Volume 9, No. 3, May 2019 * Bimonthly

ISSN: 2251-9939

Journal of Life Science and Biomedicine

Available online at www.jlsb.science-line.com

Published by Scienceline Publications

Journal of Life Science and Biomedicine

(2251-9939)

***J. Life Sci. Biomed.* 9 (3): 64-81, May 10, 2019**

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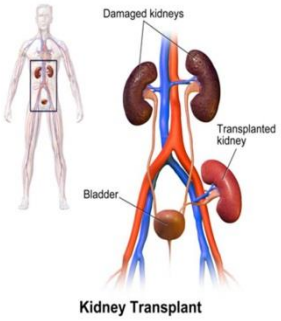
Volume 9 (3); May 10, 2019

Research Paper

Etiological circumstances and pathogenic aspects of pulmonary infectious complications in recipients of kidney transplant.

Ibadov R A, Ibragimov S Kh, Shaniyeva Z A, Matkarimov Z T, Ibadov R R.
J. Life Sci. Biomed., 9(3): 64-67, 2019;
pii:S225199391900010-9



Kidney Transplant

Ibadov R A, Ibragimov S Kh, Shaniyeva Z A, Matkarimov Z T, Ibadov R R. 2019. **Etiological circumstances and pathogenic aspects of pulmonary infectious complications in recipients of kidney transplant.** *J. Life Sci. Biomed.* 9(3): 64-67; www.jlsb.science-line.com

Abstract
Aim. This study aimed to determine the spectrum of pathogens and its resistance in the dynamics in patients with infectious complications after kidney transplantation. **Methods.** The results of the study of biomaterials from patients with infectious complications on the background of acute and chronic kidney transplant rejection have been studied. **Results.** During the analyzed period, there was a tendency to change the spectrum of pathogens, the growth of the value of gram-negative bacteria. The sensitivity analysis of the isolated microorganisms over the study period (2010-2017) showed an increase in the resistance of the dominant pathogens. Also, there was a significant increase in the frequency of occurrence of Candida fungi. **Conclusion.** In most kidney transplant recipients with nosocomial infections is unavoidable. Therefore, a timely and adequate antibiotic therapy is required to constant control of modern pathogens with increased resistance. **Recommendations.** The increase in antibiotic resistance of the leading pathogens makes it necessary to study the antibioticogram of all strains isolated from patients for an adequate choice of effective antibiotic therapy. The obtained data should be used to optimize empirical antibiotic therapy in patients with purulent-septic complications after kidney transplantation.

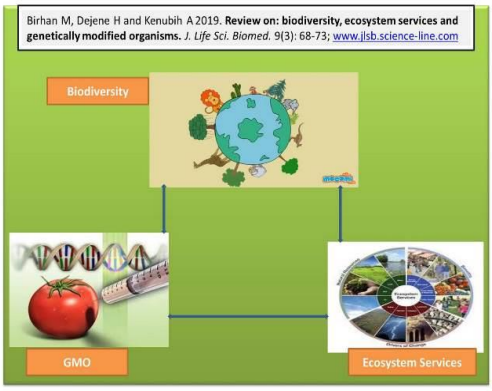
Keywords: Kidney transplantation, Immunosuppression, Chronic graft rejection, Infection, Lung damage, Intensive care

[Full text-PDF] [XML]

Review

Review on: biodiversity, ecosystem services and genetically modified organisms.

Birhan M, Dejene H and Kenubih A.
J. Life Sci. Biomed., 9(3): 68-73, 2019;
pii:S225199391900011-9



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Keywords: Biodiversity, Ecosystem services, Genetically modified organisms

[Full text-PDF] [XML]

Review

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

Irismetov M E, Tadjinazarov M B, Kholikov A M, Shamshimetov D F, Usmonov F M and Rajabov Q N.
J. Life Sci. Biomed., 9(3): 74-81, 2019;
pii:S225199391900012-9

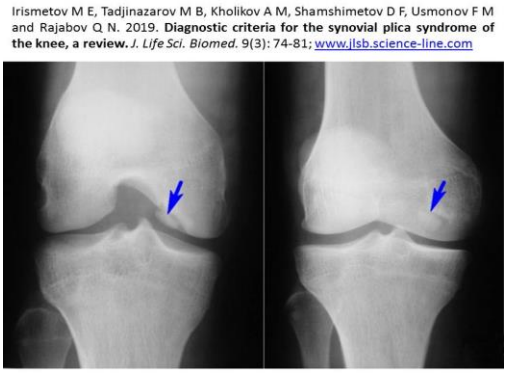

Figure 4. X-ray examination of the medial plicae syndrome of the knee

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.

Keywords: Knee joint, Pain syndrome of the knee, Synovial plicae syndrome, Diagnostic

[Full text-PDF] [XML]

Journal of Life Science and Biomedicine

ISSN: 2251-9939

Frequency: Bimonthly

Current Issue: 2019, Vol: 9, Issue 3 (May)

Publisher: SCIENCELINE

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2019 SCIENCELINE
Journal of Life Science and Biomedicine
J Life Sci Biomed, 9 (3): 64-67, 2019

ISSN 2251-9939

Etiological circumstances and pathogenic aspects of pulmonary infectious complications in recipients of kidney transplant

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ABSTRACT

Aim. This study aimed to determine the spectrum of pathogens and its resistance in the dynamics in patients with infectious complications after kidney transplantation.
Methods. The results of the study of biomaterials from patients with infectious complications on the background of acute and chronic kidney transplant rejection have been studied. Results. During the analyzed period, there was a tendency to change the spectrum of pathogens, the growth of the value of gram-negative bacteria. The sensitivity analysis of the isolated microorganisms over the study period (2010-2017) showed an increase in the resistance of the dominant pathogens. Also, there was a significant increase in the frequency of occurrence of Candida fungi. Conclusion. In most kidney transplant recipients with nosocomial infections is unavoidable. Therefore, a timely and adequate antibiotic therapy is required to constant control of modern pathogens with increased resistance. Recommendations. The increase in antibiotic resistance of the leading pathogens makes it necessary to study the antibioticogram of all strains isolated from patients for an adequate choice of effective antibiotic therapy. The obtained data should be used to optimize empirical antibiotic therapy in patients with purulent-septic complications after kidney transplantation.

