Prevalence of cartilage injury and its lack of an inherent response to heal has lead to a dilemma regarding current treatment protocols. Surgical procedures designed to treat focal chondral injuries are evolving in the human population and are supported by the basic science principles of cartilage physiology and known response to injury. Curl et al retrospectively reviewed 31,516 knee arthroscopies of patients in all age groups and reported 19,827 chondral lesions (63%), with a mean of 2.7 injuries per knee. While some of these lesions are clinically asymptomatic, the International Cartilage Repair Society (ICRS) estimates that 11% of these lesions in an age cohort averaging 35 years, would benefit from surgical intervention.

The first arthroscopic treatments for chondral injuries in the human population focused on the mechanical effects of these injuries, with a surgical goal to debride the cartilage lesion reducing both the mechanical effects and its associated inflammation. As understanding of these injuries has evolved, so have the treatments. Treatment goals have escalated to not only decreasing the current level symptoms, but have expanded to attempt to regenerate the chondral surface that has been injured. Current techniques can be separated into marrow stimulating techniques, osteochondral grafting, and cartilage transplantation of cell based technologies. Decisions regarding these different options are based on lesion size, depth, and location of the injury within the knee. Importance of addressing the non-cartilaginous injuries in the knee including both ligaments and menisci, as well as asymmetry in limb alignment are crucial for success in treating these injuries.
Marrow stimulating techniques include microfracture where perforations in the subchondral bone result in release of blood and mesenchymal cells that lead to reparative healing of fibrocartilage. While biologically inferior to normal hyaline cartilage in theory, treatment results have been encouraging with sound surgical selection with success rates approaching 85% at seven years. Recent literature however has shown inferior results in patients requiring a second procedures that may related to the negative effects of this surgical technique.

Osteochondral transfer involves transfer of an autogenous osteochondral plug from a relatively nonweightbearing region of the recipient’s knee or fresh allograft transfer of an “orthotopic” plug from a human donor knee to the injured site. This procedure can be done arthroscopically or open depending on lesion size and location. Risk of donor site morbidity increases as size of the lesion/defect increases with the autograft technique. This has lead to the utilization of fresh allograft tissue. Concerns with this technique over disease transmission remain. Success rates have approached 90% with these techniques for femoral condylar lesions.

Cartilage transplantation of cell based technologies represents an option when more traditional based treatments have failed. Autologous Chondrocyte Implantation (ACI) involves a staged process in the United States where an initial arthroscopic evaluation and chondrocyte biopsy are performed. Cells harvested are then cultured and amplified for later open transplantation utilizing a human periosteal patch or xenographic porcine alternative. While treatment results have been generally good with success rates that measure 80% in the United States, less invasive techniques have been employed in Europe where there is less regulation from the Federal Drug Administration.

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Figure Adopted from: J. Winslow Alford and Brian J. Cole

References


