University of Medicine, Pharmacy, Sciences and Technology of Târgu Mureş

Doctoral School

Abstract of the PhD thesis

THE ROLE OF BIOLOGICAL THERAPY IN TREATMENT OF CHONDRAL LESIONS OF THE KNEE

PhD student: Pal Fodor

Scientific supervisor: Tiberiu Bățagă

In the last years a completely new approach for the treatment of cartilage lesions has developed based on biological strategies. The modern therapeutically approach includes: application of matrix metalloproteinase inhibitors, gene therapy, cytokinase inhibitors, stem cells and growth factors. These approaches are based on the revolutionary idea of “regeneration” unlike the traditional approach focusing on the concept of “repair”. The biological rational behind this treatment is the topical administration of several important molecules normally involved in joint homeostasis, healing mechanism and tissue regeneration.

The first study was entitled: ***Prevalence Of Chondral Lesions In Knee Artroscopy***

The objective of the study was to establish the prevalence of cartilage injuries in patients undergoing arthroscopy of the knee for knee pain or instability. Materials and methods. The retrospective analysis of 355 consecutive knee arthroscopies was performed. Chondral lesions were found in 247 (69.6%) of 355 arthroscopies. Regarding their location, chondral lesions showed a predilection for the medial femoral condyle (53.8%), while lesions on the lateral femoral condyle alone (0,8%) were the least frequent ones. Chondral lesions were frequently associated with concomitant articular findings like meniscal injury (56.68%) and anterior cruciate ligament tear (2,84%) or both menisci and anterior cruciate ligament tear (15.38%). Grade II according to ICRS classification evaluated in arthroscopy was the most frequent grade of the cartilage lesion (56.3%) and grade 4 the least frequent one (6.9%). In conclusion, chondral lesions are common findings in knee arthroscopy, present in more than half of the arthroscopies performed and a significant proportion of chondral lesions were associated with other intra articular disorders like anterior cruciate ligament tear and medial meniscus tear.

The second study was entitled:***The Clinical Effect of Intraarticular Injections of Autologous Platelet-Rich Plasma as an Augmentation Procedure after Surgery for Patients with Condropathy of the Knee – Case Series***

The aim of the study was to investigate whether platelet-rich plasma (PRP) application after arthroscopic microfracture procedure for condropathy of the knee is associated with improved clinical outcome.Method: We enrolled prospectively 41 patients treated with microfracture procedure for condropathy of the knee. 23 received postoperative 3 intraarticular injections of PRP at 2-weeks intervals. The clinical outcome was evaluated using Knee Injury and

Osteoarthritis Outcome Score (KOOS) and International Knee Documentation Committee Subjective Knee Form (IKDC), recorded at 3 and 6 months. Results: At 3 months KOOS improved significant in PRP group ($p<0.001$), but the difference was not maintained at 6 months ($p=0.097$). At 3 months IKDC improved significant in PRP group ($p=0.002$) and the difference was maintained at 6 months ($p=0.001$). Conclusion: PRP may accelerate the healing process in patients treated with microfracture procedure for condropathy of the knee but there might be no difference in the final outcome.

The third study was entitled: ***Role Of The Biomimetic Scaffolds in the Regeneration of Articular Tissue in Deep Osteochondral Defects in a Rabbit Model***

Our aim was to study the mechanism of in vivo cartilage repair in case of severe osteochondral lesions using a three-dimensional matrix implanted without any preseeded cells in the osteochondral defect in a rabbit model. According to the ICRS scores from macroscopic observations of the femoral condyles, the average scores in the scaffold groups were higher than those in the control groups at every time ($P<0.001$). Histological examination of the ostheochondral defects, revealed regeneration of new tissue with hyaline-like cartilage features only in matrix groups. At twelve weeks from implantation, complete filling of the defect with hyaline cartilage with a tendency of mineralization and the absence of implant material is observed. The superficial area of the defect is completely covered with hyaline-like cartilage. The scaffold used leaded to the regeneration of articular tissue with an ordered histoarchitecture.

The fourth study was entitled: ***Autologous Matrix-Induced Chondrogenesis versus Microfracture with PRP for Chondral Lesions of the Knee in a Rabbit Model***

Our aim was to study the mechanism of in vivo cartilage repair in case of full-thickness articular cartilage damage of the knee using a three-dimensional matrix implanted without any preseeded cells in the defect. We also investigated whether platelet-rich plasma application after microfracture procedure of the knee is associated with improved outcome compared with traditional microfracture treatment alone in a rabbit model. Histological examination of the chondral defects, revealed the largest amount of new tissue with hyaline-like cartilage features in Hyalofast group. At 12 weeks from implantation of the Hyalofast scaffold demonstrated complete filling of the defect with hyaline cartilage in admixture with the scaffold and bone metaplasia in the deepest areas. In the PRP group, complete filling of the defect with an admixture of fibrous and hyaline-like cartilage tissue appeared with a discreet tendency of endochondral ossification. We confirmed the superiority of the autologous matrix-induced chondrogenesis compared to microfracture and PRP or microfracture alone in case of full-thickness articular cartilage damage of the knee.

Key words: osteochondral defect, scaffold, hyaline cartilage, autologous matrix-induced chondrogenesis, platelet-rich plasma, mineralization.