Original Article

PII: S225199391900010-9

Rec.	24 March	2019
Rev.	20 April	2019
Pub.	10 May	2019

Keywords
Kidney Transplantation,
Immunosuppression,
Chronic Graft Rejection,
Infection,
Lung Damage,
Intensive Care

INTRODUCTION

Rehabilitation of patients with a renal transplant is a complex clinical task and is often associated with a number of problems, one of which is the problem of infectious complications. Immunosuppressive therapy, suppressing transplant immunity, reduces the patient's resistance to infections. Therefore, the success of kidney transplantation largely depends on the ability to achieve a balance between obtaining effective immunosuppression in order to prevent the transplant-rejection and maintaining immune protection at a level sufficient to protect the recipient from developing infectious complications [1-3]. Improvement of methods of preventing, diagnosing and treating infections, optimization immunosuppressive therapy over the past 10 years has made decreasing the rate of infectious complications after organ transplantation. But this group of complications continues to occupy one of the main places among the causes of death of patients after kidney transplantation. The incidence of infectious complications leading to fatal outcomes during the first year after transplantation, according to various sources, is from 2.6 to 51.7%, and in recipients over 60 years of age – 18% to 42.8% [2].

Infection remains one of the main causes of death for patients receiving various types of renal replacement therapy – hemodialysis, peritoneal dialysis, and after kidney transplantation [3-5]. In this case, the most common causative agent of infection are bacteria, which often have multiple antibacterial resistance. Irreversible damage to the lungs, as a result of an excessive immunopathological reaction to cytomegalovirus

(CMV) antigens, the expression of specific cytotoxic lymphocytes on infected lung cells leads to damage to the alveoli.

Taking into account the constantly changing sensitivity of pathogens of bacterial infections to antibiotics, the growing resistance of pathogens requires a constant analysis of the composition and sensitivity of microflora. In this regard, the study of the etiological structure and antibiotic resistance of major pathogens is necessary for timely adequate antibiotic prophylaxis and empirical antibiotic therapy [6-8].

The aim of study was to identify the spectrum of pathogens and its resistance over time in patients with infectious complications after kidney transplantation.

MATERIAL AND METHODS

The foundation of the study was the results of the examination and treatment of 105 patients after heterotopic related TP for the period 2010-2017. Of these, 101 patients were operated on in our center. Pulmonary complications with the development of bilateral interstitial pneumonia were observed in 7 patients in the immediate postoperative period, in 4 patients in the late, during the observation period from 1 month to 4 years.

Four more patients operated in clinics in India and Pakistan were hospitalized to our center with a clinic for acute lung injury syndrome in one case against acute and in three chronic kidney transplant rejection, pyelonephritis and bacterial pneumonia with further development of sepsis were also diagnosed.

The materials for analysis were: urine (236 samples), blood (195 samples), discharge from drainages (220 samples), sputum (217 samples), material of broncho-alveolar lavage (56 samples), and tracheal wash (220 samples). Traditional methods for isolating and identifying microorganisms and determining their sensitivity to antimicrobial agents by the disk diffusion method were used. The species specificity of the isolated microorganisms was determined using standard methods using identification media (production "HiMedia", India). Investigated the effectiveness of cephalosporins, aminoglycosides, fluoroquinolones, tetracyclines, carbapenems, glycopeptides, inhibitor-protected antibiotics.

In event of bronchopulmonary infection in the complex of conventional therapy, the new antimicrobial biotechnological medication FarGALS was used, which is characterized by a pronounced antiseptic and local anti-inflammatory effect. The antimicrobial activity of the FarGALS with respect to the isolated strains was determined by diffusion into agar. Accounting for the results was to measure the diameters of the zones of inhibition of the growth of test cultures around the wells. With zones up to 10 mm, cultures were considered stable, with zones of 11-14 mm being moderately resistant, with zones of 15 mm and above being sensitive.

FarGALS has a broad spectrum of antimicrobial activity (active against gram-positive and gram-negative, aerobic and anaerobic, nesporoobrazuyushchy and spore-forming bacteria, etc., fungi of the genus Candida). In addition, the presence of antibodies against CMV in the serum was determined and the presence of CMV DNA was detected by a quantitative polymerase chain reaction method. Polymerase chain reaction (PCR), quantitative determination showed 3,5x106ME / ml in the blood. As well as dynamic control of C-reactive protein.

Ethical approval

The review board and ethics committee of RSSPMCS named after acad. V.Vakhidov approved the study protocol and informed consents were taken from all the participants.

RESULTS AND DISCUSSION

The number of microbiological positive samples is reduced from 85% to 47%. A total of 236 cultures were isolated, of which gram-positive - 20%, gram-negative - 46%, fungi of the Candida river - 34%. From gram-positive: Staphylococcus aureus and Enterococcus spp. met in 4.0-2.0% of cases, from gram-negative - Pseudomonas aerugenosa 20–13.6%, Klebsiella pneumonia 43.2–8.7%, E. coli 11–23.0%, Acinetobacter spp. - 8-39%. Strains Acinetobacter spp. excreted mainly from the trachea (patients on prolonged mechanical ventilation) - 77%. Among the samples of tracheobronchial aspirate in 25% of cases - were allocated, associated, most of the microbial associations included fungi. The results of the study of samples of biological media are represented in table 1. Most of all we studied the drain bag biological media (7.3-19%).

