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Predictors for an unsuccessful conservative treatment of patients with medial patellar plica syndrome

Fabian Blanke^{1,2}  · Nicola Oehler¹ · Hasan Al Aidarous¹ · Thomas Tischer² · Stephan Vogt¹ · Robert Lenz²

Abstract

Introduction In several cases persistent medial knee pain remains after conservative treatment in patients with medial patellar plica syndrome. In recent literature accepted criteria for surgical indication are lacking. In this retrospective study patients after conservative treatment were evaluated to identify predictors for an unsuccessful outcome.

Materials and methods 117 Patients with medial patellar plica syndrome between 2016 and 2019 were retrospectively evaluated. All patients received conservative treatment for three months. Surgery was indicated due to failed conservative treatment ($n=76$) with persistent medial knee pain and restriction of activity after 3 months. Preoperative MRI analysis, Lysholm score, pain by the visual analog scale (VAS), postoperative sports participation (RTS) and Tegner activity score were collected at least 12 months after definite treatment. Statistical analysis was performed to evaluate differences between patients with successful and unsuccessful conservative treatment.

Results There were significant differences in the clinical and radiological findings between patients with successful and unsuccessful conservative treatment. Patients with failed conservative treatment showed a significant larger diameter of the medial patellar plica (0.8 ± 0.3 mm vs. 1.6 ± 0.4 mm; $p < 0.05$) and a significant higher rate of contact of the plica to the adjacent cartilage. Furthermore, these patients reported a significant higher rate of medial knee pain from flexion to extension and snapping symptoms. At final follow-up the patient-reported outcome by means of Lysholm score (96.25 vs. 95.93), RTS (96.2% vs. 97%) and Tegner activity score (6.0 vs. 6.01) was excellent after conservative and surgical treatment. There were no statistical differences in the preoperative and postoperative outcomes between both.

Conclusions The diameter of a medial patellar plica and contact of the plica to the retropatellar cartilage as well as clinical signs like persistent medial knee pain from flexion to extension with snapping symptoms might be predictors for an unsuccessful conservative treatment and the need for surgical intervention in patients with painful medial patellar plica syndrome.

Keywords Medial patellar plica · Shelf syndrome · Surgical treatment · Conservative · Predictors

This study had been approved by the Institutional Board of our Hospital (Hessing Stiftung Augsburg, Germany, ID 092019).

✉ Fabian Blanke
fblanke@gmx.de

¹ Department of Orthopedic Sports Medicine and Arthroscopic Surgery, Hessing Stiftung Augsburg, Hessingstraße 17, 86199 Augsburg, Germany

² Department of Orthopedic Surgery, University Medical Center Rostock, Rostock, Germany

Introduction

Medial patellar plica (MPP) syndrome is a common knee problem in young adults [1–6]. It is defined as a localized medial peripatellar knee pain especially when performing patellofemoral loading activities and is obligatory linked to a thickened medial plica. However, it remains a great challenge to diagnose this clinical pattern due to several other causes of pain such as meniscal lesions, patellar maltracking or overload of medial ligaments. Therefore, this syndrome is not uncommon for misdiagnosis or a diagnosis of exclusion and needs a careful clinical examination [7]. In case of MPP syndrome inflammation and thickening of the medial plica can lead to persistent knee pain and restriction of activity [4, 5, 8]. Conservative treatment using physiotherapy and

activity modification is a useful tool to treat this frequent knee problem [5, 9–12]. However, in several cases persistent knee pain remains after non-surgical treatment [8, 13–15]. Until now it is unclear which clinical manifestations in patients with MPP syndrome are able to predict whether a surgical intervention is necessary [5, 14]. Therefore, the aim of this retrospective study is to evaluate patients with medial patellar plica syndrome after conservative treatment and to identify predictors for an unsuccessful outcome. We ask the question whether some defined clinical and radiological findings can predict an unsuccessful conservative treatment and the need for surgical intervention in patients with medial patellar plica syndrome.

