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CLINICAL AND BIOLOGICAL ASPECTS OF GONARTHROSIS TREATMENT

Amanov Kobiljon
Associate Professor of the Department of
Medical Biology and Histology, ASMI

Numanjanova Sarvinozbegim Ilkhomjon kizi
3rd Year Student of the Medical Faculty, ASMI

ABSTRACT

Conservative and surgical methods of treating the knee joint are considered from a biological point of view. The positive role of chondroprotectors at different stages of surgical treatment, the advantages of laser arthroscopic surgery and plasma coagulation are shown. Biological criteria for indications for total knee arthroplasty are outlined.

Keywords: treatment, gonarthrosis, clinical and biological aspects.

INTRODUCTION

In the human musculoskeletal system, cartilage tissue serves to connect its various segments and acts as a shock absorber under axial load conditions [1]. After the body has completed growing, cartilage in the musculoskeletal system is located in those areas that experience the greatest static and dynamic load. The characteristic features of the structure of cartilage tissue ensure its strength and elastic properties, which determines its ability to withstand high static and dynamic loads.

MATERIALS AND METHODS

There are no blood vessels in cartilage tissue, chondrocytes function due to diffusion transfer of water with biologically active components dissolved in it.

Hyaline cartilage consists of a large amount of extracellular matrix with chondrocyte islands. The extracellular matrix consists of collagen (mainly type II) and proteoglycan complexes, with a small proportion of collagen of other types, proteins and glycoproteins.

In normal cartilage, the network of collagen fibers has a well-differentiated ultrastructure, capable of withstanding compressive and tensile forces.

RESULTS AND DISCUSSION

Aggrecan molecules are linked to numerous chains of glycosaminoglycans (keratan sulfate and chondroitin sulfate), which in turn contain a large number of carboxyl and sulfhydryl groups. This biochemical complex creates a system capable of hydration and provides the elastic and resilient properties of cartilage [2]. Chondrocytes themselves are responsible for the synthesis of articular cartilage during the development of the body [3]. They ensure the incorporation of components into the extracellular matrix, maintaining the balance of matrix components. Chondrocytes respond to growth factors and cytokines, which are small protein molecules that control functions such as migration, proliferation, differentiation, and matrix synthesis. These

cells are capable of receiving signals from their environment and transforming them into biochemical products, which then recreate normal biomechanical articular cartilage [4].

It is necessary to distinguish between the restoration of the articular surface and the process of articular cartilage regeneration. Regeneration involves the formation of a new articular surface. Previously, it was believed that the success of restoring an injured or degeneratively altered joint is determined by the degree of filling of the chondral defect and the restoration of the structure and mechanical properties of the new cartilage.

However, in practice, it is important to restore function and relieve pain. Filling the cartilage defect with regenerate is not necessarily accompanied by a decrease in pain or an improvement in joint function. Even close to normal restoration of articular cartilage does not provide the best clinical outcome. Clinically acceptable treatment results can be achieved by stimulating cartilage regeneration [4]. This may include unloading the degeneratively altered joint, penetration of the subchondral bone to ensure the release of cartilage-forming cells into the defect area, and soft tissue arthroplasty [3]. Since mature chondrocytes have a limited ability to restore cartilage, a potentially productive option has been found – the introduction of a new cell population into the chondral or osteochondral defect. These cells can be obtained using tissue culture technology using an artificial matrix and chondrogenesis factors. Unfortunately, the effectiveness of this method has yet to be proven by controlled randomized clinical trials taking into account long-term results, and especially data on the biomechanical function of the joints [2].

The ability of periosteal and periosteal cells (most likely from the cambial layer adjacent to the bone) to form a hyaline regenerate is also attractive from a clinical standpoint. The wider (compared to hyaline cartilage) availability of the periosteum for clinical purposes may incline the specialist to use this tissue to fill a cartilaginous defect. In an experiment on animals, an osteoperiosteal and osteoperichondral transplant was used as a source for filling a large osteochondral defect in the knee joint area [3]. These experiments suggest that it is possible to form a regenerate that is histologically characterized as hyaline cartilage. Biomechanical and biochemical studies have confirmed its proximity to articular cartilage [4]. In the clinic, such operations provided favorable results in young people with limited cartilage damage.

Cartilage-forming cells can be used to fill the defect. We are talking about cells grown in tissue culture. Cells transplanted in the experiment turned out to be capable of fully functioning and synthesizing the cartilage matrix, thus creating a regenerate similar in structure to cartilage tissue [1]. In clinical conditions, this means harvesting mesenchymal stem cells or chondrocytes, multiplying them in tissue culture, implanting them into the matrix, and then filling the cartilage defect with them [2]. In vascularized tissue, the formation of a fibrin clot (including the release of growth factors from platelets) probably plays an important role in initiating the regeneration process. Defects that heal without transplantation are filled with fibrous tissue. It is currently believed that the reparative effect of cell breakdown products is due to the massive release of enzymes, various mediators, including cytokines and chemokines, cytoplasmic and nuclear proteins (and their breakdown products - low molecular weight peptides and amino acids), phospholipids and nucleotides, many of which are "signal molecules" for the induction of regeneration, from dying and surviving cells [4]. A.B. Shekhter, taking these data into account, put forward the concept of autoregulation of connective tissue

growth based on feedback: collagen breakdown products (polypeptides, amino acids) are signals for fibroblast proliferation and collagen production [3]. Cytokines, released from the clot, provide chemotaxis and stimulation of mitosis of mesenchymal cells, which migrate into the clot - a temporary matrix for these cells. Probably, the clot can act in a similar way in non-vascularized tissue, which is hyaline cartilage. A large number of polypeptide growth factors, such as transforming growth factor (TGF-ß), bone morphogenetic protein, insulin-like growth factor, fibroblast growth factor, platelet-derived growth factor affect the functions of chondrocytes and other mesenchymal cells, in particular migration, proliferation, matrix synthesis and differentiation. The effect of these factors is mediated through receptors (integrins).

CONCLUSION

1. In young people (16–25 years) with instability of the knee joint, conservative treatment is effective with immobilization with a hinged orthosis. Chondroprotectors against this background contribute to better functioning of the cartilaginous structures of the knee joint.
2. In case of partial damage in the area of the posterior or anterior horn of the internal meniscus, as well as in case of heterogeneity of the meniscus structure according to ultrasound examination data and clinically expressed discomfort in the area of the internal meniscus, long-term oral use of chondroprotectors is indicated, as well as temporary immobilization with a hinged orthosis. 3. In the presence of symptoms of partial damage to the anterior cruciate ligament of the knee joint and synovitis, treatment with chondroprotectors (Structum) for 5-6 months can be effective after arthroscopic sanitation of the joint, strengthening of the anterior cruciate ligament using laser or plasma technology.
4. In case of complete rupture of the anterior cruciate ligament, its surgical restoration is indicated using known techniques, including the use of arthroscopic technology. In the postoperative period and during rehabilitation, chondroprotector therapy is carried out.
5. In case of patellofemoral arthrosis, arthroscopic sanitation of the articular surface of the patella using laser technology, limitation of movement in the knee joint using an orthosis with a hinge are supplemented by taking chondroprotectors for 6-8 months. A repeat ultrasound examination allows us to clarify the effectiveness of treatment and determine further patient management tactics.

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