

Mediopatellar plica syndrome of the knee

Plica syndrome

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Plica is a general term for folds in the synovial membrane of the knee. Sometimes plica can progress to a pathologic level and clinically important condition. Normally, plica has an elastic structure and slides softly between femur condyles when flexing or extending the knee. If it is inflamed and thickened due to edema, it loses its elasticity and becomes symptomatic.

Plica syndrome is a cause of frontal knee pain. Pain is generally located in the anterior knee, but can be seen in the anteromedial, anterolateral, medial, and lateral joint spaces. In physical examination, during knee extension, sensitivity is present 1-2 cm proximal and medial to the lower pole of the patella. It is a typical sign. Magnetic Resonance Image is the best non-invasive diagnostic tool for plica syndrome.

In all cases, conservative treatment should be the first choice. Surgical treatment is used for patients who do not respond to conservative treatment. Surgical excision of mediopatellar plica associated with cartilage degeneration appears to result in substantial clinical improvement, thus representing an effective treatment modality for this group of patients.

Keywords

Plica; Knee; Mediopatellar; Arthroscopy

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Introduction

Plica is a general term for folds in the synovial membrane of the knee. The frequency of plica in the knee is between 18,5% - 87% [1-7]. Sometimes plicas can progress to a pathologic level and a clinically important condition. The cause of plica syndrome is unknown [8]. Thereby, it can count as a potential cause of complaints [9].

The anatomy of a plica was first described by Mayeda in 1918. In 1939, Lino first showed arthroscopic images of synovial folds on cadaver knees [10]. Later, in 1950 and 1971, Pipkin noticed that these plicas could be confused with knee adhesion and may be a cause of clinical complaints [11].

During embryonic development, there are three primitive cavities in the synovial space of the knee joint. There are membranes to separate these spaces, one of which is the mediopatellar plica (MPP). In an intrauterine gestational progression, MPP is absorbed in both knees, but in some individuals, the absorption level changes; while in some people, MPP is totally absorbed, in others, it can remain as band formation of varying thickness [2, 9].

There are various classifications. The classification according to location and the arthroscopic image is listed below:

Suprapatellar plica: This type is originated from the inferior surface of the quadriceps tendon and in the suprapatellar region keeps transverse position and adheres to superomedial and lateral walls of joint [1, 2, 12].

Lateral plica: This type is rarely seen of all [1, 2, 13, 14]. It is originated from the lateral wall, continues above the hiatus popliteus, and terminates in the infrapatellar fat cushion [1, 2].

Infrapatellar plica: This type is called ligamentum mucosum, which originates from the notch in between femur condyles, continues parallel to the ACL, and terminates in the infrapatellar fat cushion [1, 2, 3]. This is the most common plica seen in arthroscopy [13,14].

Mediopatellar plica: This type has various names: plica synovialis patellaris, plica synovialis medialis, medial intraarticular band, plica alariselongata, medial synovial shelf, meniscus of patella, Lino's band, Aoki's ledge [2, 9, 15]. MPP is originated from suprapatellar plica or near the medial joint wall, moves across from medial to distal of the patella, and ends in the synovial membrane which covers infrapatellar fat cushion.

In 1939, Lino described four types of plica for the first time.

Later Sakakibara organized them as follows:

Type A: plica is a little ledge on the medial joint wall;

Type B: plica does not cover the front side of medial femoral condyle totally;

Type C: plica covers the front side of medial femoral condyle totally;

Type D: plica covers the front side of medial femoral condyle totally with defects.

Dandy classified his arthroscopic study more detailed as described below (Figure 1) [4]:

Type A: medial plica does not exist;

Type B: narrow ledge on the medial wall of knee joint;

Type C: amplitude of plica less than 1 cm;

Type D: amplitude of plica is between 1-2 cm;

Type E: amplitude of plica is more than 2 cm;

Type F: plica with defects;

Type G: plica is high but not enough to reach to the medial femoral condyle;

Type H: plica is reduplicated;

In their study, Williams et al. found 5.34% MPP in 3017 arthroscopic series and classified as follows: type 1 thin plica, type 2 thick plica, type 3 called fibrotic, or fenestred plica. They have subgroups A and B in terms of whether impingement lesion is present or not.

Normally plica has an elastic structure and slides softly between femur condyles when flexing or extending the knee. If it becomes inflamed and thickened due to edema, it loses its elasticity and becomes symptomatic. In the long term, it is replaced with fibrotic tissue, even hyalinized and rarely calcified [2, 13, 17-19]. Thereby, it can cause secondary mechanical synovitis. MPP is compressed between the anteromedial side of the medial femoral condyle and medial polar of the patella in the flexion of the knee. With thickening of the plica and continuous movement in the region mentioned above, cartilage injury occurs. The initial factors for inflammatory events are direct trauma, hemarthrosis, meniscus pathologies, osteochondritis dissecans, chronic effusion, and at the end becomes a plica syndrome. Sometimes, excessive exercise, sports activities, lifestyle with chronic hyperflexion of the knee can lead to plica syndrome. Plica can damage the quadriceps function even without contacting with bone structures, causing pain by traction to synovium and fat cushion [2, 13, 19]. The exact function of the plica is unknown. According to studies, neural elements are shown in plicas [20].