Materials and methods

All patients between the age of 18 and 65 who presented with medial patellar plica syndrome between January 2015 and December 2019 in our clinic were retrospectively evaluated. Patients were included if a medial patellar plica syndrome was confirmed by clinical and MRI examination. There was confirmation when patients complained a medial knee pain (> 6 weeks) over the palpable medial patellar plica in extension, which markedly diminished at 90° flexion (MPP test), with a verified medial patellar plica in the clinical examination and MR imaging [7, 16].

All patients were initially treated conservative for at least 3 months at different institutions. Conservative treatment included activity modification, sports restriction, physiotherapy with range of motion exercises, physical applications (cryotherapy, electronic stimulation) and NSAIDs. Surgery was only indicated after failed conservative treatment with persistent medial knee pain and restriction of activity after 3 months. Clinical and radiological findings of patients with successful and failed conservative treatment were compared. Further on the difference in the outcome scores after successful conservative treatment and operative treatment were evaluated. Exclusion criteria included any concomitant knee pathologies as meniscal or ligament lesions, chondropathies, synovitis, trochlea dysplasia, patellar maltracking (TTTG > 20 mm), leg axis deviation (> 3° varus/valgus) in the clinical or radiological examination, prior knee surgery, systemic diseases and BMI > 30.

132 patients with MPP syndrome were identified. 10 patients were unavailable for follow up and 5 patients did not consent to complete the survey and were therefore excluded for questionnaire evaluation. A total of 117 patients (88.6%) remained for retrospective analysis. All these patients received conservative treatment. In 76 patients (64.9%) the conservative treatment failed, and a surgical intervention was additionally performed. The follow up survey was at

least 12 months (conservative: 12.3 ± 0.2 months, surgical: 13.0 ± 0.8 months) after the begin of the definite treatment.

Surgical technique

All patients were operated at a single institution by two experienced orthopedic sport medicine surgeons. Procedures were performed in supine position with standard arthroscopic portals and tourniquet. The medial patella plica was resected with a shaver until no signs of patellofemoral tissue impingement were evident in knee flexion and extension. After that a denervation and hemostasis of the medial capsule were performed. If any fraying of the adjacent cartilage was existing a chondroplasty was added. A postoperative drain was used by default. For postoperative management all patients had limited weight bearing of 20 kg for 1 week with free range of motion. No brace was admitted to the postoperative treatment. The patients received physiotherapy 2–3 times a week for 6 weeks with motion exercises, patella mobilization and muscle strengthening.

Data collection

Demographic data and all relevant background information were recorded from medical records least 12 months after definite treatment. For latest follow up survey the patients were contacted by mail and requested to complete the Lysholm score questionnaire [17, 18]. Pain was assessed by the visual analog scale (VAS) and postoperative sports participation (RTS) determined by means of the Tegner activity scale [18]. The surveys included questions to obtain revision surgery, any postoperative complications with special interest regarding characteristic of preoperative pain or persisting pain. The presented study was approved by the institutional review board of our hospital (HSA, ID 092019) and conducted according to the Declaration of Helsinki. All patients gave their written and informed consent.

MRI measurements

MRI examination was done on a 3.0-T scanner (Avanto; Siemens Medical Systems, Erlangen, Germany) using an 8-channel phased-array extremity coil. The following sequences were performed: (1) sagittal fat-saturated (fs) proton-density-weighted turbo spin-echo (PDw TSE) sequence, (2) a sagittal T1-weighted (T1w) TSE, (3) a coronal fs PDw TSE sequence and an axial fs PDw TSE sequence (4). Measurement of the medial patellar plica was performed at the thickest point in the axial planes and described in millimeters (Fig. 1). The contact of the plica to the adjacent retropatellar cartilage was defined as a missing gap between the plica and the cartilage in one of the axial planes (Fig. 1).



Fig. 1 MRI analysis with measurement of the diameter of the medial patellar plica (yellow line) and verification of contact to the adjacent cartilage (arrow) in a patient with unsuccessful conservative treatment (**a**) and successful conservative treatment (**b**)

Damage to the cartilage was determined by any signal alteration of the cartilage surface or superficial fraying.

