Next generation articular cartilage clinical studies

R. Gudas, Lithuania

The application of the evidence based medicine principles is new to cartilage repair. The purpose of this study was to overview the results of articular cartilage clinical studies.

A recent study evaluated the quality of available studies on cartilage repair. The overview of most evidence based results of articular cartilage repair techniques is performed in this article. Randomized clinical trials were of primary priority in this review. Also, review of the results of physically active patients was primary topic of this article. Evidence based level IV articles were not as important as level I ones.

Knowledge about the articular cartilage still remains uncertain. There are discussions regarding which method of repairing articular cartilage defects we should suggest to the patient. Various techniques of chondral or osteochondral defect treatment include abrasion, drilling, microfracture, osteochondral autografts, osteochondral allografts, chondrocyte transplantation. Traditional resurfacing techniques, such as drilling and microfracture, have proved to be safe and effective for treating articular cartilage defects of above knee joint. However, cartilage defects of lower knee joint are not to be treated with normal hyaline cartilage and have short-term success rate. In the past years, numerous investigators have developed new techniques to provide hyaline or hyaline-like repair for articular defects. Autologous osteochondral transplantation and autologous chondrocyte implantation were compared in a non-randomized study by Bentley et al., who focused on clinical and histological results of osteochondral transplantation. Defects treated with autologous chondrocyte implantation were inferior to those provided by osteochondral transplantation. However, Bentley et al. reported that autologous osteochondral transplantation and microfracture groups. However, these studies did not investigate large lesions of these athlets. Most of these techniques are effective for low physical demand population and are supported by experimental data, but it is autologous osteochondral transplantation that is currently the only surgical technique providing hyaline articular cartilage and is most effective articular cartilage surgical intervention. The literature includes some reports about good results achieved with this technique, with best success in athlete’s population. Although long term durability of autologous osteochondral transplantation remains unclear, this procedure provides excellent long term success. But, OAT can be used only for smaller lesions because of the limited availability of donor grafts; in contrast, microfracture provides fibrocartilage repair tissue. Randomized study performed by Gudas et al., on active young athletes has shown that osteochondral autologous transplantation and microfracture give encouraging clinical results after a mean period of 37 months, although microfracture appeared to deteriorate macroscopic results with time. However, osteochondral autologous transplantation was superior to microfracture in 37 months after the operations. There have been several uncontrolled studies on osteochondral autologous transplantation and microfracture in which good results were reported. The long-term results (range from 7 to 17 years) of an arthroscopic debridement and microfracture procedure for only full-thickness chondral defects in patients with an average age of 30.4 (range, 13-45 years) were evaluated by Steadman et al., who found significant improvement in knee function. No osteochondritis dissecans lesions were included in their study. In their study, only 34 % of the articular cartilage defects were located in the femoral condyles and 66% were located in other areas of the knee joint. In another report, Steadman et al. reported that microfracture at an average follow-up of 5 years (range: 2-13 years) is safe, effective, and appears to improve symptoms, function, and activity levels in a National Football League (NFL) players and 76% patients returned to football the season following microfracture. However, only 36% players continued active participation in the NFL at the last follow-up.

Hangody et al., according to his investigations, reported good-to-excellent results of osteochondral autologous transplantation, fibrocartilage-like tissue fills the gaps between the bone defect and the articular surface, and cartilage stiffness and congruity of the joint over time. It has been suggested that traditional drilling leads to good and excellent results for up to five years and that the results then decline. Histological analysis of repair tissue after drilling was reported to show fibrocartilage. However, Steadman et al. suggested that microfracture could provide a more durable repair and that the repair tissue may be a hybrid of hyaline like cartilage and fibrocartilage. More well-designed studies are needed to clarify the conflicting results. Other studies found significant histological quality difference between the osteochondral autologous transplantation and the microfracture groups. These results are not consistent with those in the study by Bentley et al., in which arthroscopic evaluation after mosaicplasty showed fair or poor results in 66% of patients and only 34% of the patients reached a good evaluation score (according to ICRA). Of course, it is difficult to compare between the trials, because Bentley et al. used large arthrotomy for mosaicplasty, while there were all arthroscopic procedures in other studies. Also, the diameters of the plugs were different in most studies. In addition, all the plugs were placed at the same level with in healthy cartilage compared with slightly prominent positioning of the mosaics in other studies during OAT procedures.

In summary, guidelines for articular cartilage repair studies would be clearly defines inclusion and exclusion criteria, randomized trials, adequate randomisation and power analysis, detailed rehabilitation protocol, validated outcome measures, outcome assessment more than 2 years, outcomes assessed by independent investigator.