Some plicas do not cause complaints or clinical manifestations. Symptomatic plica is called Plica Syndrome and generally seen in the young population [2, 3, 13, 14, 21]. Complaints related to plica syndrome raw are similar to meniscus lesions and patellar cartilage lesions. Thereby, it leads to confusion in diagnosis. MPPs with intra-articular pathologies are more common than isolated MPP. In other conditions, MPP may be missed and during arthroscopy, MPP can be seen unexpectedly [2, 3, 13, 14, 21].

Pain is the most common complaint [9]. Plica syndrome is a cause of pain in the frontal knee. Pain is generally located in the anterior knee but can also be seen in anteromedial, anterolateral, medial, and lateral joint spaces. The pain is generally episodic but can be present only with exercise or worsen. Like other patellofemoral problems, it gets worse when climbing stairs. Staying in flexion position of the knee can be described as a relief by extension, called "movie sign" positive. After sitting for a while, then try to stand up, patients feel pain and stiffness in the first steps. After a few steps, patients are relieved of the pain sensation. It is called first steps stiffness. If asked, many patients have a positive history. It is an important sign of plica syndrome. Beyond these typical signs, stuck, false tripping, sound from knee and discharge feeling signs are untypical findings of MPP syndrome [6, 9, 13, 14, 21, 24, 25].

In physical examination, during the knee extension position, sensitivity is present 1-2 cm proximal and medial to the lower polar of the patella. It is a typical sign. While the knee in flexion position, there may be sensitivity in the medial joint space [9]. Another test for MPP syndrome is the terminal extension test. In this test, clinician puts his/her hand on the back of the knee and

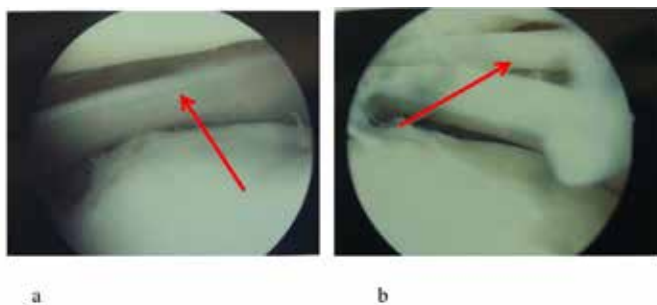


Figure 1a,b. Arthroscopic image of Dandy Type E and Type H plicas



Figure 2a,b. Axial magnetic resonance image of MPP and x-Ray image of calcific MPP

holds it in 30-degree flexion; with the other hand, the clinician holds the ankle and asks to do extension against strength. If pain occurs in the medial plica region during this test, this is a positive sign. Matsue et al. defined it as an active extension. If a patient cannot do flexion to extension against gravity, this is positive for MPP [27].

Another test is described by Pipkin. When the leg is in an internal rotation position, the patella is pushed to medial. When the knee is in 90-degree flexion, clinician puts his/her second finger to the medial of patella, and the knee is moved to extension position. If there are crossing feelings or sounds, in particularly between 60–45 degrees, this is a positive sign for pathological MPP and considered strongly to MPP [11].

In pathological MPP syndrome, McMurray, which is one of meniscus tests, can be positive. Thereby, in a patient with a positive meniscus test, plica syndrome should be considered at any time, and also caution should be exercised in the differential diagnosis [9].

Though x-Ray images are not helpful in diagnosis, they should be obtained to exclude other pathologies [26]. Particularly it is important to show patellofemoral discordance and free particles in the joint [3, 13, 14]. Sometimes a calcific mediopatellar plica can be seen in x-ray images.

There are studies that claim that arthrography can be helpful in diagnosis, particularly in plica position, but they are not common. CT and ultrasound have limited support, and after MRI they are used lesser [3, 9, 26, 28–30].

MRI is the best non-invasive diagnostic tool. Plica folds can be seen in the axial section of MRI [2, 24, 26, 31]. Effusion in the knee makes it easier to detect MPP. MPP is seen as a low-

intensity signal in high-intensity joint fluid. T2 gradient echo and fat-suppressed T2 or proton suppressed images show plica thinning better. If MRI is requested without effusion in physical examination, fluid can be injected for effusion. Thereby it will be easier to detect MPP (Figure 2) [32, 33].