Statistical analysis

Continuous variables are presented as mean, standard deviation (SD), maximums and minimums. Categorical variables are presented as percentages. The Chi square test was used to determine differences in nominal variables (e.g., sex, RTS) by comparing them between patients with non-surgical and surgical treatment. The uni-paired *t* test was used to calculate differences in clinical characteristics. Statistical significance was set at a *p* value of <0.05. Data were analyzed using SPSS statistics software version 23.0 (IBM, New York, USA).

Results

There were significant differences in the clinical and radiological findings between both groups (Table 1). Patients with unsuccessful conservative treatment showed a significant larger diameter of the medial patellar plica and a significant higher rate of contact of the plica to the adjacent retropatellar cartilage with higher rates of damage of the surface in the axial plane of the MRI (Table 1; Fig. 2). The diameter of the medial plica was 0.8 ± 0.3 mm in patients with successful conservative treatment and 1.6 ± 0.4 mm in patients with failed conservative treatment. Therefore, a diameter of the medial plica in the range of 1.2 mm seems a cut-off value between both groups. Furthermore, the

Table 1 Characteristics of patients with successful and unsuccessful conservative treatment

	Successful conservative treatment (<i>n</i> =41)	Unsuccessful conservative treatment (<i>n</i> =76)	<i>p</i> value
Diameter of medial patellar plica (mm)	0.8 ± 0.3	1.6 ± 0.4	<0.05*
Contact to retropatellar cartilage (<i>n</i>)	31	74	<0.05*
Damage of retropatellar cartilage (<i>n</i>)	6	42	<0.01*
MPP test (<i>n</i>)	41	76	n.s
Pain from flexion to extension in IR (<i>n</i>)	26	66	<0.05*
Snapping (<i>n</i>)	10	55	<0.01*
Age (years)	26 ± 9.5	28 ± 11.2	n.s
Female (<i>n</i>)	22	44	n.s

*Significant, n.s. not significant, mm millimeters, IR internal rotation of the tibia



Fig. 2 Thickened medial patellar plica with small damage (white signal alteration) of the retropatellar surface in the axial plane of the MRI

patients with unsuccessful conservative treatment reported a significant higher rate of medial knee pain from flexion to extension in internal rotation and snapping symptoms (Table 1).

At final follow up the patient-reported outcome by means of Lysholm score, VAS and Tegner activity score was excellent after successful conservative treatment and after surgery for recalcitrant cases. There were no statistical differences in the outcomes between both groups (Table 2). Moreover, there was no difference in the RTS rate between successful conservative and surgical treatment.

The overall complication rate of the patients who received surgical treatment was small (6.5%). Three patients showed a postoperative hemarthrosis, which was treated with joint puncture. Two patients reported sensibility disorders at the

medial knee (N. saphenous) with impairment of the M. quadriceps (N. femoralis), which resolved after 6 months in both patients and was most likely due to the tourniquet.

Discussion

The present study showed that specific clinical and radiological manifestations can predict an unsuccessful conservative treatment and the need for surgical intervention in patients with painful medial patellar plica syndrome. Particularly radiological parameter as the diameter of the plica and contact to the retropatellar cartilage as well as clinical signs like persistent medial knee pain from flexion to extension with feeling of snapping seem to be crucial in the decision between conservative and surgical treatment.

