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Original Article

Is percutaneous release of medial collateral ligament in medial compartment arthroscopy effective and reliable?

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Abstract

Aim: Arthroscopic visualization of the knee medial compartment can be challenging in tight knees and undesired chondral damage can occur during instrumentation in these cases. In order to achieve thorough examination of the medial meniscus and to avoid complications, pie crusting of medial collateral ligament (MCL) has been described, which provides opening of the medial joint space. However, concerns about over releasing and instability still remain. Moreover, the reliability and effectively of the pie-crusting technique has not been studied widely. In this study, we aimed to investigate the advantages and possible complications of percutaneous releasing of medial collateral ligament in medial compartment arthroscopy.

Material and Methods: A total of 320 arthroscopic surgeries performed between 2014 and 2017 were reviewed retrospectively and 28 patients who underwent partial meniscectomy or repair by pie crust technique were included in the study. Mean follow up was 18 (6-40) months. Patients were evaluated clinically with the Lysholm score and Tegner score. Additionally, joint balance, valgus instability, pain or tenderness at the MCL region and numbness at the medial side of the joint was noted.

Results: On physical examination, during valgus stress at 30° of knee flexion, only one patient showed Grade 1 laxity; however, no patients had subjective valgus laxity at the final follow-up. Furthermore, there was no pain or tenderness over the MCL and there were no signs of saphenous nerve or vein injury in any of the patients.

Conclusion: Pie-crusting of the medial collateral ligament is an effective and reliable technique which provides enough space for visualization and instrumentation of the medial compartment, particularly in tight knees.

Keywords: Pie crust; knee arthroscopy; knee mcl; percutaneous release.

INTRODUCTION

Arthroscopic knee surgery is one of the most common orthopedic procedures with satisfactory clinical outcomes. However, it requires a thorough visualization of compartments, which can be difficult in tight knees (1). In these cases, insufficient exposure and limited working space may cause iatrogenic cartilage damage or missed diagnosis. Additionally, the medial femoral condyle can obstruct visualization of the posterior horn of the medial meniscus, which is notorious for diagnostic errors (2). Inadequate surgeries due to poor visualization or instrumentation may also result in the persistence of symptoms and the requirement for revision surgeries (3).

In order to improve visualization and instrumentation in patients with tight medial compartments, different methods including the establishment of a posteromedial or an inframeniscal portal, the use of a joint distractor and medial collateral ligament (MCL) release techniques have been described (4-6). Agneskirchner et al. (7) and Bosch et al. (8) recommended outside to inside percutaneous puncture of the capsuloligamentous structures of the posteromedial area to increase medial compartmental space in arthroscopic surgery. Moreover, MCL release techniques have been used for soft tissue balancing in knee arthroplasty. Although many different techniques for MCL releasing have been described, there is still no consensus and each technique has its own advantages and disadvantages. In this study, we aimed to investigate the advantages and possible complications of percutaneous releasing of medial collateral ligament in medial compartment arthroscopy.

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MATERIAL and METHODS

All arthroscopic surgeries performed between 2014 and 2017 were retrospectively reviewed from hospital records and the personal archives of the authors. The study was approved in advance by the institutional review board (ID:1397 Date:17/08/2018) and all patients signed an informed consent form. A total of 320 operation notes were evaluated and 28 patients (23 male and 5 female) with a medial meniscus tear who underwent either partial meniscectomy or repair were considered as eligible. Mean follow up was 18 months with a minimum of 6 months. Patients were excluded if they had concomitant multiple ligament injuries, concomitant ACL surgery, malalignment over 5 or grade 3-4 arthrosis. Resultantly, 28 patients were contacted and asked for a final follow up. At the last follow up, patients were evaluated clinically with the Lysholm score and Tegner tests. Additionally, joint balance, valgus instability, pain or tenderness at the MCL region and numbness at the medial side of the joint was noted. Patients were also questioned about the pain on the medial side where percutaneous release had been performed.

Surgical technique

All operations were performed under general or spinal anesthesia in a supine position. A pneumatic tourniquet was applied to 300-400mmHg and an external side support was used to restrain the proximal part of the thigh. All surgeries started with standard diagnostic arthroscopy. The surgeon or assistant applied valgus force while visualizing the medial compartment and the pie crust technique was performed when the medial compartment was tight or if it was difficult to reach the posteromedial meniscus according to the discretion of the surgeon. Multiple punctures were performed with an 18-gouge needle to the posteromedial part of the MCL, while a controlled valgus force was applied to the knee (Figure 1). The needle was passed percutaneously through the MCL at the level of the joint until medial widening was achieved (Figure 2). Subsequently, the meniscal resection or repair was performed, the fluid was drained, the portals were closed and a pressured bandage was applied.

