ORIGINAL ARTICLE

The Complications of Medial Patellofemoral Ligament Reconstruction using Semi-tendinous Autograft with an Arthrex RetroButton for the Treatment of Chronic Patellofemoral Instability

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ABSTRACT

There are a wide variety of surgical options when presented with cases of patellofemoral instability. From this case series, we wanted to answer the following question: "What are the complications of medial patellofemoral ligament (MPFL) reconstruction using semi-tendinous autograft with Arthrex RetroButton for the treatment of chronic patellofemoral instability?" A retrospective case series approach was conducted on 50 patients (54 knees). All data collected in the case series were from patients operated on for MPFL reconstruction due to instability patient inclusion criteria included those with reported patellofemoral instability, repeated patellofemoral dislocation failing to respond to more conservative management, and a Q angle of <15°. Data were collected on a total of 50 patients representing MPFL reconstruction using a semi-tendinous autograft with Arthrex RetroButton surgery performed on 54 knees between October 2007 and February 2014. Results of the case series demonstrated a higher percentage of post-operative complications than evidenced in current literature. 54% (n = 29) of the knees presented with no post-operative complications at follow-up. The remaining 48% (n = 27) of the knees followed experienced a range of complications, stiffness (7.4%, n = 4), patella fracture (1.86%; n = 1), reduced flexion (1.86%, n = 1), persistent swelling (1.86%, n = 1), infection (5.55%; n = 3), saphenous nerve injury (1.86%; n = 1), and lax joint (1.86%, n = 1). However, despite the potential for complications, specifically based on the use of the Arthrex RetroButton, MPFL reconstructive surgery is a successful approach to the resolution of patellofemoral instability.

Key words: Arthrex retrobutton, MPFL reconstruction, patellofemoral instability

INTRODUCTION

The knee is essentially the composite of two joints: The patellofemoral and the tibiofemoral.[1] Of the two joints, patellofemoral complaints are considered the most frequently cited reason for patient visits to an orthopedic surgeon.[2] An understanding of the anatomy and biomechanics of the patellofemoral joint is required to understand patellofemoral instability and the challenges related to treatment.[3]

The patella articulates with the femoral condyles and is the largest bone in the sesamoid category. The primary role of the patella is to protect the knee joint from injury, particularly as a result of direct trauma, as the trauma that leads to dislocation is predominantly evidenced as the causal factor in a torn medial patellofemoral ligament (MPFL) [Figure 1]. According to Zaffagnini *et al*.,[4] the MPFL is responsible for contributing upward of 60% of the force that opposes lateral displacement of the patella. Injury to the MPFL would, therefore, result

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in an approximately 50% reduction in the force needed to dislocate the patella laterally with the knee extended. In fact, Zhang *et al*.[5] stressed that the MPFL is the most important factor when considering patellofemoral stabilization. Thus, injury to the MPFL is directly tied to issues of the anatomy relating to patellofemoral stability.

There are a wide variety of surgical options when presented with cases of patellofemoral instability, ranging from tibial tubercle osteotomy, trochleoplasty, medial soft tissue reconstructive procedures, and lateral retinacular release.[6] Each of these has their advantages and disadvantages based on a patient's unique type of dysfunctional presentation, the goals for intervention, and surgeon's belief in the procedure that is most effective to achieve the goals.

In addition to varied MPFL reconstruction protocols, there are also several types of graft fixation implant techniques that can be used, including the RetroButton.[7] Given the anatomical variability and complexity coupled with optional surgical reconstruction techniques, the problem lies in the risk of complications, many of which are associated specifically with the surgical technique utilized. Parikh *et al*.[7] reported the most common complications of MFPL reconstructive surgical procedures include patellar fracture, lateral instability (persistent and recurrent), loss of knee range of motion, iatrogenic medial instability, and patellofemoral arthrosis. For a surgical procedure, the patient and surgeon hope will cure and restore instability, these risks are paramount and of great concern.

