THE CURRENT STATE OF THE SCIENCE OF MEDIOPATELLAR PLICA SYNDROME IMAGING

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Abstract. The research paper deals with the problem of mediopatellar plica hypertrophy diagnostics from the viewpoint of the efficiency of different imaging techniques.

Based on the findings of the analysis of domestic and foreign researches on this problem complex examination is suggested to verify this syndrome. This complex examination includes X-ray imaging, arthrosonography, magnetic resonance imaging as well as arthroscopy. Based on the data provided in a number of research papers it is established that sonography of a knee joint allows verifying indirect signs of mediopatellar plica hypertrophy.

A magnetic resonance imaging allows verifying with high accuracy direct and indirect signs of mediopatellar plica syndrome, however the variability of diagnostic difference in diagnostic centers is up to 47.0%. Arthroscopy is an invasive method, although its sensitivity reaches 100.0%.

Analizing a bulk of literature we should conclude that the problem of noninvasive diagnostics of mediopatellar plica syndrome still remains challanging.

Keywords: mediopatellar plica syndrome, X-ray imaging, arthrosonography, tomography, arthroscopy, sensitivity, direct signs, indirect signs.

Introduction. Mediopatellar plica (MPP) syndrome of a knee joint, according to world literature, is between 3.0-5.0% of all knee joint pathology. At the same time, verification of MPP, if available, ranges from 18.5% to 72.0% [20].

Difficulties in identifying this syndrome result in delayed diagnosis, so that timely surgical intervention during 3-12 months is exercised only for a small number of patients [19]. Undiagnosed MPP hypertrophy is the cause of chronic gonarthritis. In addition to that, the development of fibrosis, thickening of the fibrous membrane and articular capsule is observed. In the articular cavity secondary changes with the formation of commissures, scar tissue are developed masking the clinical finding of the underlying disease. This results in incorrect tactics regarding the choice of conservative or surgical treatment.

Objective. The objective of the research was to analyze data available in the scientific literature on the basic principles of diagnosing the mediopatellar plica syndrome, to assess the effectiveness of different imaging techniques and to identify currently pending tasks that are relevant for this study.

Materials and methods. The study is based upon the thorough analisis of all available English-language, Russian-language and Ukrainian-language scientific publications on the subject of mediopatellar plica syndrome diagnosing. A literature search identified studies relevant to invasive and noninvasive diagnostic methods for mediopatellar plica syndrome detecting. Databases used included MEDLINE, EMBASE, CINAHL, AMED, PubMed, and TRIP Database. Evidence based reviews from the Cochrane library were also included in this review. National offline libraries were used as well. No data restrictions applied. However, database search only included articles from 1990 until present. Keywords included for

example mediopatellar plica syndrome, X-ray imaging, arthrosonography, tomography, arthroscopy, sensitivity, direct signs, indirect signs etc. and their combinations. The results were then narrowed to exclude those that focused solely on other diagnoses or treatment methods. Case series and case reports were excluded. The references in the selected articles were also used to find additional relevant sources. We evaluated the quality of evidence and grade of recommendation.

Results. Differential diagnosis of mediopatellar plica syndrome is made by means of a comprehensive examination that includes clinical and radiological methods, knee joint sonography, computer-aided tomography and magnetic-resonance imaging (MRI), as well as arthroscopy.

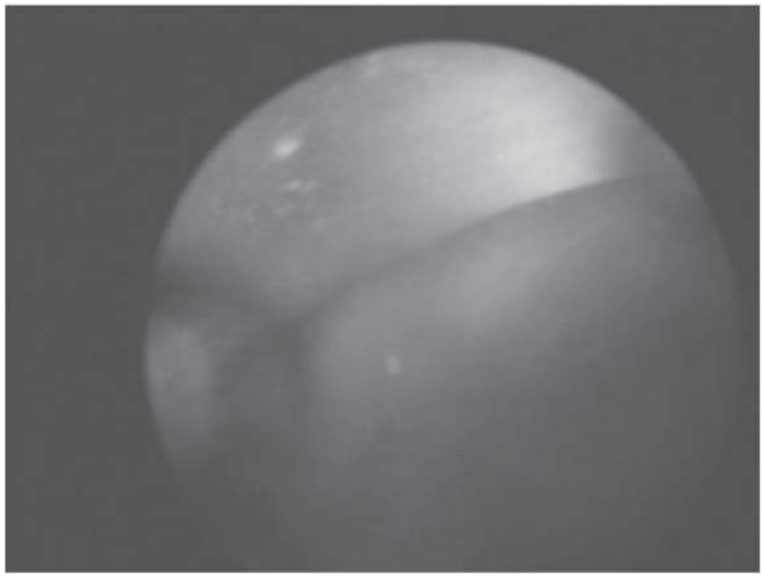
X-ray imaging of suspected MPP syndrome is conducted mandatory to eliminate traumatic bone pathology. This method also helps to identify bones relation in the joint, patella position, signs of dysplastic changes. At the same time, X-ray imaging of the knee joint produces little information for reliable diagnosis of pathological MPP. Difficulties in verification of this nosological form consist in the fact that clinical symptomatology often simulates the symptoms of menisci injury, so incorrect diagnosis of chronic injury of medial and outer menisci, anterior crucial ligament injury, deforming gonarthrosis etc. is often made in such cases [20]. (Pic. 1)

