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Articular Cartilage Injuries and Their Treatment

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Articular Cartilage injuries and their Treatment

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Injury to the articular surface or articular cartilage is becoming increasingly recognised as a source of pain, swelling and premature joint wear, degeneration and arthritis. These injuries may be recognised at the time of injury by an MRI scan or joint arthroscopy. The lesions may be partial- or full-thickness cartilage injuries. Recently, attempts to restore articular hyaline cartilage by use of new techniques of joint resurfacing have been described. The implications of successful biological repair for these chondral or osteochondral lesions are enormous, particularly in younger patients. It may therefore be advantageous to resurface such symptomatic articular cartilage defects to relieve the pain of those lesions and halt the progression of degenerative arthritis.

Both partial- and full-thickness hyaline cartilage defects have a well-documented progression over the course of time to joint degeneration and arthritis. Articular cartilage is avascular and has very little potential to heal. Although the use of modern techniques can reconstruct the articular defect and have the effect of eradicating or improving the symptoms experienced, it is unproven that these techniques will delay the onset of arthritis. However experience suggests that these techniques may delay the onset or progression of such symptoms.

Patients usually present with a recent injury with pain and swelling of the joint, an MRI scan of an injured joint which demonstrated articular cartilage damage or in the chronic situation pain, swelling, stiffness or mechanical complaints such as locking, giving way or of a loose body in the joint. MRI is very helpful in determining the extent of the problem. However special scan sequences are needed to demonstrate the articular surface of joint clearly. It is not uncommon that these lesions are first detected at the time of the arthroscopy.

Cartilage injury – conservative management

Patients with damage to the articular cartilage following an injury may not suffer or complain of any symptoms. Alternately the symptoms may be mild, non-intrusive and controlled by modification of activity, analgesics or non steroidal anti-inflammatory drugs (NSAID's). Patients often avoid twisting or contact sports in order to control the symptoms. Alternately NSAID's taken intermittently or before exercise may control the symptoms. In this way many patients may not present in the acute situation or may be unaware of any problems.

Many patients present with a coexisting injury such as an anterior cruciate ligament injury of the knee or meniscal tear, and the articular cartilage damage is first discovered during knee arthroscopy. Alternately an MRI may identify an unexpected defect or damage to the articular cartilage. Often in such cases careful assessment of the extent and degree of articular cartilage damage is necessary before a decision as to whether it is suitable for one of the techniques of surgical reconstruction.

Unfortunately drugs such as glycosamine or intra-articular injection of hyaluronic acid or other synovial fluid replacement has as yet not been shown to have a significant effect on the healing of these articular cartilage lesions.

Cartilage injury – surgical treatment

Joint debridement

In the past, articular cartilage lesions have been treated by subchondral bone abrasions or drilling at the site of focal damage with procedures popularized by Pridie, Johnson and described by Steadman as microfracture chondroplasty. However the results of these techniques may only be applicable to certain lesions in terms of site and size, and the results may not be long lasting or universally reproducible. Both small and large articular surface lesions continue to pose challenges to surgeons.

Chondral reconstruction

When a chondral or osteochondral lesion is determined to be inappropriate for a simple debridement of the damaged tissue, a limited number of other procedures are available. Autologous chondrocyte transplantation has shown some promise. This technique involves the harvesting of a sample of the patients articular cartilage during the first operation. The harvested articular cartilage cells are then cultured into a large population of cells in the laboratory over a period of weeks and then a second procedure is required to implant the cells into the damaged area of the joint. However, the technique is dependent upon an outside lab, is very expensive, and requires an initial arthroscopy and a following subsequent surgical procedure of joint arthrotomy.

The alternative technique is the use of autogenous or allogenic osteochondral plugs. This involves the harvesting at surgery of a plug or dowel of articular surface and the underlying bone and the transplantation of this plug from an area of the joint which is non-weight bearing into the damaged area. This offers the use of the patients own tissue incorporating the subchondral support for the living articular cartilage. It also offers the chance of using true hyaline cartilage resurfacing. It is also undertaken as a single operative procedure. The technique was first described by Hangody when he described and popularised the use of small diameter osteochondral cylinders to resurface damaged chondral surfaces. This technique is generally known as mosaicplasty. Originally the procedures involved an open technique, however this has subsequently been modified to include an arthroscopic technique.

These articular cartilage reconstruction techniques are suitable for the repair of isolated, circumscribed and contained defects of various sizes. However these techniques are not suitable for more general joint wear, deformity or arthritis. Severe joint space narrowing or collapse, osteophyte formation, and subchondral cyst formation is not amenable to these techniques at this time. Generally the microfracture technique is reserved for small lesions having a diameter of up to 1.5cm. Large dimension lesions of 2.5cm diameter or greater are only amenable to chondrocyte transplantation techniques. The technique of osteochondral grafting methods (eg, mosaicplasty [Smith and Nephew], osteoarticular transfer surgery [Arthrex]), is generally used on lesions between 1cm and 2.5cm in diameter.

In theory, this technique could be used for any joint surface. However, practical considerations have limited its early use to a small number of joint surfaces. This includes the ankle, shoulder but particularly in the knee.

Rehabilitation

Following any surgery to reconstruct the articular weight bearing surface a period of protected motion is necessary. This involves undertaking gentle exercises to mobilise the joint and to ensure that the joint does not become stiff. However crutches are often used to ensure that the operated area is not damaged during the healing phase by the action of walking or bearing weight through the joint. This usually involves using crutches for a period of time. Commonly this may be at least a week and can be up to as long as six weeks duration. Thereafter gentle activities of daily living are undertaken with a return to twisting activities and sport as much as three months following surgery.

Success of Articular Cartilage Reconstruction

The success is very dependant on the individual circumstances. In particular the age of the patient, the size, site, depth and nature of the damaged area of articular surface. In many of the reported studies the assessment of the results is confused by the fact that many patients have undergone several different operations so the effect of the reconstruction of the articular surface is difficult to assess.

As a generalisation microfracture can be successful in small localised areas of damage in particular where the damage is not to the convex weight bearing surface of the femur or patella. Osteochondral transplantation has been reported (D Johnson) to be successful in up to 96% of patients with localised lesions of less than 2cm in diameter. Osteocyte transplantation has been reported to result in an improvement in 72% of patients over a two year period. Many of the lesions in these cases were of considerable size.

Complications of the procedure are in general relatively small. These complications may include general complications such as infection, thrombosis, joint stiffness, continued symptoms and pain or a failure of the procedure. Specific complications may include an unresolved defect in the articular surface, continued symptoms or progression over the course of time to arthritis.

It should however be remembered that general wear in any joint may progress and become worse and even arthritic over the course of time. Surgical reconstruction may improve the symptoms and provide a good result in the short term but the long term outlook remains to be defined.

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