Given the background provided on patellofemoral challenges and options presented for MPFL reconstruction, we aimed to answer the following research question:

"What are the complications of MPFL reconstruction using semitendinosus autograft with Arthrex RetroButton for the treatment of chronic patellofemoral instability?"

MATERIALS AND METHODS

A retrospective case series approach was conducted on 50 patients (54 knees). All data collected in the case series were from patients operated on for MPFL reconstruction due to instability. In particular, the reconstructive technique performed on all patients was that utilizing a semitendinosus autograft with Arthrex RetroButton and was performed expressly for the treatment of chronic patellofemoral instability. Follow-up was performed on the patients in the clinical setting through clinical examination. Two surgeons in the District General Hospital were identified as performing the same procedure utilizing the same techniques and protocols. No other surgeons were identified that offered the same techniques to ensure consistency in protocol and thus prevent any data invalidation due to the introduction of confounding variables.

Patient inclusion criteria included those with reported patellofemoral instability, repeated patellofemoral dislocation failing to respond to more conservative management, and a Q angle of <15°.

Patient exclusion criteria included those with reported 1st time dislocation, Q angle more than 15°, dysplastic trochlea and patella, any underlying knee pathology like infection tumor, and those seeking revision surgery.

All data were collected based on a comprehensive review of the two surgeons' clinic letters and patient's case notes.

RESULTS

Data were collected on a total of 50 patients, representing MPFL reconstruction using a semitendinosus autograft with Arthrex RetroButton surgery performed on 54 knees between October 2007 and February 2014. One case originally included in evidence gathered was a revision, and for the sake of consistency, deleted from the data pool. Therefore, results herein are based on 49 patients, and 53 MPFL reconstruction surgical procedures, as four patients required and were treated with bilateral MPFL reconstruction surgery.

Patient demographics

All patients were residents of the Greater Manchester area and patients of one of the two surgeons. Surgery was conducted at one of the two orthopedic surgical trusts associated with the specific surgeon performing the surgery. Patients ranged in age from 13 to 44 years, with the average patient age of 23.5 years. Finally, the case series revealed a dominant female composition of >2:1 (35 females and 14 males). Reconstructive surgery was performed almost equally between the right and left knees, with 51.85% (n = 28) requiring surgery on the left limb, and 48.15% (n = 26) requiring surgery on the right limb. For 37.03% (n = 21), this was a bilateral surgical requirement.

All patients had MPFL reconstruction surgery with an Arthrex RetroButton fixation on the patella. Onset of patient's symptoms was reported as ranging from 1 to 21 years; however, this notation was inconsistently recorded in the charting data. Follow-up examinations were held for all patients at an average of 10.18 months following MPFL reconstruction, with actual follow-up ranging from 0.5 to 51 months. Of the 54 knees represented in this case series, this was the first surgical intervention for patellofemoral instability for 66.66% (n = 36) of the knees, whereas 33.33% (n = 18) of the knees had prior surgical interventions that failed to provide patellofemoral stability, ranging from lateral release and medial plication (n = 7), Roux-Goldthwait

procedures (n = 2), Elmslie–Trillat (n = 2), arthroscopic procedures (n = 6), mosaicplasty (n = 1), and open medial meniscectomy (n = 1), graphically presented in Table 1.

Q angle was assessed at preoperatively in the clinic for 51 knees (94.44%), with 100% presenting with normal values.

Patella alta was evidenced preoperatively in 75.92% of knees (n = 41), not evidenced in 12.96% (n = 7), and not reported in the case charts as applicable for 11.11% (n = 6) of knees operated on. Patellar apprehension was evidenced in 44.44% of the knees (n = 24), with no evidence of patellar apprehension in 1.85% (n = 1); this was not recorded in evidence in 53.7% (n = 29) of surgical charts. Both of these results are presented in Table 2.

