

ABSTRACT OF PHD THESIS

Diagnostic and treatment options for chondral lesions of the knee

PhD student: Zazgyva Ancuța

Coordinator: Prof. Dr. Nagy Örs

Articular cartilage lesions are common in orthopaedic practice, and continue to be a difficult problem to treat. According to various data reported in the literature, about 63% of patients undergoing arthroscopic knee surgery present cartilage lesions, from which approximately 20% are full thickness lesions. Furthermore, approximately 75% of patients aged <40 years have solitary cartilage lesions in the knee, the rest showing multiple lesions of the articular cartilage; associated intra-articular pathology is present in approximately 65% of these cases, usually anterior cruciate ligament and meniscus injuries. Small, superficial cartilage lesions in the knee may remain asymptomatic, however most of the larger lesions (>2cm²) are clinically symptomatic and usually progresses in evolution, leading to early degeneration of the articular surfaces and an arthritic process of the joint.

In 1743, William Hunter observed that “from Hippocrates to the present age, it is universally allowed that ulcerated cartilage is a troublesome thing and that when destroyed, it is not recovered” - his statement remains true even after 270 years, despite progress in diagnosis and treatment methods.

Most of chondral lesions of the knee show no signs of spontaneous healing and osteochondral lesions are therapeutically irreversible to the present day. It is believed that lesions that do not penetrate the subchondral bone undergo no restoration process, while the penetration of subchondral bone means that the lesions can be repaired by the formation of a mixed tissue containing fibrocartilage, and fibrous tissue. This recovery process yields a lower quality tissue, which does not have the biomechanical strength of the native hyaline cartilage, and is therefore easier damaged.

This thesis aims to assess the current concept regarding the diagnosis and treatment of chondral lesions of the knee, highlighting some of the most used techniques and their results in a series of

clinical studies, as well as evaluating the results of using new materials for the treatment of osteochondral lesions in an animal model.

Study 1 looked at the diagnosis of chondral lesions using serum and synovial liquid biomarkers in patients undergoing arthroscopic knee surgery. The cytokines chosen were TNF- α and MMP-8, and we found high levels of both substances in the synovial fluid and serum of patients with chondral lesions of the knee, while the correlation of MMP-8 levels and functional knee scores demonstrated an important role of this metalloproteinase in the degradation of articular cartilage.

Study 2 is an epidemiologic study that evaluates chondral lesions present in a consecutive series of patients treated arthroscopically, highlighting the incidence of these lesions, as well as their grade, localisation, extension and correlation to patient characteristics, activity level and presumed causative factors.

Study 3 focuses on comparing the results of using polynucleotides versus hyaluronan in the local treatment of incipient knee osteoarthritis, on 30 patients that were followed up for three months after the completion of treatment. We found a significant improvement of clinical scores, and the symptomatic and functional results were superior in case of polynucleotides, thus a viable treatment option for this category of patients.

Study 4 looked at the role of arthroscopic debridement in improving clinical symptoms of patients with knee osteoarthritis. The 36 patients were followed for 12 months after the intervention, and the clinical scores and patient specific questionnaires all showed both symptomatic and functional improvements.

Study 5 presents the short-term clinical results of arthroscopic debridement and intra-articular infiltration with hyaluronic acid for the treatment of early stages of knee osteoarthrosis. Both treatment options are frequently used, and we found that the combination of these improved functional results with remission of painful symptoms at 6 months post-intervention.

Study 6 presents the results of using a bioactive glass (S53P4) in combination with fibrin glue, compared to fibrin glue alone, to fill osteochondral lesions prepared in the trochlea and on the medial femoral condyle of rabbits. We found that the use of fibrin glue alone yields superior results in partial loading conditions, with the formation of a cartilaginous tissue. Regeneration of the subchondral bone was also found to be dependent on loading conditions of the joint and on the substances used as fillers.

Conclusions: Currently the diagnostic and treatment of chondral defects of the knee is aimed towards finding early diagnostic tools like biomarkers detecting asymptomatic lesions, so that less invasive early treatment options can either halt the process of cartilage degeneration or offer options for the regeneration of this highly specialised tissue.