Table 1. The results of the study of samples of biological media (%)

Type of biomaterial	2010 г.	2011 г.	2012 г.	2013 г.	2014 г.	2015 г.	2016 г.	2017 г.
	0.6	2.6	-	-	-	-	-	-
Surgical wound	11	14	5.4	1.7	-	-	0.6	-
Blood	0.3	0.9	2	-	-	-	0.3	-
From the pleura	5.3	4.8	6.7	2.6	2.3	1.4	3.8	2.6
From drain bag	7.3	9.6	11	19	17	10	14	19
From the trachea	3.1	3.8	2.6	1.4	0.6	1.6	0.6	1
From the bronchi (Sputum)	3	1.4	2	-	-	-	-	0.6

Table 2. Acinetobacter spp. resistance in ICU (%)

Antibiotics	2010 г.	2011г.	2012 г.	2013 г.	2014 г.	2015 г.	2016 г.	2017 г.
Ampicillin / Sulbactam	100	100	100	100	100	100	100	100
Amoxicillin / Clavulanate	100	100	100	100	100	100	100	100
Piperacillin / Tazobactam	-	-	82	66.6	76	87	100	100
Imipenem	11.7	21	11.7	13	21	43	85	100
Meropenem	41	41	60	66.6	76	87	100	100
Ertapenem	-	-	-	-	100	100	100	100
Cefazolin	100	100	100	100	100	100	100	100
Cefuroxime	100	100	100	100	100	100	100	100
Cefotaxime	100	100	100	100	100	100	100	100
Ceftazidime	100	100	100	100	100	100	100	100
Ceftriaxone	100	100	100	100	100	100	100	100
Cefoperazone	100	100	100	100	100	100	100	100
Cefoperazone / Sulbactam	66.6	84	82	66.6	73	85	100	100
Cefepime	100	100	100	100	100	100	100	100
Gentamicin	86	78	86	88	90	100	100	100
Amikacin	78	90	90	90	90	100	100	100
Tetracycline	46	17.6	17.6	26	68	66	57	20
Doxycycline	41	16	11.7	16	52	50	19	15
Ofloxacin	78	90	76	90	100	100	100	100
Ciprofloxacin	100	100	100	100	100	100	100	100
Levofloxacin	-	78	100	-	100	100	100	100
Gatifloxacin	-	-	-	-	100	100	100	100
Polymyxin	0	0	0	0	0	0	4	5

According to the data obtained, one of the most prevalent thing were respiratory diseases in the structure of severe infections. The sensitivity analysis of the isolated microorganisms over the study period (2010-2017) shows that there is a tendency to increase the resistance of the dominant pathogens. Gram-positive cocci in patients with a renal transplant currently retain sensitivity to vancomycin, rifampicin, IV generation cephalosporins, amikacin. Recently (2014-2017) among the most "topical" pathogens are Ps.aeruginosa, Klebsiella pneumonia, E.coli, Acinetobacter spp. There is a high increase in resistance (for example, Acinetobacter spp., Table 2), so the range of medications active in their regard was extremely limited: the latest generation cephalosporins (75-100% R), fluoroquinolones (75-100% R), imipenem (80, 0-70.0% R), polymyxin B (7.0-19.0% R), amikacin (69.0-55.0% R).

Analysis of the antimicrobial activity of the medication "FarGALS" in relation to the isolated strains showed high sensitivity - 22 mm. In detection of IgG antibodies, IgM against CMV, antiviral therapy with Ganciclovir and Valganciclovir was performed, after which the control determination of IgM against CMV, as well as the determination of CMV DNA by PCR showed a negative result, which gives us the opportunity to proceed to reduce the infection activity to latent forms.

The dynamics of the observation of the C-reactive protein level showed a generalization of the infection with C-reactive protein rates above 70 mg/l; in connection with which de-escalation antibacterial therapy was

carried out. The inclusion of the medication "FarGALS" in the complex for the prevention and treatment of purulent-inflammatory lung diseases in the form of nebulizer therapy and fibrobronchoscopic bronchial lavage can reduce the incidence of early and late specific bronchopulmonary complications and achieve a clinical improvement in patients already by 2-3 days and reduce their recovery time.

In the early postoperative period, one case death was observed in a 47-year-old man. The cause of death was the crisis of rejection, bilateral lower lobe pneumonia, severe acute respiratory distress syndrome, acute cardiovascular failure. These data demonstrate the leading position of respiratory diseases in the structure of severe infections. In the structure of nosocomial infection in ICU - Acinetobacter spp. is a leading pathogen that can cause infections of any location and is highly resistant to all groups of antibacterial medications. For example, over the past 10 years, the rate of seeding of this pathogen was 5.4-39%, i.e. increasing it by 7 times.

CONCLUSION

For most kidney transplant recipients, infection with nosocomial infections is unavoidable. Increasing resistance of modern pathogens requires its constant control for timely and adequate antibiotic therapy. Detection the risk factors for the development of bacterial and fungal infectious complications after kidney transplantation allowed the targeted implementation of preventive measures both before and after kidney transplantation, which led to a decrease in the frequency of these complications. The increase in antibiotic resistance of the leading pathogens makes it necessary to study the antibioticogram of all strains isolated from patients for an adequate choice of effective antibiotic therapy. The obtained data should be used to optimize empirical antibiotic therapy in patients with purulent-septic complications after kidney transplantation.

DECLARATIONS

Acknowledgements

This work was supported by Republican specialized scientific–practical medical center of surgery named after academician V.Vakhidov, Tashkent, Uzbekistan

Authors' Contributions

All authors contributed equally to this work.

Competing interests

The authors declare that they have no competing interests.

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2019 SCIENCELINE
Journal of Life Science and Biomedicine
J Life Sci Biomed, 9 (3): 68-73, 2019

ISSN 2251-9939

Review on biodiversity, ecosystem services and genetically modified organisms

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ABSTRACT

Introduction. Understanding the relationship between ecosystem and diversity requires knowledge of how species interact with each other and how each is affected by the environment. It is useful to distinguish between the instantaneous effects of species richness on ecosystems and those which become deceptive on a longer time scale, described here as filter and founder effects. Biological diversity appears to enhance the resilience of desirable ecosystem states, which is required to secure the production of essential ecosystem services. Aim. The diversity of responses to environmental change among species contributing to the same ecosystem function, which we call response diversity, is critical to resilience. Response diversity is particularly important for ecosystem renewal and reorganization following change. Here we criticism the various roles that biodiversity, ecosystem services and genetically modified organisms play in terrestrial ecosystems with special emphasis on their contribution to productivity and diversity. Therefore, the aim of this review is summarizing of different articles and writing of the effects of one to the others, and the relation between biodiversity, ecosystem services and genetically modified organisms.