The rehabilitation plan differed based on the meniscal intervention. The patients started full-weight bearing and motion, with a hinged knee brace and were advised to begin muscle toning with isometric exercises if they had undergone a partial meniscectomy. On the other hand, if meniscal repair was performed, isometric exercises were started, but flexion over 60 ° was not allowed during the initial 2 weeks and flexion over 90 ° for the following 2 weeks. Regardless of the surgical technique, a hinged knee brace to protect the MCL was given to all patients for 6 weeks.

Statistical analysis

Mean, standard deviation, median lowest, highest, frequency and ratio values were used in the descriptive statistics of the data. The distribution of the variables was measured by the Kolmogorov Simirnov test. Wilcoxon test was used in the analysis of the dependent quantitative data. SPSS 22.0 program was used in analyzes.

RESULTS

The mean patient age was 31.4 (range: 16 to 51). The patient's demographic data with continuous variables are found in Table 1. Twelve of the 28 patients underwent meniscal repair, whereas the remaining 16 menisci were considered as unrepairable and therefore underwent partial meniscectomy. The distribution of the tears regarding morphology was as follows. Bucket handle tear (n = 9), horizontal cleavage tear (n = 4), radial tear (n = 7), parrot beak tear (n = 2) and complex tear (n = 6). No intraoperative complications were seen and all surgeries were performed successfully under adequate visualization without iatrogenic chondral injury. Last follow up Lysholm values ($p < 0.05$) and last follow up

Figure 1. Performing pie crust tecnique to MCL in knee arthroscopy.

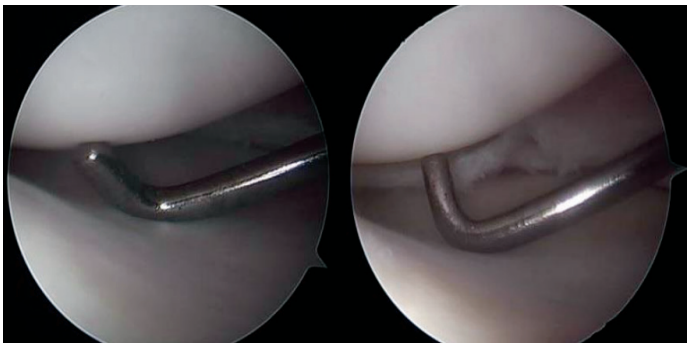

Figure 2. Image of arthroscopic medial compartment before and after pie crust technique.

Tegner values ($p < 0.05$) significantly increased compared to preoperation values (Table 2). On physical examination, during valgus stress with the knee at 30° flexion, only one patient showed Grade 1 laxity; however, no patients had subjective valgus laxity. MRIs could not be obtained because of ethical concerns for all cases; however, in 10 follow-up MRI scans that were taken independently from our study, intact contours and continuity of the MCL were shown.

Furthermore, at the final follow-up, there was no pain or tenderness over the MCL and there were no signs of saphenous nerve or vein injury. Six patients complained of pain at the medial side, which dissipated after several days, but they could not remember it as a distinct pain. It was not possible to evaluate the potential temporary pain at the medial side since the patients could not recall the nature and localization of pain.

Table 1. The patient's demographic data

		Min-Max	Median	Mean±sd/N-%	
Age		16 - 51	31.0	31.4 ± 8.7	
Sex	Female			5	17.9%
	Male			23	82.1%
Follow Up (Months)		6 - 40	15.0	18.1 ± 9.5	
Meniscal Tear Patern	Bucket Handle			9	32.1%
	Complex			6	21.4%
	Horizontal			4	14.3%
	Parrot Beak			2	7.1%
	Radial			7	25.0%
Suture/Menissecto my	Menissectomy			16	57.1%
	Repair			12	42.9%
Complication	(-)			28	100.0%
	(+)			0	0.0%
Valgus Stres Test	Grade 1 Laxity			1	3.6%
Last Follow up	No Laxity			27	96.4%
Subjective	(-)			28	100.0%
Instability	(+)			0	0.0%

Table 2. Preoperative and Last follow up Lysholm and Tegner Scores

	Min-Max	Median	Mean±sd	p
Lysholm				
Preop	42 - 70	56.0	56.0 ± 7.3	
Last Follow Up	84 - 98	89.5	90.3 ± 4.0	**0.000** w
Tegner				
Preop	2 - 4	3.0	2.6 ± 0.6	
Last Follow Up	3 - 5	4.0	4.0 ± 0.4	**0.000** w

[w] Wilcoxon test

DISCUSSION

Clear visualization of the posteromedial compartment of the knee is required for an impeccable diagnosis and treatment of the posterior horn of the medial meniscus. Otherwise, working in a narrow joint space may lead to inadequate evaluation of the posterior root of medial meniscus and iatrogenic cartilage damage. However, it is well-known that arthroscopic evaluation may fail to visualize the posterior part of the medial meniscus and may miss tears in this region (2). In tight knees, various techniques have been described, yet the debate is still ongoing. MCL release is one of these techniques performed to enhance the visualization and instrumentation.

