

SYNOVIAL FLUID RESEARCH AS A PART OF ARTHROPATHOLOGY DIFFERENTIAL DIAGNOSTIC

V. KLYMCHUK, assistant

National University of Life and Environmental Sciences of Ukraine

Abstract. *Evaluation of the synovial fluid cellular composition is an informative indicator of the comprehensive examination of the joints pathology. Using advanced diagnostic tests are very important in diagnostic of articular pathology, especially in order to confirm or exclude the presence of osteoarthritis. Actually synovial fluid analysis is a very useful kind of research to exclude sepsis and immunological disorders that often occur cytosis and number of polymorphonuclear neutrophils increasing.*

Keywords: *synovial fluid, articular pathology, synoviocytogram, inflammation, dogs*

Introduction. Wide spread of joint disease associated with lower of mobility and activity, changes in quality of animals life etc. It's makes actual the development of new diagnostic technology, in which the synovial fluid research is an important element of it [1,3].

Synovial fluid, which contained in the joint cavity, is a biological environment, unique in its composition, biophysical, physical and chemical properties [2]. Fundamentals of synovial fluid research was laid in the middle of the XIX century by german researcher Frerichs (1846), who studied the chemical and cellular composition of animals' synovial fluid.

Nowadays the laboratory methods of the synovial fluid changes diagnostic are more informative. Synovial fluid collects from the articular cavity with diagnostic or therapeutic aims in according to all rules of aseptic and without anesthesia, because Novocain destroys the cell nucleus chromatin [4,9,10].

Laboratory research involves determining the physical and chemical characteristics of synovial fluid and microscopic, bacterioscopic and bacteriological investigations. Usually determine the quantity, color, clarity, viscosity, mucins clot formation, pH and optical density of synovial fluid [3,5,6].

Cytological investigation is the most important part of the synovial fluid analysis. Unfortunately, during arthrocentesis is not always possible to collect the enough quantity of synovial fluid for all types of laboratory researches. In this case the priority has cytological analysis [7,8,11].

Purpose. The aim of our work was to realize the cytological analysis of synovial fluid in dogs in normal conditions and in the presence of joint pathology.



1. Picture Elbow arthrocentesis (the synovial fluid collection)

Materials and methods. Samples of synovial fluid were obtained from three healthy animals and eighteen animals with signs of joints pathology. Synovial fluid was collected by arthrocentesis of shoulder or elbow joints using disposable syringe of 2.0 ml. The diameter and length of the needle selected individually depending on the size of the animal and the place of puncture.

Synovial fluid droplets are put on a glass slide and dried in air, after that fixed after May-Grunwald and stained after Romanovsky-Himze. Prepared example was investigated by microscope using immersion lens and counted at least 100 cells for synoviocytogram building.

Results. The most of the synovial fluid cellular composition (65%) are cells of the tissue origin (synoviocytes and hystiocytes), about 30% of well differentiated lymphocytes and 8-10% of neutrophils. Changing of the synovial fluid cells number were not specific, but useful to differentiate the inflammatory and non-inflammatory processes, and to make the conclusions about the degree of inflammation. The increase of the polymorphonuclear neutrophils number (50-93%) and low number of lymphocytes (0-8%) in the synovial fluid often indicate the inflammatory changes in it.

Based on these data, we can make the conclusions that the character of synovial fluid changes determined by organoleptic characteristics, test of mucins clot formation, determination of protein concentration and calculation of synovial fluid cytosis – can be classified into two groups: non-inflammatory and inflammatory (inflammatory divide to aseptic and septic).

Inflammatory aseptic synovial fluid characterized by moderately elevated cytosis, changes in the volume and viscosity, and mucins test usually is in norm. Transparency and color change due to the presence of different cells types in synoviocytogram.