Ultrasonography (US) for the diagnosis of knee joint MPP hypertrophy is carried out in accordance with the basic principles of arthrosonography: 1) systemacy; 2) standardization of imaging accesses (examination in succession standard CT-scans); 3) adaptability and conscious use of methodological means (based on the principles of polyprojection, polyposition nature of ultrasound scan, parallelism and perpendicularity of the sensor location to MPP); 4) symmetry (required comparing of ultrasound image to contralateral joint); 5) functionality (necessity and obligation of functional tests); 6) monitoring and comparison, analysis of structural changes in dynamics [13] (Pic. 2)

Knee joint sonography allows revealing fluid in the articular cavity, its amount, location, periarticular tissue changes, thickness and structure of cartilage [17]. In case of MPP hypertrophy US verifies hyperechoic structures in the medial part of knee joint. In addition, signs of chronic inflammatory process are often identified accompanied by inhomogeneous synovial fluid hypertrophy, its reduced echogenicity, uneven ragged outline and formation of commissures between the plicae. Less characteristic feature is the formation of villi which is not specific to a pathological MPP syndrome. These changes are verified mainly in the medial parts of the patellofemoral joint [21].

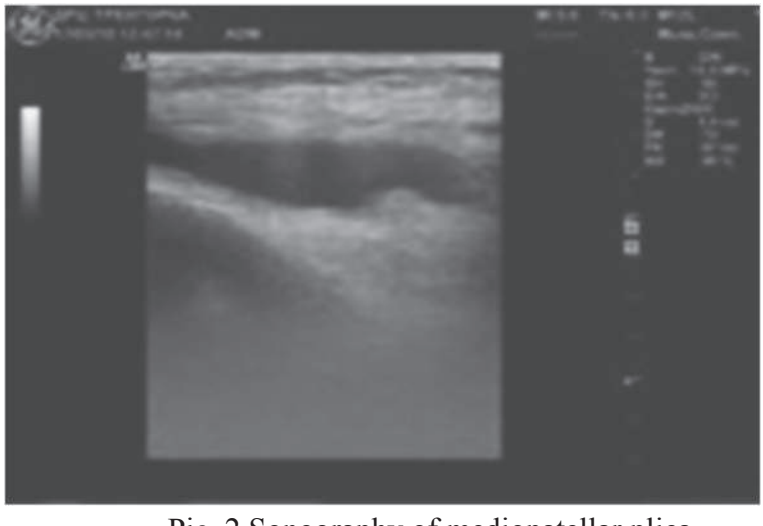
According to Shevtsov V.I. et al., sonography examination of MPP syndrome in a projection of medial condyle identifies hyperechoic loose mass, with structure sclerosing while bending knee joint and its location directly on the inner femur, as well as the indentation area on medial condyle in contact with the plica [6]. Sencha A.N. et al. indicate that MPP syndrome is often accompanied by its hypertrophy, and the thickness of the medial plica in pain syndrome in the knee joint exceeds a similar structure in the opposite joint by 0.5 – 1.1 mm [8].

Chondral and osteochondral injury to articular surfaces can be indirect signs of MPP hypertrophy, i.e. identification of chondromalacia patellae or areas of impression on the inner femur from contact with the fibrous mediopatellar plica [2].



