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Diagnostic criteria for the synovial plica syndrome of the knee, a review

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ABSTRACT

Aim. Based on literature review, the article highlights the current diagnostic criteria for the synovial plicae syndrome (SPS) of the knee. Introduction. The syndrome diagnosis algorithm includes a carefully collected clinical history and clinical examination using specific functional tests, non-invasive research methods (ultrasound, magnetic resonance imaging) and arthroscopy. Discussion. It should be noted that the principles of early diagnosis by clinical and radiological methods are still not well understood. Due to non-specific clinical symptoms, this syndrome in most cases is detected by arthroscopic intervention. Conclusion. We try to provide an evidence-based guide to the diagnosis criteria of the knee SPS, based on the analysis of the literature and our own experience.

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INTRODUCTION

The synovial plicae syndrome (SPS) of the knee develops as a functional disorder in response to chronic inflammation, injury or other pathological conditions of the knee, in which there is a change in the structure of the synovial plicae (violation of elasticity, fibrous restructuring).

Patients often mention anterior knee pain, clicking, clunking, and a popping sensation on patellofemoral loading activity such as squatting [1, 2]. There is wide variation in reported prevalence of SPS, ranging from 3 to 30% in European population studies; most studies cite a figure of approximately 10% [3, 4, 5]. According to their location, the synovial plicae are classified as suprapatellar, mediopatellar, infrapatellar, or lateral; the medial plica is the most commonly symptomatic one [6, 7, 8].

Most cases of knee SPS are idiopathic, and symptoms have been estimated to be bilateral in up to 60% of cases, although they may not manifest concurrently [8]. Other causes or associations have been identified associated with trauma, overuse injuries, hematoma, diabetes, and inflammatory arthropathy.

In adolescence, symptoms can occur during a period of growth spurt. Any primary disorder of the knee capable of producing transient or chronic synovitis may therefore be implicated in the development of a pathological plica.

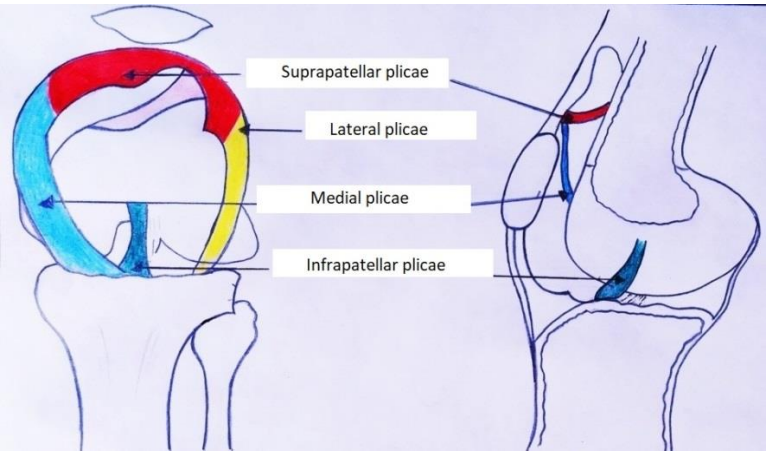

Figure 1. The topical anatomy of the pathological plicae of the knee

The article outlines the main points of the examination of patients with the SPS. Based on the analysis of the literature and our own experience, diagnostic criteria for this pathology are presented.

HISTORY AND METHODS

Undoubtedly, one of the most important stages in the diagnosis of knee pathology is obtaining an appropriate history of the disease in a patient. Patients may report an aggravation of symptoms on excessive or severe traumatic effects associated with flexion and extension of the knee. Intense painful sensations are more common in athletes with poor quadricep tone or significant muscular imbalance around the knee, because synovial folds are directly related to the articular surfaces of the knee and are indirectly attached to the muscles of the quadriceps, while the folds change dynamically during knee activity [4].

The diagnosis should be suspected in patients of any age. Also, it should be noted that aggravation of symptoms is not a mandatory clinical course of the disease and for this reason the problem of identifying patients with a long asymptomatic syndrome is still relevant. Some patients report blunt trauma or twisting trauma, which usually lead to the development of effusion. Prolonged pain in the projection of the medial articular surface of the knee is usually associated with the development of fibrosis [9].