Review Article

PII: S225199391900011-9

Rec. 25 December 2018
Rev. 22 April 2019
Pub. 10 May 2019

Keywords
Biodiversity, Ecosystem services, Genetically modified organisms

INTRODUCTION

The growing demand for food poses major challenges to humankind [1]. Genetically modified (GM) crops are subject to regulatory approval before entering the market [2]. Genetically modified (GM) crops have been commercially grown for 10 years [3]. The Millennium Ecosystem Assessment (MA) documented the dominant impacts of agriculture on terrestrial land and freshwater use, and the critical importance of agricultural landscapes in providing products for human sustenance, supporting wild species biodiversity and maintaining ecosystem services [4].

Epidemiological studies recommend that living close to the natural environment is associated with long-term health benefits including reduced death rates, reduced cardiovascular disease, and reduced psychiatric problems. The significance of biological diversity in maintaining such systems cannot be overemphasized [5]. Diversity of crops above ground as well as diversity of soil life below ground provided protection against the vagaries of weather, market swings, as well as outbreaks of diseases or insect pests [6].

In recent decades, the concept of ecosystem services (ES) has gained widespread attention as one fruitful approach for integrating into decision-making ecosystem-related values often heretofore dismissed as externalities [7]. Ecosystem services are functions provided by nature that improve and sustain human wellbeing [8]. In agro-ecosystems, biodiversity performs a variety of ecological services beyond the production of food, including recycling of nutrients, regulation of microclimate and local hydrological processes, suppression of undesirable organisms and detoxification of noxious chemicals [9]. Many ecosystem services are delivered by organisms that depend on habitats that are segregated spatially or temporally from the location where services are provided [8].

The majority of farmers in the developing world tend small plots in marginal environments, using indigenous agricultural methods. These diversified agro-ecosystems have emerged over centuries of biological evolution, and represent the experiences of farmers interacting with their environment without access to external inputs, capital, or scientific knowledge [10].

Large-scale exploitation of wild animals and plants through fishing, hunting and logging often depends on augmentation through releases of translocated raised individuals. Such releases are performed worldwide in vast numbers [11]. For example, in the rice endosperm, the edible part of the rice grain, the micronutrients iron, folate, pro-vitamin A, and vitamin E are present only at minimal levels while in the rice leaf they are present in quantities which would be adequate if rice leaves were apt for human consumption. Unfortunately, large parts of the world's population survive on less than two dollars a day and hence can neither diversify their diets nor buy supplements [12].

The prime aim and justification of conservation research is to benefit biological diversity, whether through identifying patterns and mechanisms, quantifying changes, recognizing problems, or testing solutions. Many of the successes in conservation can be attributed to the successful translation of conservation science to conservation practice [13].

Individual organisms within a community may represent different species or different genetic variants within species. The birth, death and movement of individuals determine the dynamics of populations and communities, and therefore both genetic diversity within populations and species diversity within the community. Species diversity and genetic diversity have traditionally received independent treatment by community ecologists and population geneticists, respectively, despite repeated recognition in the literature over the past 30 years of potential connections between these two most fundamental levels of biodiversity [14].

Despite a worldwide biodiversity crisis and negative impacts of biodiversity loss on humanity, conservation is not as prominent in political agendas as some believe it should be. This is largely because most conservation strategies fail to incorporate the flow of benefits from ecosystems to people (ecosystem services). Yet, for conservation to gain greater prominence in political agendas, these schemes must demonstrate how conservation efforts can also meet human needs [15]. Therefore, in this review, I attempted to summarize the current condition, available evidence, and present information about biodiversity, ecosystem services and genetically modified organisms and their impacts on the existing environments.

GENETICALLY MODIFIED ORGANISMS

GMOs can be defined as organisms in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating or natural recombination, i.e. by being genetically modified (GM) or by recombinant DNA technology. The addition of foreign genes has often been used in plants to produce novel proteins that confer pest and disease tolerance and, more recently, to improve the chemical profile of the processed product, e.g. vegetable oils. In the European Union (EU) and other regions, the use of this technology, the consequent release of GMOs in the environment and the marketing of GMO-derived food products are strictly regulated [16].

Types of GMO testing

GM products contain an additional trait encoded by an introduced gene(s), which generally produce an additional protein(s) that confers the trait of interest. Raw material (e.g. grains) and processed products (e.g. foods) derived from GM crops might thus be identified by testing for the presence of introduced DNA, or by detecting expressed novel proteins encoded by the genetic material. Both qualitative (i.e. those that give a yes/no answer) and quantitative methods are available. Laboratories carrying out these assays must be proficient in performing them [17].

Testing for (detection of) GMOs

Testing for (detection of) GMOs may serve several purposes. Qualitative testing may be used to discriminate between authorized and unauthorized material or use of material, to identify safe or potentially unsafe material, or for certification of purity of identity preserved material. Quantitative testing may be used to control for compliance with legal (e.g. for labeling) or contractually agreed thresholds (e.g. with respect to botanical impurity). Testing may also play a role in the safety assessment and risk management of GMOs by providing a means of tracing and if necessary retracting the GMO material, by providing data from characterization of the GMO itself [18].

The test report therefore must provide information not only about the test result but also about the uncertainties and limitations associated with the test result. This information must be presented in a form that is perceived and interpreted correctly by the stakeholder. The responsibilities of the analysts include: 1)

appropriate choice of testing method, including method validation status; 2) identification of potential sources of error in reporting and translation of results; and 3) communication with the stakeholders *a priori*, explaining what the analyst can provide, and *a posteriori*, explaining what the results mean including relevant limitations. Most testing is not performed by the same people who sample the material that is subject to testing, and sampling is not covered in the present paper. Because the sampling error may be much larger than the analytical measurement uncertainty or error, the interested reader is referred to for more information on sampling [19].

ECOSYSTEM SERVICES AND BIODIVERSITY

Human impacts on the environment are intensifying, raising vexing questions of how best to allocate the limited resources available for biodiversity conservation. Which creatures and places most deserve attention? Which should we ignore, potentially accepting their extinction? The answer to this dilemma depends on one's objectives. To motivate action, conservationists often mix diverse ethical and practical objectives, hoping they will reinforce each other. But attention given to one goal may instead diminish the prospects for achieving others [20].