The medial plica is frequently found, however, it does not cause symptoms in the majority of patients [1, 2, 15]. For definition of a clinically relevant medial plica syndrome functional tests combined with ultrasound imaging were commonly used. In this context it was shown that the MPP test is the most important sign in diagnosing a symptomatic medial patellar plica syndrome with high sensitivity and specificity [7]. A positive test was defined as medial knee pain over the palpable medial patellar plica in extension, which markedly diminished at 90° flexion [7, 16]. However, in some cases medial patellar plica syndrome is a diagnosis of exclusion and needs the confirmation of the integrity of other medial sided structures because the clinical symptoms can be similar. Therefore, the clinical diagnosis of a medial patellar plica syndrome was performed by clinical evaluation (MPP test) and MR imaging in present study. Beside the diagnosis the therapy of a medial patellar plica syndrome is also difficult. The treatment decision in patients with persistent pain happens often empirically [5, 13, 19, 20]. In present study both successful conservative treatment and operative treatment showed excellent outcome scores. That agrees with the current literature, conservative treatment with physiotherapy, restriction of activity and physical applications is the first step therapy and showed good results [5, 9, 13]. However, in patients with persistent pain

Table 2 Outcome measures of patients with successful conservative treatment and surgical treatment

	Successful conservative treatment (n=41)	Surgical treatment (n=76)	p value
Lysholm score before treatment	70.1	64.09	n.s
Lysholm score after treatment	96.25	95.93	n.s
Tegner score before treatment	3.9	3.36	n.s
Tegner score after treatment	6.0	6.01	n.s
Return to sport (%)	96.2	97.0	n.s
Mean follow-up (months)	12.3±0.2	13.0±0.8	n.s

n.s. not significant

arthroscopic intervention might be needed. In the recent literature arthroscopic intervention showed excellent results in such cases but no predictors are available to decide between conservative and surgical treatment [5, 8, 13–15, 21]. Therefore, several patients probably receive expensive and time-consuming conservative treatment although this treatment concept might be guaranteed to fail in a specific patient population. Present study firstly revealed possible clinical and radiological patient characteristics which can help to decide between non-surgical and surgical treatment in patients with medial patellar plica syndrome. Particularly a large diameter of the plica and a contact to the adjacent retropatellar cartilage of the medial patellar plica as well as medial knee pain from flexion to extension in internal rotation of the tibia with feelings of snapping were identified as predictors for an unsuccessful conservative treatment. It is rational that the diameter of the plica with contact to the retropatellar cartilage might be crucial because a highly thickened plica has maybe lost the ability to adapt and does therefore not respond to non-surgical treatment. In this context pain from flexion to extension with feelings of snapping is also comprehensible and seems to be linked to the diameter of the plica too. The cut-off value of the medial patellar plica to decide between surgical and non-surgical therapy seems to be in the range of 1.2 mm according to our results. Considering these predictors before choosing a therapy in patients with a medial patellar plica syndrome is recommended based on the findings of this study. Especially the measurement of the diameter of the medial patellar plica in the axial planes of the MRI should be a standard procedure in patients with medial patellar plica syndrome. Nevertheless, careful diagnosis of a symptomatic medial patellar plica syndrome with clinical testing is essential, because several other intra- and extraarticular causes of medial knee pain are possible [7]. In this context MR imaging might serve mainly for the specific treatment decision in confirmed medial patellar plica syndromes and for the exclusion of other medial sided pathologies and cannot replace integral clinical examination. Especially snapping symptoms and specific plica tests are crucial and should decisively influence the ultimate diagnosis.

Present study has some limitations. This study is a retrospective evaluation with medium sample size. Moreover, surgical intervention was already performed after three months of non-surgical treatment. It is possible that the plica pain would have resolved after longer duration of conservative treatment. Another limitation is the small difference in the diameter of the medial plica between the patients with successful and failed conservative treatment. Native MRI might be too imprecise in some cases and application of intraarticular gadolinium should be discussed in future.

Further on the contact of the medial plica could only be assessed for the retropatellar cartilage. However, contact of the medial plica to the trochlear cartilage might be more

specific and therefore dynamic MRI would be beneficial in further studies. Finally, it has to be mentioned that the follow-up of present study was < 2 years.

Conclusion

The diameter of a medial patellar plica and contact of the plica to the retropatellar cartilage as well as clinical signs like persistent medial knee pain from flexion to extension with snapping symptoms might be predictors for an unsuccessful conservative treatment and the need for surgical intervention in patients with painful medial patellar plica syndrome.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in this study were in accordance with ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all patients included in the study.