Pain syndrome sometimes occurs after intense passive or active physical exertion (repeated flexion and extension of the knee), when climbing or descending stairs, squatting, getting up after prolonged sitting [5]. In addition, patients may note pain in the knee during the sitting itself [1, 10]. Patients commonly report intermittent nonspecific anterior knee pain, snapping, clicking, catching, clunking, grinding, "giving way," or a popping sensation along the inside of the knee during flexion and extension. The knee may be tender to the touch, swollen, and stiff (Table 1) [11].

Thus, the pain that occurs on the anterior articular surface of the knee is a cardinal symptom and is present in almost all patients with this pathology.

Table 1. Symptoms and signs of knee synovial plica syndrome

• Anterior knee pain
• Snapping sensation along the inside of the knee as the knee is bent
• Clicking, catching, clunking, grinding, popping
• Tender to the touch
• Felt as a tender band underneath the skin
• Knee effusion, swelling
• Pain on squatting
• Locking, stiffness, giving way

CLINICAL EXAMINATION

In a clinical examination, the surface of the knee may be soft to the touch, swollen or hard. Symptoms are often clinically indistinguishable from other intra-articular pathologies of the knee, such as damage to the meniscus and articular cartilage, making it difficult to diagnose [2]. Therefore, physical methods are insufficient.

In turn, clinical diagnosis is supported by special functional tests and instrumental imaging methods. When examining the knee, it is important to make sure that the patient is relaxed, which is usually achieved by taking a supine position on the back while supporting both legs.

The abnormal medial plicae is palpated in the form of a cord located 1 cm medially from the superior of the patella. Some patients may experience a feeling of moderate pain when palpating the location of the synovial fold. In this case, an important point is to conduct a comparative study with the second knee to see if there is a difference in the intensity of pain.

As with any other physical examination, it is important to simultaneously determine whether there are other possible pathologies in the structures of the knee, which are located close to the synovial folds. In case of acute injuries, other common pathologies of the knee soft tissues, such as meniscal and cruciate ligament injuries, should be excluded.

The Hughston's plica test (Figure 2) and Stutter test (Figure 3) are provocative tests commonly used to support a diagnosis of SPS [5, 9, 10]. These tests are considered to be more supportive of the diagnosis when

both tests are positive, but are less reliable when used individually, with wide variationnin their reported sensitivity and specificity.

Figure 2. Hughston's plica test

Hughston's plica test

Patient positioning: supine with the knee fully extended and relaxed. The examiner stands on the affected side, placing one hand around the heel and the palm of the other hand over the lateral border of the patella with the fingers over the medial femoral condyle. Action: the examiner flexes and extends the patient's knee while internally rotating the tibia and pushing the patella medially. Positive finding: pain and/or popping in the knee is indicative of an abnormal plica. It is typically in the range of 30 to 60 degrees toward extension.

Figure 3. Statter test (description in the text)

Stutter test. Patient positioning: sitting on the side of the bed with knee flex to 90 degrees. The examiner crouches down to knee level placing the index and middle fingers on the center of the patella. Action: the examiner asks the patient to extend the knee slowly while keeping the fingers on the patella and watches its movement. Positive finding: if the patella stutters or jumps during the course of movement, it is indicative of a plica. It is typically in the range of 45 to 70 degrees toward extension. Crepitus of the patella may also be felt.