Ecosystem Services

Relationships between ecosystem services and human well-being are poorly understood [21]. Most research related to ecosystem services focuses on direct drivers, such as land use change or invasive species. Yet, effective management requires more attention to indirect drivers such as demographic, economic, sociopolitical, and cultural factors. Lack of knowledge of trends in human reliance on ecosystem services also posed serious constraint in the MA analysis. Lack of appreciation of humans dependence on natural ecosystems represents but one of a complex of interacting factors responsible for today's array of anthropogenic disruptions of the biosphere. Yet, it clearly represents a major hindrance to the formulation and implementation of policy designed to safeguard earth's life-support systems [22].

Moreover, lack of understanding of the relations between ecosystem services and human well-being traces ultimately to a failure of the scientific community to generate, synthesize, and effectively convey the necessary information to the public. In fact, the benefits provided by natural ecosystems are both widely recognized and poorly understood. Consequently, it is vital to understand the relationships between ecosystem services and human well-being as well as their changes following economic development, including: (*i*) the correlations between human well-being yielded from ecosystem services and economic growth; (*ii*) the dynamics of the dependence of humans on different types of ecosystem services; and (*iii*) the effects of ecosystems and biodiversity on human well-being yielded from ecosystem services [23].

An assessment of the capacity of ecosystem services to benefit a given community requires identification and quantification of human-related benefits, costs, and the availability of alternatives to meet needs [15].

Ecosystem Diversity

Ecosystems are complex, adaptive systems characterized by historical dependency, non-linear dynamics, and multiple basins of attraction. We are part of ecosystems and alter their dynamics through activities that change the atmosphere and climate, land surface, and waters. In the future, we are likely to face different, more variable environments, and there will be greater uncertainty about how ecosystems will respond to the inevitable increases in levels of use. At the same time, our activities have already reduced the capacity of ecosystems to cope with disturbance and change. Here we highlight the often neglected but essential role of diversity within functional groups in the adaptive capacity of ecosystems [24].

Ecosystem resilience may be an essential factor underlying the sustained production of natural resources and ecosystem services in complex systems faced with uncertainty and surprise. Ecosystem resilience is defined as the amount of disturbance a system can absorb and still remain within the same state or domain of attraction [25]. Resilience also encompasses the ability of an ecosystem subject to disturbance and change to reorganize and renew itself. The definition includes the degree to which the system is capable of self-organization (versus a lack of organization, or organization forced by external factors), and how much it expresses a capacity for learning and adaptation [26].

Genetic diversity

Genetic diversity, defined here as any measure that quantifies the magnitude of genetic variability within a population, is a fundamental source of biodiversity. For more than 80 years, the study of genetic diversity has principally been the domain of evolutionary biologists [27].

The pioneering work of the modern evolutionary synthesis provided the theoretical and empirical foundation for the study of genetic diversity, including the derivation of new standard quantitative metrics of genetic diversity such as heritability and genetic variance. Since the modern synthesis, interest in genetic diversity has focused on its origin and maintenance, its role in the evolution of sexual reproduction and how the level and types of genetic variance affect the rate of evolutionary change within populations [28].

Species-individual diversity

Species diversity and genetic diversity can be defined, measured or manipulated in a number of different ways. Species diversity is most often measured as species richness, the number of species in a given locality. In studies that experimentally manipulate species diversity (review, it is also most often species richness that is varied among treatments. Several indices of species diversity incorporate information about the relative abundances of species in a locality, with higher diversity indicated by a more even distribution of abundance among species higher 'evenness' [14].

Functional diversity

Use of the term 'functional diversity' has grown exponentially over the last decade and in 2003-2005 it give the idea in the title, abstract or keywords of 238 articles. These include studies of marine, freshwater and terrestrial ecosystems, and span a wide range of taxa from bacteria to bats. Functional diversity generally involves understanding communities and ecosystems based on what organisms do, rather than on their evolutionary history. This is a very general definition for functional diversity and an enormous amount of ecological research is relevant. For example, if 'what organisms do' is interpreted as the organisms' phenotype (i.e. a phenotypic trait) then functional diversity equates with phenotypic diversity and the majority of ecological research has touched on this subject [29].

CONCLUSION AND RECOMMENDATIONS

In the area of biodiversity, ecosystem services, genetically modified organisms, sampling will mainly be an issue with respect to testing of raw materials and ingredients where most problems of inhomogeneity will exist. At the same time as there will be few problems of ecosystems diversity to the importing genetically modified organisms with processed foods i.e. retail foods, there will be enormous difficulties in developing validated methods of analysis robust enough to cover the full range of food types. To sustain biological and ecosystems richness in the country, it should be build and form regulatory body to be more practical to carry out sampling at the factory rather than at retail level. To date, there have been no attempts to study the problems of homogeneity of consignments of non-GMO and clearly this work will need to be undertaken to develop sampling plans. For this purpose the experience of ecosystems services and biodiversity diversity is equivalent areas to be valuable in developing country. Based on the above information the following recommendations should be forwarded:

- Current natural resource management seldom takes the ecosystem functions performed by organisms that move between systems into consideration.
- There is a need for generic protection goals that are independent of the agricultural technology used; what constitutes environmental harm should not be defined by the technology causing the harm.
- Sustainable development requires the reconciliation of demands for biodiversity conservation and increased agricultural production.
- The adoption of herbicide-resistant crops has reduced crop rotation and favored weed management that is solely based on the use of herbicides.

DECLARATIONS

Authors' contributions

MB, AK and HD conceived the review, coordinated the overall activity and drafted the manuscript.

Availability of data and materials

Data will be made available up on request of the primary author

Acknowledgment

First of all, the authors would like to express their sincere gratitude to the review participants for their willingness to take part in the synthesis. The authors' heartfelt thanks will also go to University of Gondar, Vice President of Research and Community Service, Collage of Veterinary Medicine and Animal Science for the financially supporting the systematic review.

Consent to publish

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Funding

This review is not funded by any organization.

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2019 SCIENCELINE
Journal of Life Science and Biomedicine
J Life Sci Biomed, 9 (3): 74-81, 2019

ISSN 2251-9939

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.