Pic.1. Arthroscopy of mediopatellar plica

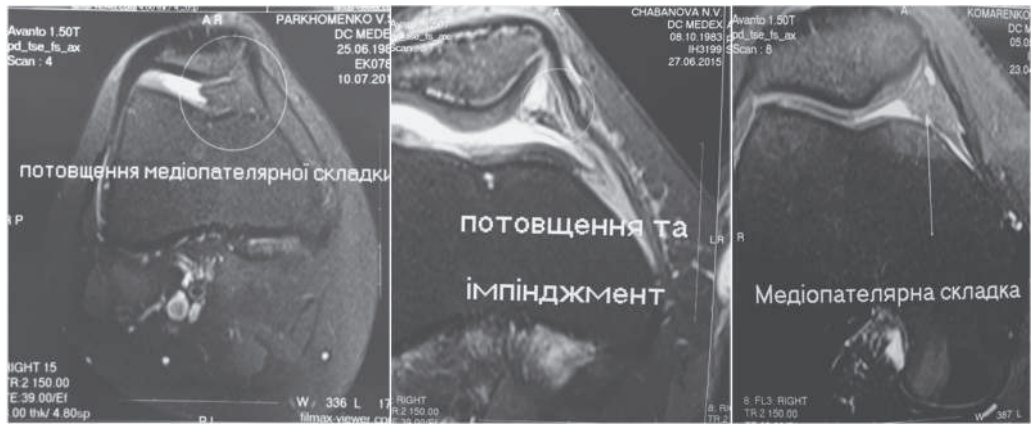
Artrosonography allows studying pathological MPPs in dynamics, with the identification of areas of affection verified as hyperechoic structures in the medial part of knee joint. It is extremely difficult to conduct an objective study of unchanged synovial bursa, both of adults and children, especially because there is no contrast signal multiplication from unchanged synovial membrane. Artrosonography also makes it possible to diagnose associated synovitis at MPP hypertrophy, specifies the degree of its intensity, allows reveling subclinical synovitis that is diagnosed more frequently than clinical one (according tp Bukina I.E. et al. - 11.0% vs. 22.0%) [1].



Pic. 2 Sonography of mediopatellar plica

X-ray multispiral computed tomography (CT) with intraarticular contrast agent is provided with major diagnostic opportunities in the study of inner structures of the knee joint due to its high distribution ability. It allows reliable estimation of the existence, location, type and size of the inner structures of the knee joint, including the menisci, cartilages and crucial

ligaments; identifying and characterizing mediopatellar plicae [16]. It is also possible to reveal the existence of fluid and blood in capsules and synovial bursa. It thickens and is better visualized at hemarthrosis or reactive effusion. Foreign authors suggested syringing 15 ml of water-soluble contrast agent into the articular cavity while making CT arthrography. Adam G. and Gunter R.W. report high precision of CT arthrography of knee joint in the diagnosis of hyaline cartilage injuries, which in some cases more accurate than MRI [9]. Helzel M.V. et al. also note high information value of CT of the knee joint with intra-articular syringe of air in reveling articular cartilage defects exceeding information value of joints sonography [15].



Pic.3 MRI of mediopatellar plica

MRI records physiological separation in case of mediopatellar plica. Thus, the synovial membrane looks like a dark line on T1 and T2 weighted images. Basically, plicae are displayed in axial sections, since they are located in a horizontal plane. T1 and T2 weighted images are characterized by a reduced signal that can also be seen in the series of MR tomograms. In case of concomitant synovitis MR tomograms record an accumulation of fluid in synovial membrane pouch, mainly in suprapatellar articular capsule, articular cavity of the knee joint and the posterior parts of synovial membrane of a joint which is visualized as an area of high signal intensity on T2 weighted images and low signal intensity on T1 weighted images. In addition, an edema and hypertrophy of the synovial membrane are identified. These appear on the T2 weighted images with high signal intensity areas, mainly around ligaments in the articular cavity [11]. (Pic. 3)

Discussion. In many countries MRI compared to sonography and CT is more costly and technically difficult. However, in Ukraine the cost of MRI is almost the same as CT. MRI method provides the best and simultaneous visualization of soft tissues, allows determining all elements of the knee joint that is impossible with other methods of radiologic and non-radiologi c diagnostics provided minimal contraindications for the patient [11]. As Langer J.E. et al. note, MRI has become a leading method in the study of knee joint eliminating the need for a large number of other methods of diagnosis, allowing one to visualize all internal structures of a joint and trace the evolution in the process of treatment [18].

According to Magee T., MRI sensitivity may be increased by 20.0% using clear diagnostic criteria [19]. Gumerov R.A. et al. recommend contrast signal increasing by gadolinium preparations while conducting MRI investigation to eliminate inflammatory process at MPP

syndrome. In this case, postcontrast T1 weighted images clearly reveal increased signal intensity from inflamed synovial membrane of a joint. Higher concentrations of gadolinium in the synovial membrane at MPP syndrome enable distinguishing synovitis from articular and subchondral effusion [3]. The signal from the inflamed synovia is sometimes stronger than the signal from normal synovial membrane, but it is always weaker than the signal from liquid. Therefore, proliferative changes of synovia are visualized as being lighter than normal capsule, while being different from effusion and recognized against its background. The same study showed that wavy, thinning and blurred contours of a ligament, its lengthening, changing of the direction of its location are circumstantial evidence of the disease [3].

