radiographs that the origin of the MPFL was proximal to the growth plates by 2.7 ± 1.1 mm in girls and 4.6 ± 2.4 mm in boys.

Nelitz et al.³ conducted an evaluation similar to that of Shea et al.⁷ However, in addition to the lateral view of the knee,

they also gave emphasis to the frontal projection. According to these authors, the distal epiphysis of the femur has a concave shape, which is followed by the growth plate. Thus, in lateral projection, only the central portion of the growth plate is viewed. Hence, the point proposed by Schöttle would be close to the growth plate line. However, in frontal view, the medial border of the growth plate is more proximal than its central part, and so the point of origin of the MPFL would be distal to the growth plate because of this concavity.³ In all the patients evaluated, the femoral origin was distal to the growth plate by a mean of 6.4 mm. Studies on cadavers by LaPrade et al.⁸ and Baldwin⁹ also confirmed the distal positioning of the origin of the MPFL.

In adult patients, fixation of the MPFL graft in a more proximal position leads to increased medial patellofemoral loading, medial subluxation and excessive tensioning of the graft, which may fail and cause recurrence of lateral instability.^{1,10} Construction of an access of adequate size, identification of the bone structures that serve as parameters (medial epicondyle and adducting tubercle) and use of fluoroscopy are the main recommendations for locating the femoral point during the operation.^{1,5}

In reconstructing the MPFL in skeletally immature patients, fixation proximal to the growth plate tends to become increasingly proximal with the patient's growth, which will also lead to graft failure.

With the experience of these two cases, and from reviewing the current literature, we conclude that the ideal location for graft fixation in reconstructing the MPFL is distally to the growth plate of the distal femur.

Conflicts of interest

The authors declare that there were no conflicts of interest.

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