Review Article

PII: S225199391900012-9

Rec.	25	February	2019
Rev.	24	April	2019
Pub.	10	May	2019

Keywords

Knee joint, Pain syndrome of the knee, Synovial plicae syndrome, Diagnostic

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.

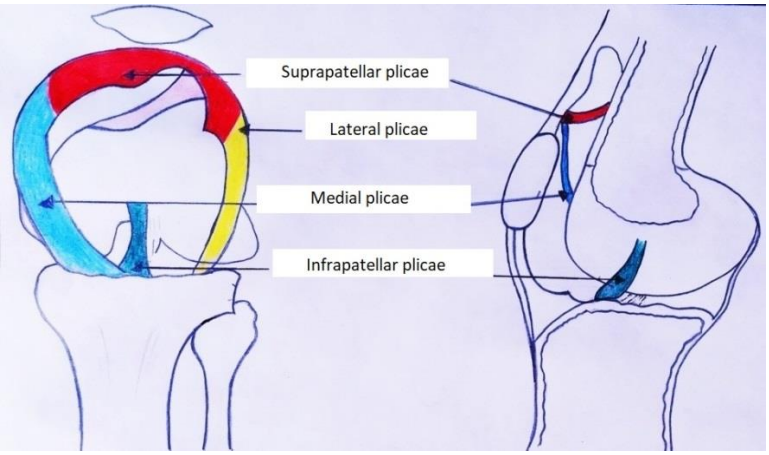

Figure 1. The topical anatomy of the pathological plicae of the knee

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.

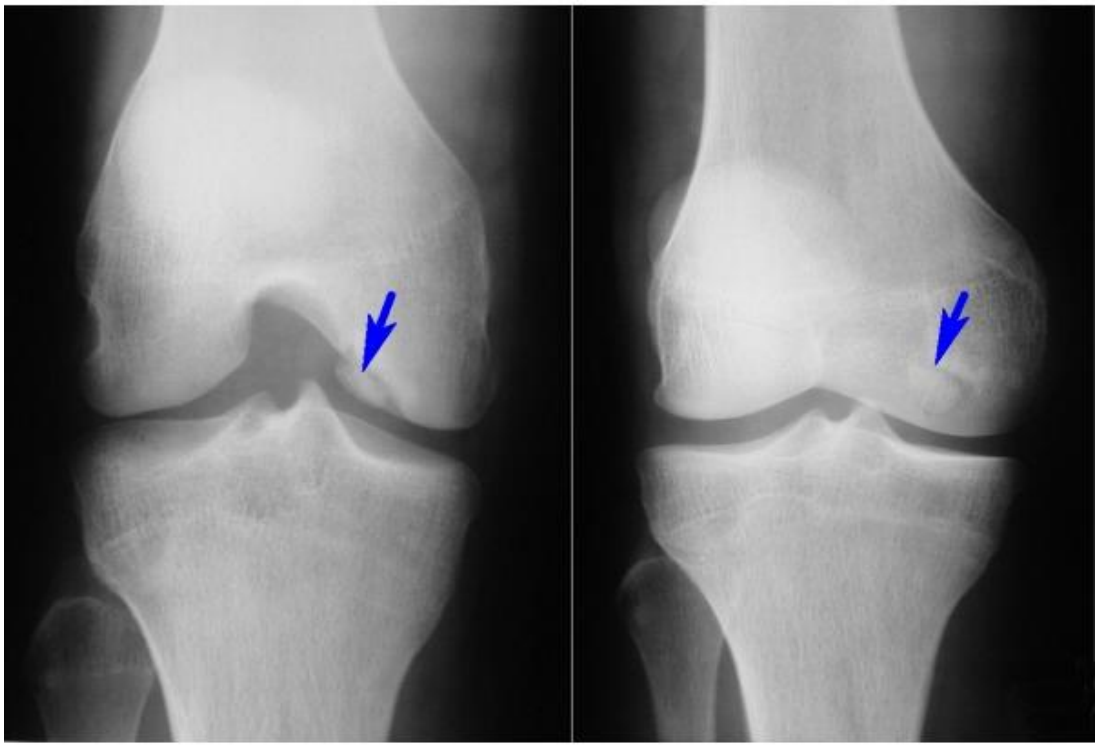

Figure 4. X-ray examination of the medial plicae syndrome of the knee

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.

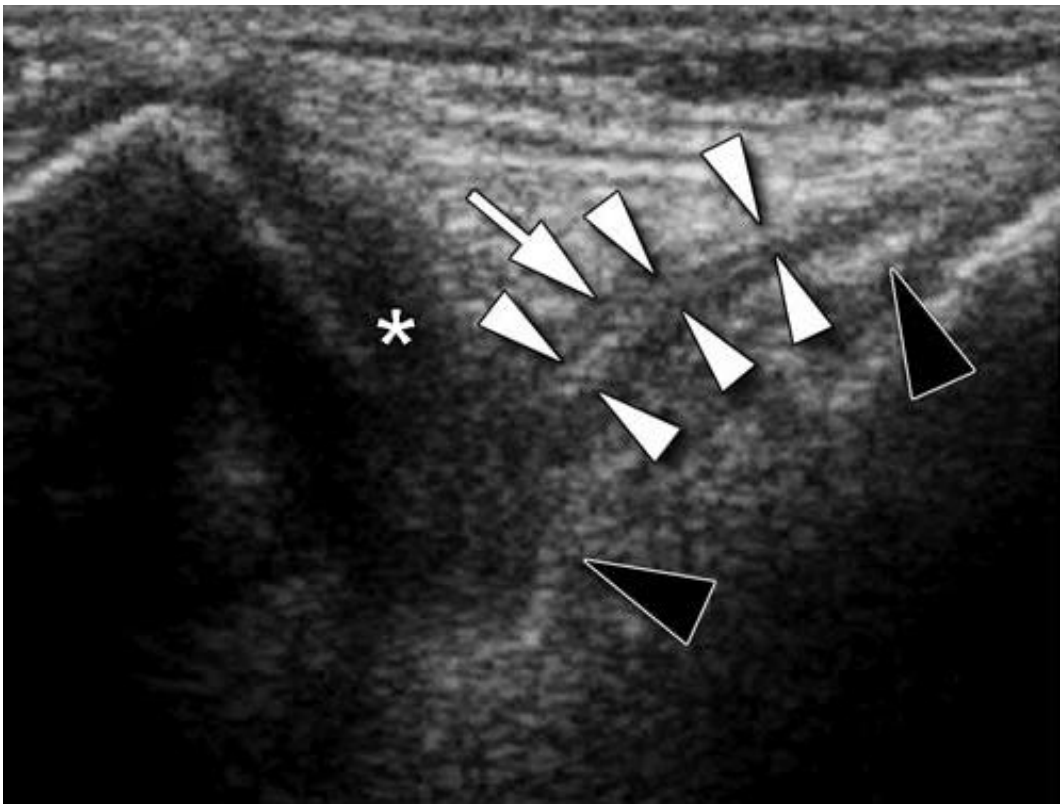

Figure 5. Ultrasound photo showing reveal the presence of a patellar plicae

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.