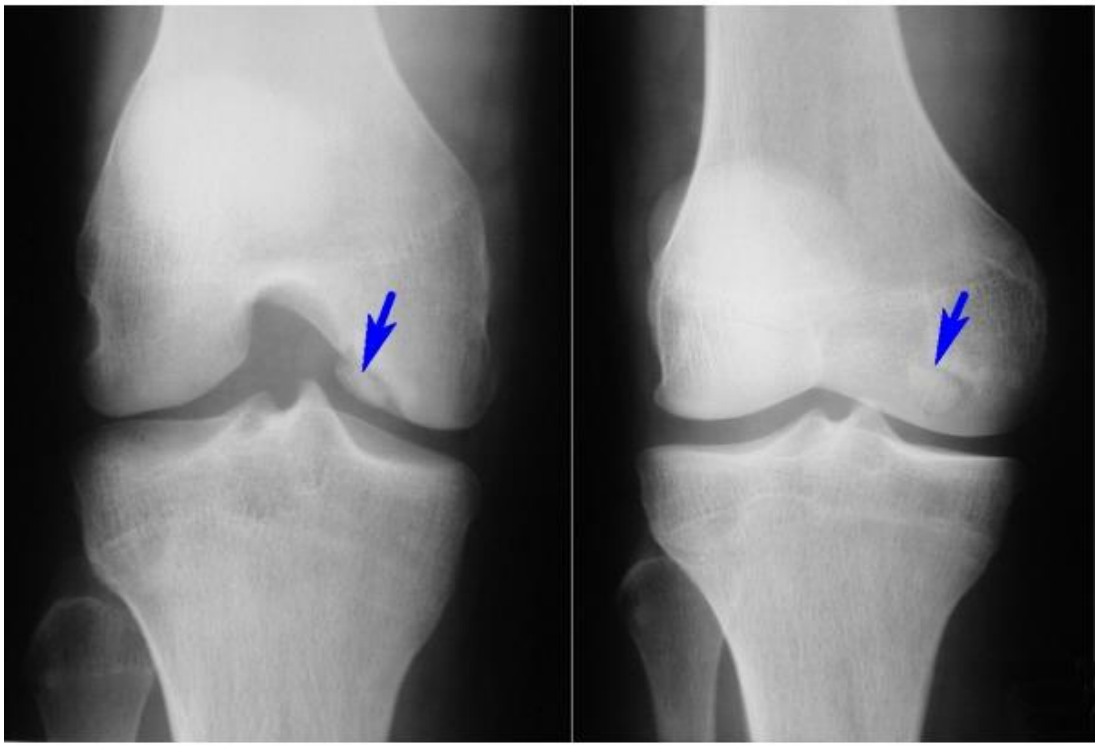

Figure 4. X-ray examination of the medial plicae syndrome of the knee

In order to exclude another pathology of the knee, it is recommended to conduct an X-ray of the knee to exclude bone traumatic pathology (Figure 4). Also, this method determines the ratio of bones in the joint, standing of the patella, the presence of dysplasia, etc. However, in many patients with SPS, radiography does not reliably indicate the presence of the syndrome.

Ultrasound and magnetic resonance imaging (MRI) can reveal the presence of a patellar fold, but they are unreliable in verifying the pathological fold. These visualization methods are useful and their use is better in specialized centers for the assessment of complex cases, the recurrence of symptoms and for the evaluation of indications for surgery.