At most of degenerative diseases of the joints synovial fluid analysis will not differ from normal, but cytology shows us a steady light inflammation. Color usually varies from light yellow or dark yellow. The

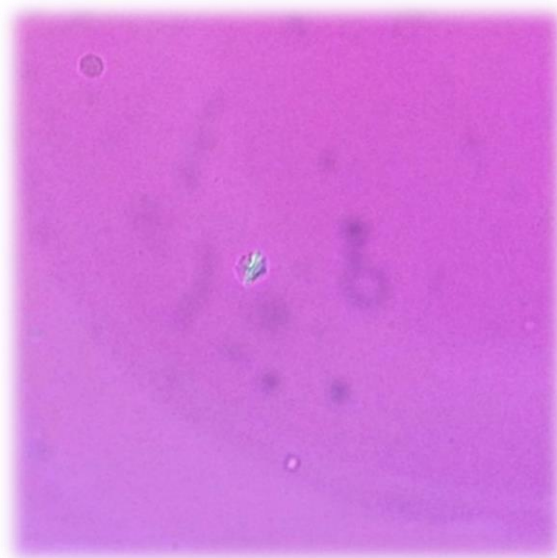
dominant cell type in this case are lymphocytes and monocytes-macrophages, in some cases during microscopy can be observed the elements of cartilage.

Based on the synovial fluid bacteriological research joint pathology divided into infected and not infected. Not infected processes include joint diseases such as rheumatoid arthritis, neoplasia, and changes associated with the crystals deposition (chondrocalcinosis) in the joints.

During inflammatory aseptic processes in joints synovial fluid usually characterized by mild or moderate increase in the number of cellular elements, the presence of different cell types in synoviocytogram and a large number of red blood cells.

In many cases of degenerative joint lesions organoleptic and biochemical parameters of synovial fluid will come closer to norm, but synoviocytogram will show steady light inflammation. The dominant cell type in this case are lymphocytes and monocytes-macrophages, in some cases during microscopy can be observed the elements of cartilage.

Changes of synovial fluid cellular composition in various pathological conditions in experimental dogs showed in the table 1.



1. Picture Calcium pyrophosphate crystal seen in an elbow arthrocentesis example, x100

The investigation of synovial fluid cellular composition is an informative indicator of the animal with joints pathology complex examination. Using advanced diagnostic tests are very important in diagnosis of articular pathology, especially in order to confirm or exclude the presence of osteoarthritis.

Actually synovial fluid analysis is a very useful kind of research to rule out septic and immunological disorders (which often manifest increased cytosis and increased number of polymorphonuclear neutrophils).

1. Changes in synovial fluid of experimental dogs in various pathological conditions, $n = 18$

Sign	Type of changes		
	Non-inflammatory (n=6)	Inflammatory (n=6)	Septic (n=6)
Color	Light yellow	Yellow	Variable
Clarity	Transparent	Semitransparent	Muddy
Leucocytes, in 1 μ l	200 - 2000	2000 – 75000	>75000
Neutrophils, %	<25	40 – 75	>75
Crystals	Absent	Sometimes (n=1)	Absent
Bacteriological examination	Negative	Negative	Sometimes positive (n=2)
Disease	Osteoarthritis (n=2), traumatic arthritis (n=3), aseptic necrosis (n=1).	Rheumatoid arthritis (n=5), spondyloarthropathy (n=1).	Infectious arthritis (staphylococcal (n=4), streptococcal (n=2))

Evaluation of synovial fluid in combination with anamnesis, clinical signs, laboratory tests and X-ray is the most appropriate approach for the diagnosis and monitoring of joint disease.

The method gives possibility to compare clinical features with diagnostic parameters of synovial fluid and facilitate the differential diagnosis of joint pathology in dogs.

Discussion

1. The joint pathology in dogs can be classified into inflammatory and non-inflammatory according to the nature of changes in synovial fluid. Inflammatory processes may be purulent and not purulent.

2. Purulent inflammatory pathology characterized by small or medium increasing of cellular elements number in the synovial fluid (50-93%); presence of various cell types and a large number of red blood cells in synoviocytogram.

3. In many cases of degenerative joint lesions organoleptic and biochemical parameters of synovial fluid will come closer to norm, but synoviocytogram will show steady light inflammation. The dominant cell type in this case are lymphocytes and monocytes-macrophages, in some cases during microscopy can be observed the elements of cartilage.

4. Pathological changes in synovial fluid collected from animals with joint diseases often serve as a “mirror”, which reflecting the pathological changes in the synovial membranes and articular cartilage.

References:

1. Matveeva E.L., Luneva S.N., Chegurov O.K., Makushyn V.D. (2006). Analiz svyazi biohimicheskikh pokazateley sinovialnoy zhidkosti bolnyih osteoartrozami kolennogo sustava s ih klinicheskoy harakteristikoy [Analysis of relationship between biochemical

parameters of synovial fluid of patients with osteoarthritis of the knee with their clinical characteristics]. Traumatology and Orthopedy № 4 (42), 55–58 (in Russia).