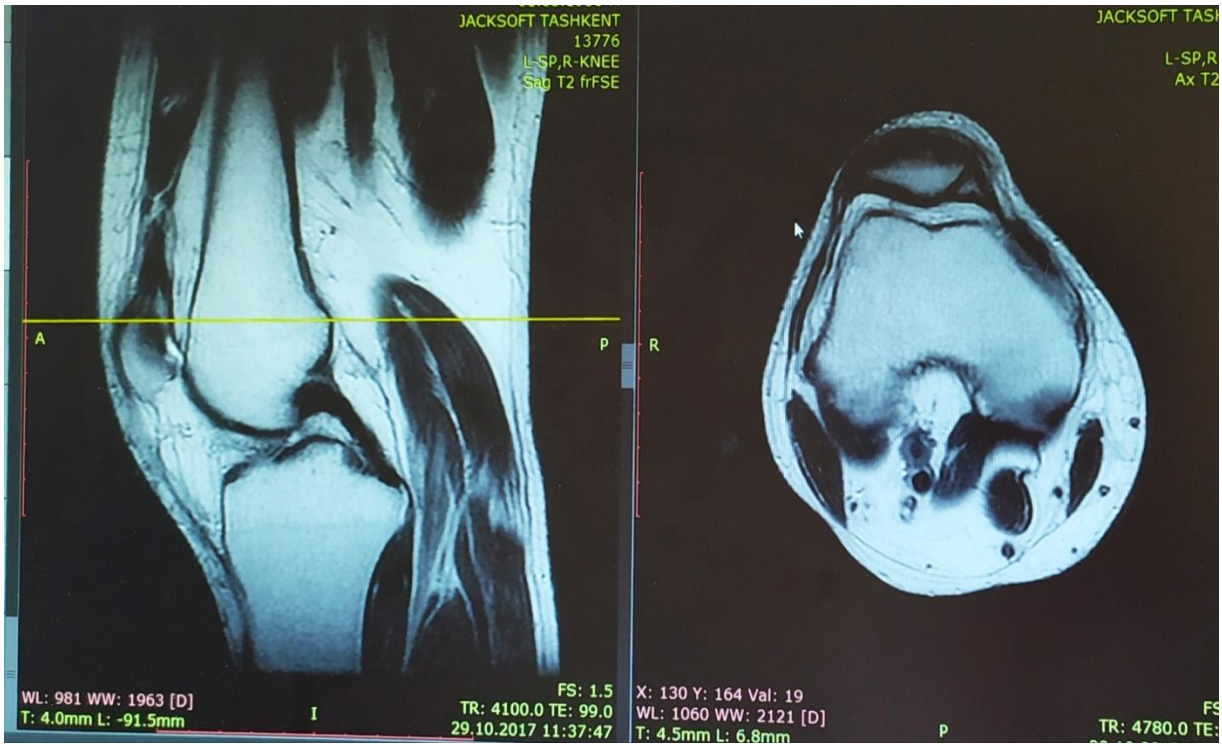

Figure 6. Synovial plica syndrome of the knee. MRI.

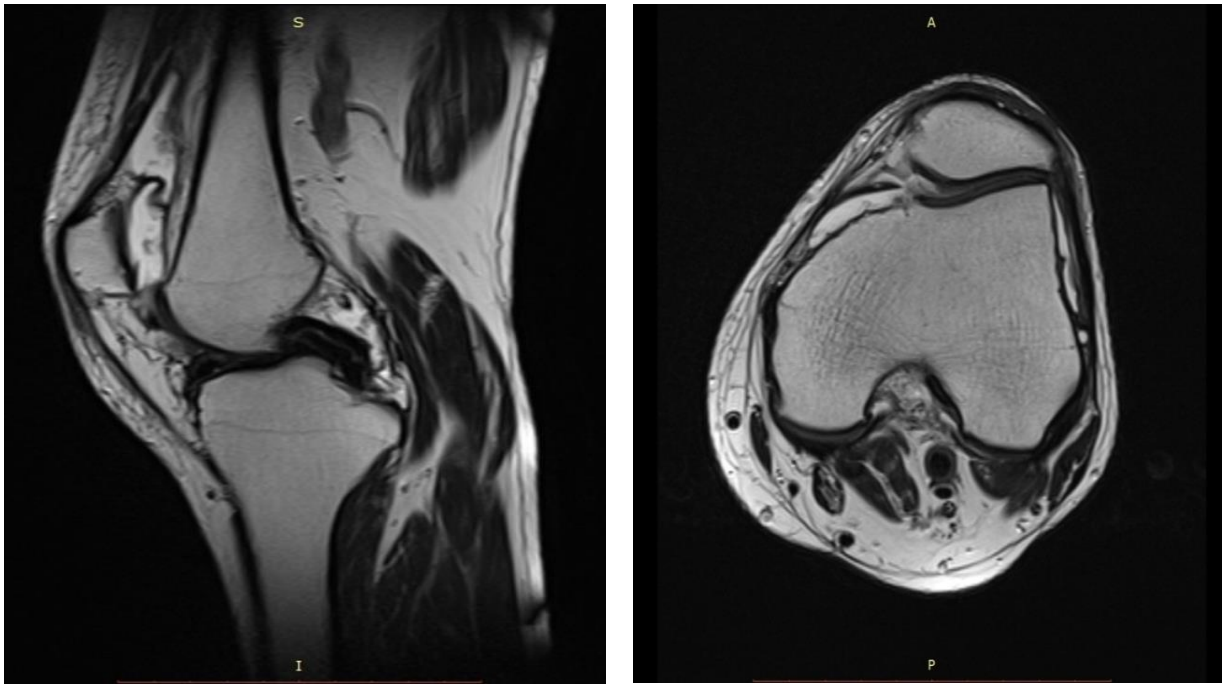

Figure 7. Suprapatellar plicae of the knee. A 45-year-old patient with pain syndrome