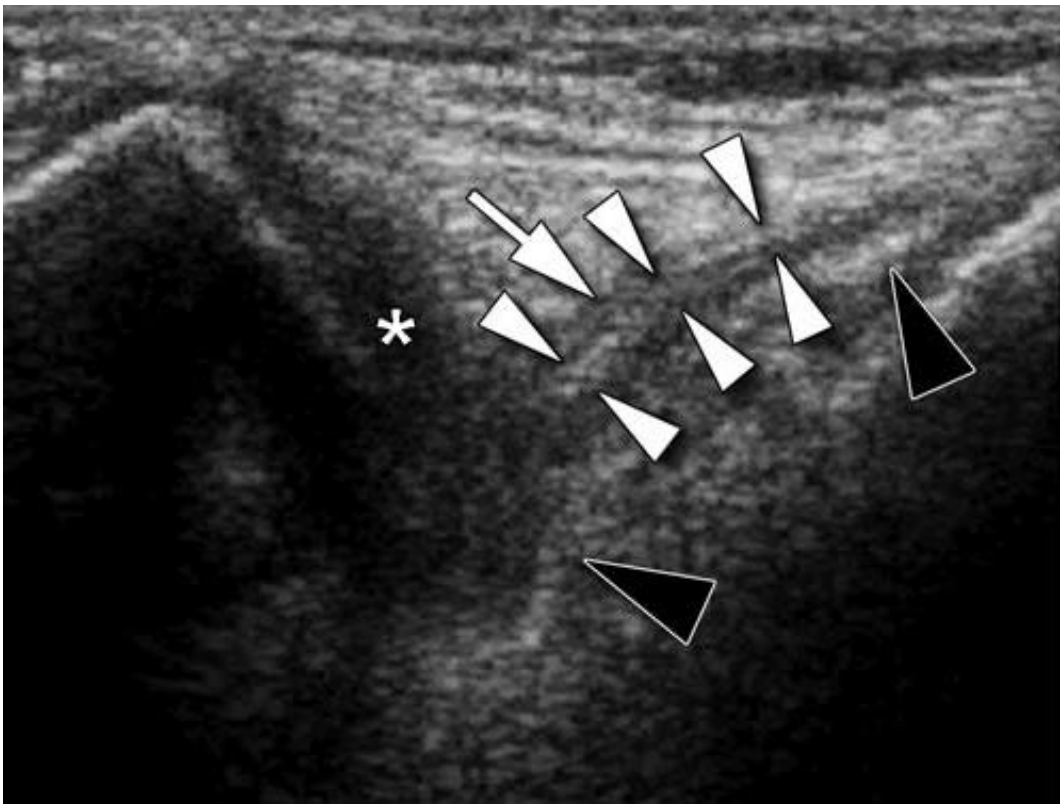

Figure 5. Ultrasound photo showing reveal the presence of a patellar plicae

The average arithmetic indicators of MRI are: accuracy-86.8%, the predictive value of a positive test is 78%, the predictive value of a negative test is 91.6%. On MRI, the synovial membrane looks like a dark line on T1 and T2-weighted images. It is extremely difficult to visualize an unchanged synovial sac, in both adults and children, especially since there is no contrast enhancement of the unchanged synovial membrane. Basically folds are visualized in axial sections, as they are located in the horizontal plane. Have a lower characteristic of the signal T1- and T2 VI. The physiological separation of the joint is due to synovial folds, which can also be seen on the MRI tomogram series [2, 3, 12].

Indirect signs can be chondral and osteochondral damage to articular surfaces, i.e. identification on a series of tomograms of chondromalacia of the patella or indentation zones on the internal condyle of the thigh from contact with the fibrous patellar plicae.