Raiser M. et al. note that on sagittal T2 weighted images unchanged articular capsule is visualized in the area of suprapatellar pouch as a narrow dark line. The fluid in articular cavity of a knee joint looks like a light layer of different width in the projection of the anterior upper pouch. Even if there is a slight effusion anterior and posterior leaves of the capsule are displayed separately, so it looks like a dark double line [14].

Despite recent studies on optimization of MR images to visualize intraarticular structures of a knee joint, the methods for contrasting intraarticular synovial contents have still being developed to date [7].

According to the meta-analysis of Morozov S.P. et al., providing the most accurate comparison of the results of clinical studies, MRI and arthroscopy require unification and entering a single code of existing classifications and syndromes. For example, to encode the intensity of clinical symptoms in points from 0 to 3 (absent, weakly positive, positive, strongly positive) (Pic. 1). Later, based on the examination record of a knee joint a traumatologist must carefully select the information on a patient's anterior pain (injury to the articular cartilage of a patella or a thigh, mediopatellar plica syndrome, injury to the anterior horn of the lateral or medial menisci), medial pain (injury to the medial meniscus, articular cartilage of medial condyles), lateral pain (injury to the lateral meniscus, articular cartilage of the lateral condyles). At the second stage, the authors suggest analyzing the diagnostic efficiency of clinical examination and MRI compared to arthroscopy (with stratification according to the intraarticular structures comparing diagnostic devices). This meta-analysis included also determination of sensitivity, specificity, predictive value of positive and negative results, likelihood ratio. Diagnostic efficiency of MRI in different centers in the carried out meta-analysis was compared by studying the characteristic curves (ROC-analysis) and calculating the area under the curve for each analyzed intraarticular structure (medial and lateral menisci, anterior crucial ligament and articular cartilage) [4].

The obtained data allowed not only determining the diagnostic value of MRI but conditionally predicting the likelihood of surgical intervention considering combined injuries and syndromes. At the same time, the analysis of the diagnostic value of MRI in some diagnostic centers found variability of the difference concerning the method efficiency of up to 47.0% [4].

Currently, the best method of revealing pathology of mediopatellar plica hypertrophy is arthroscopy that allows verifying the given syndrome with 100.0% confidence [10].

During arthroscopy normal MPP has a pink colour with whitish or yellowish tint. The length and width are different averaging 1.5 – 3.0 and 0.5 – 0.8 cm respectively. The plica's consistency if soft, it is relaxed and pliable. Sometimes the plica may consist of two thinner

plicae arranged one above the other or have one or two holes. Arthroscopic study data of local blood circulation of mediopatellar plica may indicate its early pathological changes. The vasculature has normally radial capillaries forming a thin winding structure [20].

Sensitivity of the diagnostic arthroscopy is 100.0%. Sakakibara classified MPP by arthroscopic characteristics into 4 main types: type A – taenia-like rise of synovial membrane; type B – a prominence that does not cover the anterior surface of the medial femoral condyle; type C – a big prominence that covers the anterior surface of the medial femoral condyle; type D – a plica with a central hole (fenestrated plica) [12]. This classification is considered almost universal, as it is quite simple and has clinical value. Types A and B do not lead to the onset of symptoms. Types C and D may create a valve between a medial condyle and a patella which thickens and consolidates causing the median knee joint injury. It can simulate injury to the articular cartilage of a patella medial surface of a medial femur when extending [20].

According to the reserch findings of Ignatev Yu.T., hypertrophy of mediopatellar plica during arthroscopy is diagnosed in 19.4% of patients with meniscal injuries. In case of the effusion in the articular cavity of a knee joint a plica ballots, if the effusion is small then a plica gets in contact with patellar surface of the femur or the articular surface of the patella when bending a lower extremity up to 30 degrees. In 8.3% of patients only hypertrophy of medial synovial plica is diagnosed. It can be fenestrated (5.6%) or become fibrous (2.7%) [5].

In the same paper, when comparing the data of arthroscopic study of knee joints with MRI data, some regularities were found. In particular, hypertrophy of the medial synovial plica is a functionally organic factor of a locked knee and is diagnosed while comparing its thickness with the opposite joint. An interesting fact is that hypertrophy of the medial synovial plica is often associated with injury to the meniscus and is MRI and arthroscopic finding for this pathology. The sensitivity of ultrasonography compared with arthroscopy is 47.8%, the sensitivity of MRI is 91.3% [5].