Complications

About 54% (n=29) of the knees presented with no post-operative complications at follow-up. The remaining 48% (n = 27) of the knees followed experienced a range of complications, stiffness (7.4%, n = 4), patella fracture (1.86%; n = 1), reduced flexion (1.86%, n = 1), persistent swelling (1.86%, N=1), infection (5.55%; N= 3), saphenous nerve injury (1.86%; N= 1), and lax joint (1.86%, n = 1). In addition, 3.86% (2) presented with post-surgical deep vein thrombosis (DVT) and 3.86% (n = 2) presented with persistent post-operative pain and were referred out to pain management specialists.

Finally, 16.67% (n = 9 of 27) of patients' knees evidenced post-operative complications including anterior knee pain requiring removal of the prominent RetroButton that resolved the pain. Total required revision rate was 7% (n = 3) due to recurrent instability of patella; thus, 93% of surgical interventions were considered successful at improving patellofemoral stability.

For easy reference, rates and types of complications are presented in Table 3 and Figure 3.

Table 1: Prior failed surgical interventions

Prior failed intervention	*n*
Lateral release and medial plication	7
Roux-Goldthwait procedure	2
Elmslie–Trillat	2
Arthroscopic procedures	6
Mosaicplasty	1
Open medial meniscectomy	1

Table 2: Pre-operative assessment results

Follow-up results	*n*
Q angle increase	0
Q angle normal	51
Q angle decrease	0
Q angle not assessed	3
Patella alta evidenced	41
Patella alta not evidenced	7
Patella alta not assessed	6

DISCUSSION AND CONCLUSION

There are 7 steps which the Arthrex MPFL reconstruction team deems essential for the procedure. Figure 2 shows these steps in a visual format, from the preparation of the patella, preparation of the femur, preparation of the medial patellofemoral layer, and the passage of the graft with fixation. These images have been taken from the Anthrax operation Techbook.

One of the striking factors associated with patient demographics was the consistency of results with gender-based risk factors indicative of the need for MPFL reconstruction, indicating females presented more frequently for surgery.[6] This was consistent with the current case series indicating an almost 2:1 preponderance of female patients.

It was also interesting to note that the MPFL reconstruction procedure using the Arthrex RetroButton presented with a 46% major and minor post-operative complication rate, whereas current literature evidenced rates ranging from 21.2%[7] to 26.1%.[8] While the current case series presented with evidence of significantly higher rates of complications, it is unknown whether or not these can or should be attributed to the use of the RetroButton as a graft fixative or not, as current literature failed to isolate the entire surgical protocol used for MPFL reconstruction. However, the types of complications, both major and minor, are consistent with current literature, including persistent pain, stiffness, patella fracture, reduced flexion, persistent swelling, and infection.[7,8] In addition, patients in the current case series also presented with complications common to orthopedic

Table 3: Complication type and rates

Complication	Rate (%)
None	29.00 (53.74)
Stiffness	4.00 (7.40)
Patella fracture	1.00 (1.86)
Reduced flexion	1.00 (1.86)
Persistent swelling	1.00 (1.86)
Infection	3.00 (5.55)
Saphenous nerve injury	1.00 (1.86)
Lax joint	1.00 (1.86)
DVT	2.00 (3.86)
Persistent pain	2.00 (3.86)
RetroButton-associated pain	9.00 (17.60)

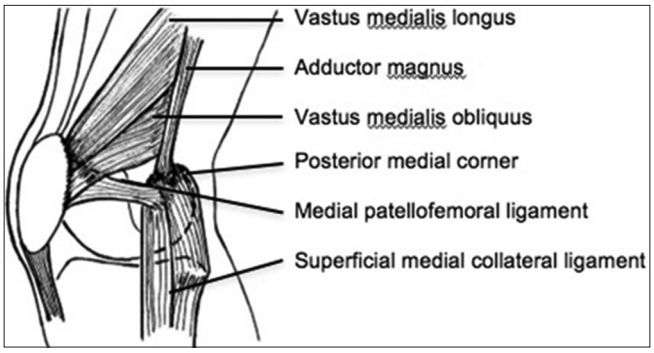

Figure 1: The ligaments involved in patella stability including the medial patellofemoral ligament