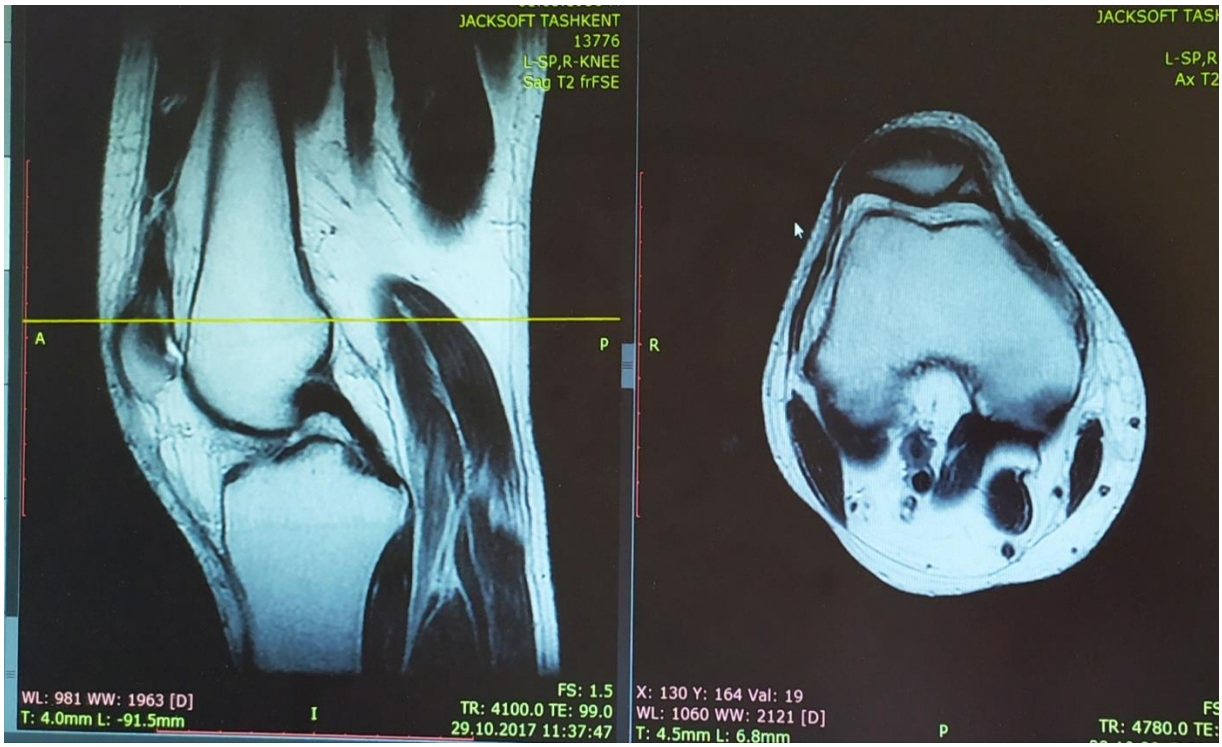

Figure 6. Synovial plica syndrome of the knee. MRI.

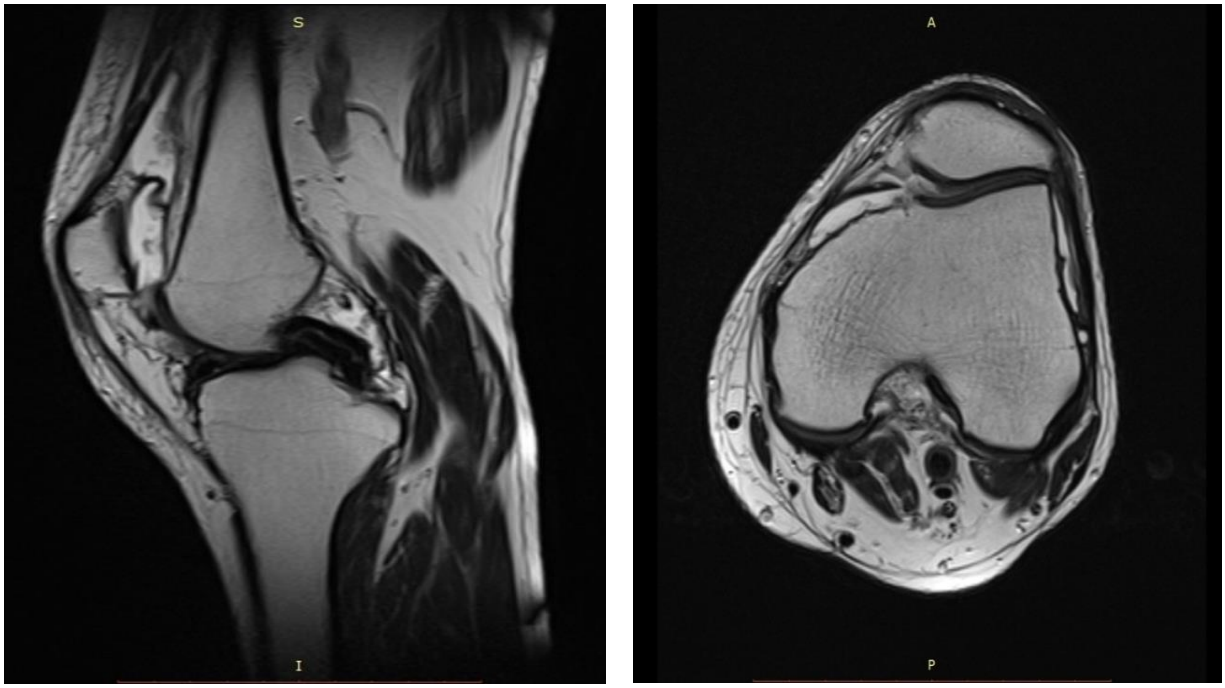

Figure 7. Suprapatellar plicae of the knee. A 45-year-old patient with pain syndrome