According to Gumerov R.A. et al., comparing the data obtained during arthroscopy with the results of primary MRI of a knee joint in operated patients showed that the accuracy of MRI in diagnosing MPP of a knee joint is 94.1%, sensitivity – 89.1 %, specificity – 95.1%, arthroscopy and MRI data coincidence is observed in 91.1% of cases [3].

Although the diagnostic value of each method is indisputable, in clinical practice comprehensive examination of patients is made being the basis for a single diagnosis and instituting therapy. In recent years, due to improved diagnostic opportunities, an issue of efficient use of modern technologies has become especially burning. The problem of diagnostic information value of each method compared with others, as well as the benefits in each of the cases, considering the cost of a comprehensive survey, still remains relevant.

Unfortunately, the opportunities of sonography and magnetic resonance imaging are discredited in many cases by improperly made diagnostic tests and incorrect interpretation of the obtained results. In this context, the isue of assessing the quality of diagnosis which should be based on the principles of “evidence-based medicine” is of great importance. In our reserch scientifically based analysis of the efficiency of various diagnostic tests at mediopatellar plica syndrome is planned.

Conclusions. Based on the analysis of domestic and foreign studies regarding assess

ment of the effectiveness of different imaging techniques at mediopatellar plica syndrome basic essential clinical points are identified:

1. X-ray examination for suspected mediopatellar plica hypertrophy is conducted mandatory to eliminate traumatic bone pathology, however, according to the literature, the method provides almost no information for a reliable diagnosis of the syndrome itself.

2. Sonography of a knee joint, according to the other researchers, allows revealing hyperechoic structure in a medial part of a knee joint and a number of indirect signs of mediopatellar plica hypertrophy – fluid in an articular cavity, signs of chronic inflammatory process with synovia hypertrophy, chondral and osteochondral injury of articular surfaces.

3. Multispiral computed tomography, according to clinical recommendations, makes it possible to conduct accurate assessment of the existence, location, type and size of the internal structures of a knee joint, however the method is inferior to magnetic resonance imaging by sensitivity of imaging of soft tissues and requires intraarticular contrasting.

4. Magnetic resonance imaging, according to a number of works, allows verifying with high accuracy direct and indirect signs of the mediopatellar plica syndrome, but the analysis of diagnostic value of the method by some diagnostic centers found the variability of diagnostic difference in diagnostic centers of up to 47.0%.

5. The sensitivity of the diagnostic arthroscopy is 100.0%, however, this technique is quite invasive, so quality assessment of mediopatellar plica syndrome diagnosis based on the principles of "evidence-based medicine" has still been of relevance.

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УДК 616.718.45-001.5-089.84:612.76

ОСОБЛИВОСТІ РЕАБІЛІТАЦІЇ ХВОРИХ З ЧЕРЕЗВЕРТЛЮГОВИМИ ПЕРЕЛОМАМИ СТЕГНОВОЇ КІСТКИ ПІСЛЯ ПРОВЕДЕНОГО ТОТАЛЬНОГО ЕНДОПРОТЕЗУВАННЯ КУЛЬШОВОГО СУГЛОБА

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PECULIARITIES OF REHABILITATION OF PATIENTS WITH PERTROCHANTERIC FRACTURES OF FEMORAL BONE AFTER TOTAL HIP REPLACEMENT

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Вступ. Переломи проксимального відділу стегнової кістки (ППВСК) – є великою медико-соціальною проблемою та завдають значних матеріальних збитків у всіх країнах світу. За даними В.П. Охотського з співавт. ця патологія складає 17 % в структурі травм опорно-рухової системи, з них 35 - 40 % припадає на вертлюгову і 5 - 10% – на підвертлюгову ділянку [1]. В США щорічна кількість позасуглобових ППВСК у людей похилого становить в середньому 97 випадків на 100000 населення (63 - жінки, 34 - чоловіки) [2]. Біля 104000 пацієнтів з ППВСК госпіталізують в Німеччині за рік.

За аналізом статистиків та демографів цей показник в найближчі 10-15

Introduction. Proximal femoral fractures (PFF) are a big medico-social problem and cause reasonable material loss worldwide. According to V.P. Okhotskyi, this pathology makes 17% in the structure of locomotion system injuries, among them 35-40% relate to trochanteric and 5-10% to pertrochanteric area [1]. In the USA, annual quantity of abarticular PFF in senior people makes in average 97 cases per 100000 of population (63- women, 34 - men). [2]. Approximately 104 000 patients with PFF are annually hospitalized in Germany.

Analysis of statistics and demography, this index tends to triple in the nearest 10-15 years [3]. In the literature the matter