References

1. Verdonk R, Rombouts J et al (1982) Medial plica synovialis or shelf syndrome of the knee. *ActaOrthopBelg* 48(3):463–467
2. Nottage WM, Sprague NF 3rd et al (1983) The medial patellar plica syndrome. *Am J Sports Med* 11(4):211–214
3. Nakayama A et al (2011) Incidence of medial plica in 3,889 knee joints in the Japanese population. *Arthroscopy* 27(11):1523–1527. <https://doi.org/10.1016/j.arthro.2011.06.022>
4. Johnson DP, Eastwood DM, Witherow PJ (1993) Symptomatic synovial plicae of the knee. *J Bone Joint Surg Am* 75(10):1485–1496
5. Bellary SS et al (2012) Medial plica syndrome: a review of the literature. *ClinAnat* 25(4):423–428. <https://doi.org/10.1002/ca.21278>
6. Broukhim B, Fox JM et al (1979) The synovial shelf syndrome. *ClinOrthopRelat Res* 142:135–138

7. Stubbings NS (2014) Diagnostic test accuracy of clinical and radiological assessments for medial patella plica syndrome: a systematic review and meta-analysis. *Knee* 21:486–490
8. Hufeland MA et al (2019) Symptomatic medial synovial plica of the knee joint: an underestimated pathology. *Arch Orthop Trauma Surg* 139(11):1625–1631. <https://doi.org/10.1007/s00402-019-03249-w>
9. Rovere GD, Adair DM (1985) Medial synovial shelf plica syndrome. Treatment by intraplica steroid injection. *Am J Sports Med* 13(6):382–386
10. Amatuzzi MM, Fazzi A, Varella MH (1990) Pathologic synovial plica of the knee. Results of conservative treatment. *Am J Sports Med* 18(5):466–469
11. Kölle T, Alt W, Wagner D (2020a) Effects of a 12-week home exercise therapy program on pain and neuromuscular activity in patients with patellofemoral pain syndrome. *Arch Orthop Trauma Surg*. <https://doi.org/10.1007/s00402-020-03543-y>
12. Kölle T, Alt W, Wagner D (2020b) Immediate effects of an elastic patellar brace on pain, neuromuscular activity and knee kinematics in subjects with patellofemoral pain. *Arch Orthop Trauma Surg* 140(7):905–912
13. Schindler OS (2014) ‘The Sneaky Plica’ revisited: morphology, pathophysiology and treatment of synovial plicae of the knee. *Knee Surg Sports Traumatol Arthrosc* 22(2):247–262. <https://doi.org/10.1007/s00167-013-2368-4>
14. Paczesny L et al (2019) A 10-year follow-up on arthroscopic medial plica syndrome treatments with special. *Cartilage* 2019:1947603519892310. <https://doi.org/10.1177/1947603519892310>
15. Lee PYF et al (2017) Synovial plica syndrome of the knee: a commonly overlooked cause of anterior knee. *Surg J (N Y)* 3(1):e9–e16. <https://doi.org/10.1055/s-0037-1598047>
16. Kim S-J, Jeong J-H, Cheon YM, Ryu S-W (2004) MPP test in the diagnosis of medial patellar plica syndrome. *Arthroscopy* 20(10):1101–1103
17. Lysholm J, Gillquist J (1982) Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale. *Am J Sports Med* 10(3):150–154
18. Briggs KK et al (2009) Lysholm score and Tegner activity level in individuals with normal knees. *Am J Sports Med* 37(5):898–901. <https://doi.org/10.1177/0363546508330149>
19. Kim SJ, Choe WS (1997) Arthroscopic findings of the synovial plicae of the knee. *Arthroscopy* 13(1):33–41
20. Dorchak JD et al (1991) Arthroscopic treatment of symptomatic synovial plica of the knee: long-term. *Am J Sports Med* 19(5):503–507
21. Muse GL, Grana WA, Hollingsworth S (1985) Arthroscopic treatment of medial shelf syndrome. *Arthroscopy* 1(1):63–67