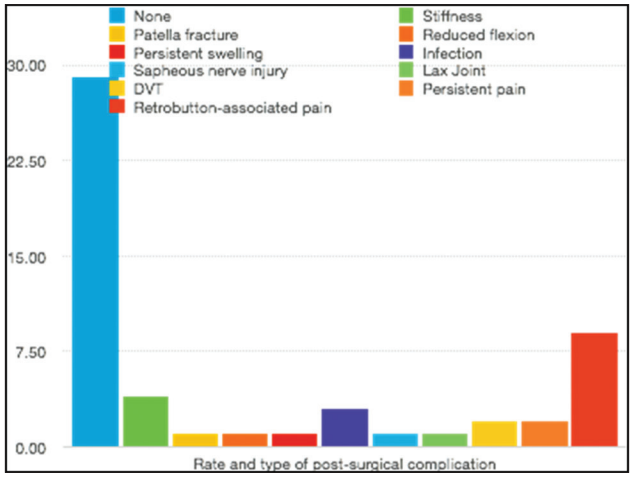

Figure 2: Complication type and rates

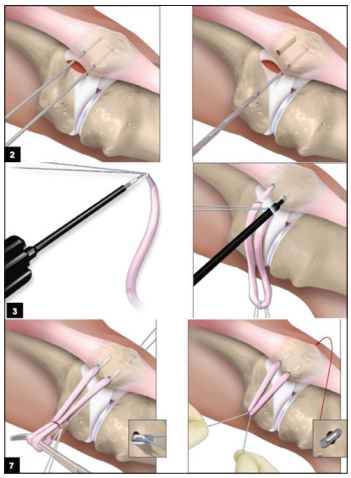

Figure 3: Some steps involved in medial patellofemoral ligament reconstruction - images from the operation Techbook[12]

surgical procedures, but not necessarily associated with MPFL reconstructive surgery, including saphenous nerve injury[9,10] and post-surgical DVT.[9] In addition, in the current case series, nine patients required secondary surgical procedures to remove the prominent for unremitting post-surgical pain. Despite complications, however, the current research effort demonstrated that the vast majority of MPFL reconstruction efforts are successful at improving patellofemoral stability, and despite the minority of patients requiring RetroButton removal, the case series also demonstrated the Arthrex RetroButton can be used in MPFL reconstruction with good graft fixation on the patella.

Results of the case series demonstrated a higher percentage of post-operative complications than evidenced in current literature, at 50% compared to 21.2%[7] or 26.1%.[8] However, the fixative procedures do contribute to the majority of complications experienced in MPFL reconstruction surgery that included restricted range of knee motion, arthrofibrosis, recurrent lateral instability, medial instability, patellofemoral arthrosis, fracture, graft impingement, graft failure, implant pain, hemarthrosis, and wound infections, consistent with conclusions highlighted herein by Tanaka *et al*. In fact, RetroButton removal was only required in 9 (16.66%) patients due to post-operative pain. The challenge associated specifically with the use of the RetroButton, however, is the potential to cause post-operative anterior knee pain due to its prominence underneath the skin requiring secondary surgical procedures to remove the device. It should be noted that the current research effort experienced a significantly lower percentage (7%; $n = 3$) of post-operative patellofemoral instability requiring secondary surgery, compared to the average of 17% identified by Christiansen *et al*.[11]

Based on the current evidence and our results provided, we feel that additional research is vital which would demonstrate our findings but on a larger scale.

Additional recommendations focused on correlating patient health and comorbid disorders with rates and types of complications experienced in the post-operative phase following MPFL reconstructive surgery. Limitations of this study were also highlighted, including the potential for selection and information bias.

In conclusion, we believe that, despite the potential for complications, specifically based on the use of the Arthrex RetroButton, MPFL reconstructive surgery is a successful approach to the resolution of patellofemoral instability.

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How to cite this article: Surya P, Mastan S, Hossain S. The Complications of Medial Patellofemoral Ligament Reconstruction using Semi-tendinous Autograft with an Arthrex RetroButton for the Treatment of Chronic Patellofemoral Instability. Clin Res Orthop 2018;1(1):1-5.