2. Matveeva E.L., Makushyn V.D., Chegurov O.K., Soldatov Y.P. (2005). Ponyatie normyi v issledovanii sinovialnoy zhidkosti

3. [The concept of norms in the synovial fluid study]. Clinical Laboratory Diagnostic №10, 18 (in Russia).

4. Nurbulatova L.G. (2010). Relief poverhnosti i stroenie mikrotsirkulyatornogo rusla sinovialnoy membranyi okolosustavnyih sinovialnyih sumok kolennogo sustava [The surface topography and structure of the microvasculature of the synovial membrane of the knee joint synovial periarticular bags]. Morphology V. 137 № 4, 144 (in Russia).

5. Synyachenko O.V. (2008). Sovremennyye aspekty analiza sinovialnoy zhidkosti [Modern aspects of the analysis of synovial fluid]. Ukrainian Journal of Rheumatology № 2 (32), 30–39 (in Ukraine).

6. Yarmola T., Katerinchuk I. (2003). Analiz klinichnoyi effektivnosti ta bezpechnosti amizonu u hvorih na revmatizm [Analysis of clinical efficacy and safety in patients amisione rheumatism]. Drugs of Ukraine № 6, 51–53 (in Ukraine).

7. Cowell R. L., Tyler R. D., Meinkoth J. H. (eds) (1999). Diagnostic Cytology and Hematology of the Dog and Cat, 2-nd ed. – Mosby. –Inc., 124–131.

8. Fox D. B., Cook D. B. (2001). Synovial fluid markers of osteoarthritis in dogs. Am Vet Med Assoc 219, 756–761.

9. Garnero P., Rousseau J.-C., Delmas P. D. (2000). Molecular basis and clinical use of biochemical markers of bone, cartilage, and synovium in joint diseases. Arthritis Rheum 43, 953–968.

10. Kuroki K., Cook J. L., Kreeger J. M. (2002). Mechanisms of action and poten-tial uses of hyaluronan in dogs with osteoarthritis. Am Vet Med Assoc. 221, 944– 950.

11. Read R (2002) Diagnosis and management of osteoarthritis. WSAVA 2002 Congress., 1–4. <http://www.vin.com>.

12. Rorvik A. M. Grondahl A. M. (1995). Markers of osteoarthritis a review of the literature. Vet Surg 24, 255–262.

ДОСЛІДЖЕННЯ СИНОВІАЛЬНОЇ РІДИНИ ЯК ЧАСТИНА ДИФЕРЕНЦІАЛЬНОЇ ДІАГНОСТИКИ СУГЛОВОВОЇ ПАТОЛОГІЇ У СОБАК

В. В. Климчук

Анотація. Оцінка клітинного складу синовіальної рідини є інформативним показником у комплексному обстеженні тварин із патологією суглобів. Використання додаткових діагностичних тестів є дуже важливим під час діагностики суглобової патології, насамперед для того, щоб підтвердити або виключити наявність остеоартриту. Власне аналіз синовії є дуже цінним видом дослідження для виключення сепсису та імунологічних порушень, які найчастіше проявляються

підвищенням цитозу та збільшенням кількості поліморфноядерних нейтрофілів.

Ключові слова: *синовіальна рідина, суглобова патологія, синовіоцитограма, запалення, собаки*

ИССЛЕДОВАНИЕ СИНОВИАЛЬНОЙ ЖИДКОСТИ КАК ЧАСТЬ ДИФФЕРЕНЦИАЛЬНОЙ ДИАГНОСТИКИ СУСТАВНОЙ ПАТОЛОГИИ У СОБАК

В. В. Климчук

Аннотация. *Оценка клеточного состава синовиальной жидкости является информативным показателем при комплексном обследовании животного с патологией суставов. Использование дополнительных диагностических мероприятий очень важно во время диагностики суставной патологии, в частности для подтверждения или исключения наличия остеоартрита. Собственно, анализ синовиальной жидкости – очень ценное исследование в плане исключения сепсиса или иммунологических нарушений, которые сопровождаются повышением уровня полиморфоядерных нейтрофилов и общим цитозом.*

Ключевые слова: *синовиальная жидкость, суставная патология, синовіоцитограма, воспаление, собаки*