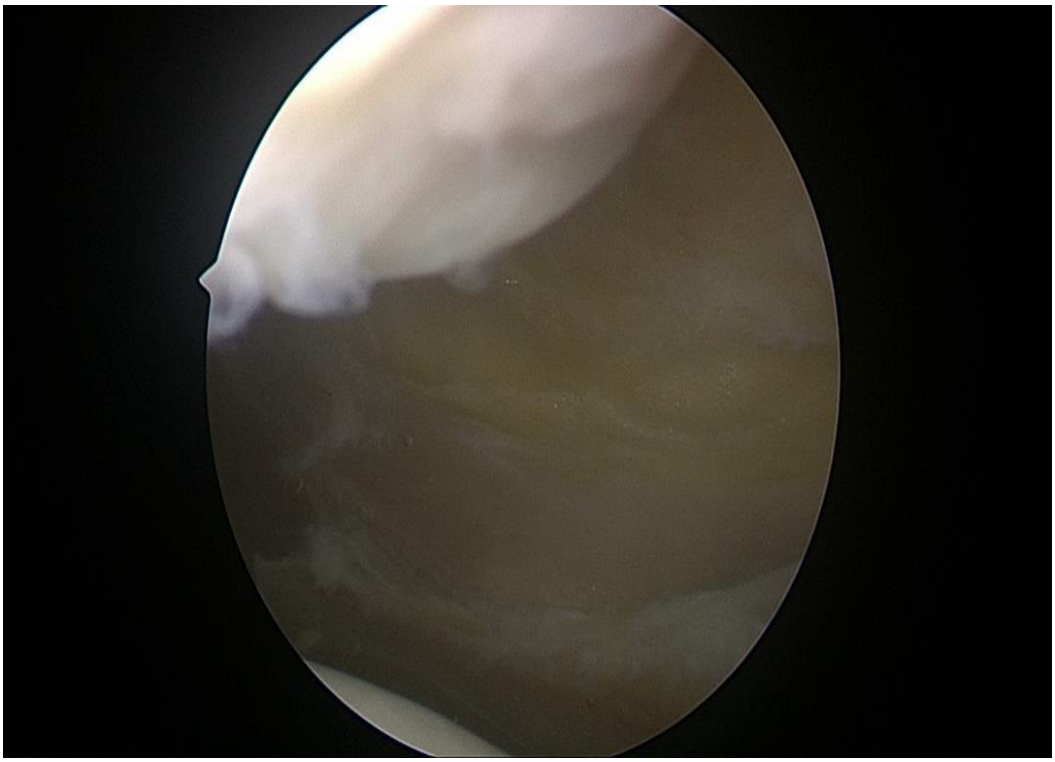

Figure 8. Arthroscopic photo showing the cartilage surface of the medial femoral compartment being eroded by the synovial plica

Arthroscopy is the most reliable method for the diagnosis of the SPS. Due to the emergence and development of the method of arthroscopy, it is possible to most accurately diagnose intra-articular pathology, to study the synovial membrane of the knee in more detail. Today, arthroscopy has become the best method for this pathology, which allows with 100% certainty to verify certain injuries in the knee, including the SPS, as well as to carry out adequate operational measures.

CONCLUSION

The SPS of the knee is common and is seen in both community and hospital practice. A diagnosis of SPS should be suspected in patients with intermittent pain, swelling, and snapping sensation affecting the knees, which is associated with activity that involves increased loading of the patellofemoral joint.

DECLARATIONS

Authors' Contributions
All authors contributed equally to this work.

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Competing interests
The authors declare that they have no competing interests.

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