Biomechanical studies have demonstrated that the MCL is the primary medial stabilizer of the knee resisting valgus loading, the secondary stabilizer against excessive external tibial rotation, and is essential for providing stability during valgus stress and external rotation stress (9) . The load on the s-MCL is highest in external rotation, particularly from 30° to 90° knee extension (10). Therefore, the major concern with the release of MCL, regardless of whether it is the superficial or deep portion of it, is valgus instability due to MCL insufficiency. However, injury of the MCL complex typically heals with favorable results without any surgical treatment, particularly in case of Grade I and Grade II injuries (11). Many clinical studies have also shown that a released MCL heals uneventfully after total knee replacement and arthroscopic surgeries (12-14). In the present study, we cautiously released the MCL. Therefore have not seen persistent valgus instability in any of our cases. This is consistent with previous studies (12,13,15). It was possible to obtain MRI images of 10 patients postoperatively and in all of these cases, contours and continuity of the MCL was observed. Although we did not confirm MCL healing with MRI in all cases, it was assumed that absence of instability demonstrates that the MCL healed completely. Therefore, we believe that concerns over instability are not sufficient for avoiding MCL release.

In the literature, many techniques have been published describing MCL release in arthroscopic surgery and in total knee replacement. The outside to inside technique at the joint level was described by Agneskirchner et al.(7) and subsequently similar methods have been described (13,16). Fakioglu et al. (13) published results of 18 patients and concluded that controlled release of the MCL is safe and effective. Likewise, in the present study, no complications were observed related to MCL release, including neurovascular injuries; therefore, we believe that outside to inside MCL release is a safe method.

Atoun et al. (17) performed multiple needle punctures inside to outside to the deep MCL through the anteromedial portal. They claimed that saphenous nerve injury, infection, uncontrolled release and injury to superficial MCL are less likely to occur with the inside to outside technique. However, it is not supported by the literature and they have not published their results. Additionally, the MCL is not an intra-articular tissue and capsular disruption is inevitable when reaching from the inside, which may cause fluid leakage from the damaged synovial cavity. Many articles have been published on the adverse effects of synovial fluid on tendon healing, particularly on tissues that are not normally exposed to it (18,19). On the other hand, in the literature there are no studies comparing outside-inside and inside-outside techniques.

The inside-outside arthroscopic capsular release technique achieves successful results, especially in tight joints (20). However, arthroscopic release of the medial capsule of the knee does not provide sufficient opening in the medial joint space and release of the extra articular MCL is required. Javidan et al. (21) used a curved banana blade and released deep MCL from the anterolateral arthroscopic portal. They did not observe an chronic valgus laxity in their 35 patient; however, Kwak et al. (22) did not consider pie crusting with a blade to be safe because of unexpected early over-releases.

On the other hand, a safe zone for the posteromedial portal has been described (23) and it can improve visualization of the posteromedial compartment (24). However, additional portals do not indeed increase the joint space to facilitate passage of the instruments. Furthermore, many surgeons do not routinely perform these portals and this lack of experience may lead to iatrogenic neurovascular or cartilage injuries.

All of the patients in our study were given a hinged knee brace in the postoperative period. Fakioglu et al. also recommended the use of a brace to avoid chronic instability (13). On the other hand, in some series, braces were not used when the MCL release was performed for the treatment of medial compartment osteoarthritis (4, 25). Likewise, Claret et al. did not use a brace on any of their patients and they did not see any valgus instability. Although there is not enough data in the literature supporting the use of a brace, the authors of this study decided not to risk instability, even in the early period.

The main limitation of this study is its retrospective design. In addition, this study did not have a control group and MCL release was not performed randomly; instead, it was performed at the surgeon's discretion. However, the main aim of this study was not to compare results between two groups, but to reveal the possible effects and complications of percutaneous MCL release. We have not observed any complications in our limited number of patients, but a larger series is needed to reveal possible rare complications. Another limitation is that follow-up MRI was not checked in all patients because of ethical and economical concerns; therefore, although the MCL healing could only be seen in less than half of the patients with MRI, it was confirmed clinically in all patients.

CONCLUSION

This study showed that pie crusting of MCL is a effective and reliable technique which not only provides enough space for visualization, but also for instrumentation in tight knees.

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