Arthroscopy is the best diagnostic tool. Another advantage of arthroscopy is the provision of information about plica, in terms of whether it is pathological or not. Stiffness and tension of plica can be detected by arthroscopy, and also with knee movements, effects of plica on the condyle can be seen. Further, with the help of arthroscopy, other pathologies in the knee are detected, and their treatment will become possible [3, 26].

Conservative Treatment

In all cases, conservative treatment should be the first choice [2, 8, 9, 18]. Pain can be relieved by rest and NSAIDs, and later, rehabilitation program is started [8].

The main subject of the program is strengthening quadriceps and hamstring and stretching exercises [3, 26]. Patients with frontal knee pain and no patellofemoral pathologies undergo a patellofemoral rehabilitation program. However terminal extension exercise increases pain in plica syndrome [3]. Phonophoresis and ultrasound can be used to decrease the inflammation in the early period [3].

The duration of conservative treatment is due to a response. If the response is seen in 2–3 months, conservative treatment should be continued. If there is no any response, surgical treatment should be considered. If the pain is worsening, surgery can be held earlier [3].

There are very few studies about conservative treatment in literature. Ammatuzzi et al. found that the percent of successful conservative treatment is 40%. They claimed that the percentage is satisfactory to be an option. However, it should be considered that plica is diagnosed clinically not arthroscopically in this series [6].

Intraplica corticosteroid injection is another therapy in conservative treatment. In a study by Rovere et al., 21 of 30 patients were successfully treated with the steroid-local anesthetic combination.

Surgical Treatment

The medial patella plica is most commonly associated with symptoms and is frequently considered to be pathological [34]. Surgical treatment is used for patients who do not respond to conservative treatment. If a plica causes friction on the medial femoral condyle or pinches between the patella and medial femoral condyle, it should be excised. But arthrotomy should not be done for excision. According to Patel, surgical indications are as follows: palpation of clinically painful and sensitive band determination of thickened and subluxated mediopatellar plica existence with or without cartilage lesions at patella or femur. If arthroscopy is performed under local anesthesia, stretching plica with a hook lead to complaints from patients without the determination other pathologies clinically and arthroscopically [2,3].

For arthroscopic surgery, usually standard portals like anteromedial, anterolateral are used. Brief et al. described the superolateral approach as a better arthroscopic portal for medial plica, and it offers a sweeping, unobstructed view of the entire plica and also good visualization of the patella-femoral

joint [8,35].

Visualization of all the compartments of the knee and probing of the menisci should also be performed to ensure that there are no other pathological causes of pain in the knee. Accessory portals can be created to allow better visualization of the patellofemoral and suprapatellar compartments. If any other pathology is found, it needs to be treated appropriately [36].

Arthroscopic excision of the medial plica is carried out as a daytime procedure. Complete resection of pathological plica to the capsular attachment is advisable. Many studies reported good to excellent results with this procedure [9, 14, 36, 37]. However, extensive excision of medial plica can lead to patellar subluxation [25, 38]. During the medial plica surgery, the knee should be in full extension. Mild flexion of the knee complicates the surgery.

The amount of excision is controversial. The main operations in the literature are the division of the plica just as band, total excision, and segmental resection. The division of the plica may cause recurrences. The radical resection may lead to the formation of tense fibrotic tissue through the capsule and subcutaneous fat tissue. A thin peripheral edge is left in the procedure of subtotal resection. In this way, capsule and synovium are not traumatized and because of this, the formation of fibrous tissue is not seen. As described by Dandy, segmental resection may be insufficient for large and hard plicas [4, 13, 14, 18, 26, 39].

The normal or asymptomatic plicas which are detected incidentally should not be excised. Some researchers suggest the excision of plicas to prevent future complaints, except for thin and distant plicas from bony structures.

Plicas have copious blood supply around the synovial attachments, and thus it is necessary to achieve homeostasis to prevent complications of intra-articular bleed post-operatively [35, 40]. Postoperatively, a compression bandage is applied over the joint. Mobilization is started on the same day with the help of a physical therapist, and early knee physiotherapy is encouraged to prevent stiffness and scarring of the plica [8, 25, 40].

Conclusion

Plicas around the knee are common findings at arthroscopy but are rarely pathological. The plica syndrome causes pain in the anterior knee and can be debilitating for patients. Inflammation and synovitis cause fibrosis and thickening of the plica, and then plica starts to behave like a bowstring causing impingement and cartilage damage. If a thickened and hypertrophic pathological plica is found at arthroscopy and is completely excised, good results from the arthroscopically excision can be expected in the majority of the patients.

Surgical excision of mediopatellar plica associated with cartilage degeneration appears to result in substantial clinical improvement, thus representing an effective treatment modality for this group of patients.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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