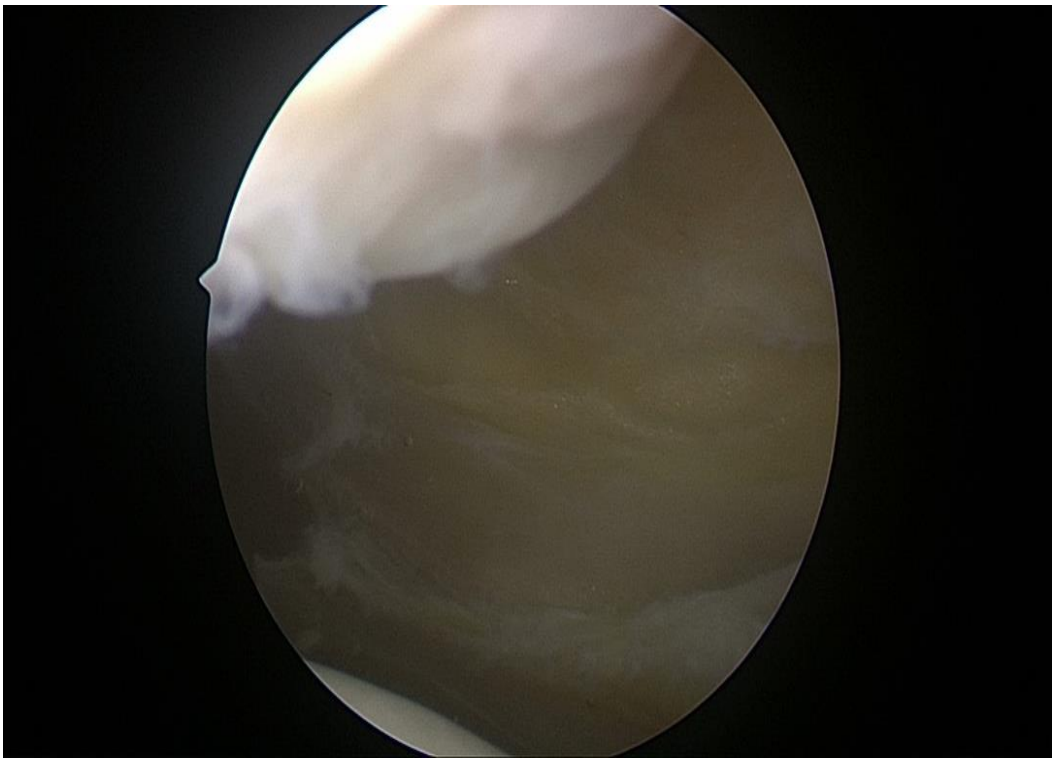

Figure 8. Arthroscopic photo showing the cartilage surface of the medial femoral compartment being eroded by the synovial plica

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.

Acknowledgements

This work was supported by Republican Specialized Scientific and Practical Medical Center of Traumatology and Orthopedics, Tashkent, Uzbekistan.

Competing interests

The authors declare that they have no competing interests.

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Results and Discussion can be presented jointly.
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2. Karen KS, Otto CM. 2007. Pregnancy in women with valvular heart disease. Heart. 2007 May; 93(5): 552–558.
3. Doll MA, Salazar-González RA, Bodduluri S, Hein DW. Arylamine N-acetyltransferase 2 genotype-dependent N-acetylation of isoniazid in cryopreserved human hepatocytes. Acta Pharm Sin B, 2017; 7(4):517-522.

For In press manuscripts (maximum 2):
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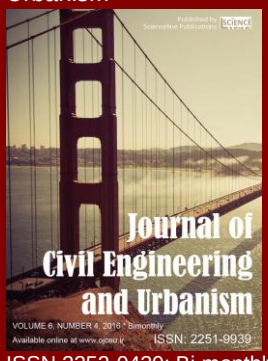

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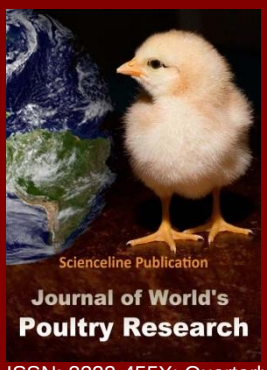

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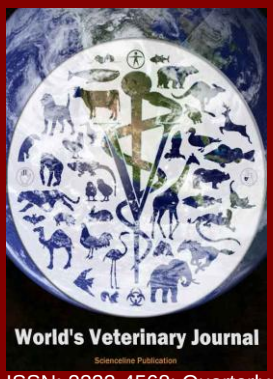

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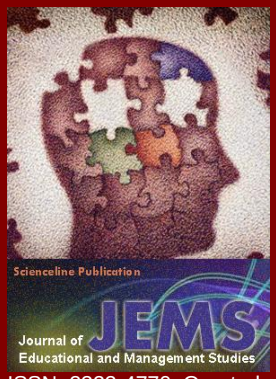

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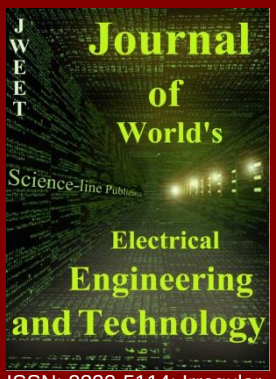

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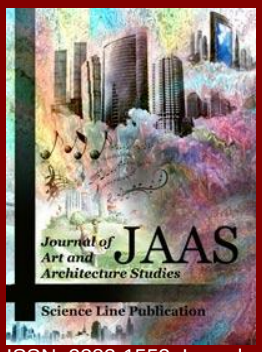

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