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CURRENT CONCEPTS IN THE TREATMENT OF ARTICULAR CARTILAGE DEFECTS

Every joint in the body is composed of a smooth surface called articular cartilage on the end of the bone which is connected to the next bone by ligaments. This articular cartilage is of varying thicknesses depending upon the joint but is critical in proper joint function. Unfortunately, articular cartilage frequently proves vulnerable to traumatic injury or degenerative conditions that may eventually lead to osteoarthritis. This is particularly true in a large weight bearing joint such as the knee. The problem is that the body has a limited means by which it can repair or regenerate damage to articular cartilage, a fact that has been known for years.

Although a variety of surgical procedures have been developed in an attempt to overcome this treatment challenge none has been successful in achieving regeneration of normal articular cartilage. The techniques used to date have been partially successful in that they may reduce pain and increase mobility but are often only to a limited extent in a short period of time. Lesions over the articular cartilage are graded in various ways but the most common classification is one Outerbridge classifying this as Grade I to Grade IV, Grade IV being a complete loss of the surface down to bare bone. Family history of osteoarthritis, obesity and limb misalignment may hasten the development of osteoarthritis by increasing load stress, particularly in patients who have sustained cartilage damage.

TREATMENT OPTIONS AND OUTCOMES

The goal of articular repair is to restore the integrity of the joint surface and to provide a full range of pain free motion preventing further tissue deterioration. A variety of treatment techniques have evolved in pursuit of this outcome.

1. Lavage – One of the most basic traditional techniques is lavage. Arthroscopic lavage rids the knee of loose articular debris and inflammatory mediators known to be generated by the synovial lining of damaged joints. In many studies up to 70% of the people had relief from the arthritic symptoms for up to three years time. This is an arthroscopic procedure and has a relatively short recovery time and can be repeated if necessary, but certainly it does not work for everyone.

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2. A second type of treatment is also arthroscopically performed but involves a micro fracture in which the subchondral bone is exposed, gently abraded and left intact. The adjacent cartilage is debrided to help the cartilage. The subchondral bone surface is then broached using small picks so that it communicates with the marrow and clot formation is stimulated. This is defined as a marrow stimulation technique. Various different techniques have been used for years. This is often combined with protective weight bearing and a continuous passive motion machine post operatively. These techniques can have 76-80% excellent short term results but the result in repair is fibro cartilage which has a different consistency than articular cartilage and does not have the long lasting effects that we would like.
3. A third alternative is periosteal grafting where perichondrium taken from the rib can be placed in the joint to try to stimulate healing cartilage. This has been done on a very limited basis and is not presently being done to any degree.
4. Osteochondral autograft. Chondral injuries can be treated by multiple osteochondral arthroscopically transplanted grafts of cartilage and bone. Osteochondral plugs, that is plugs with cartilage with underlying bone attached, are taken from around the notch in the knee and placed into defects on the weight bearing surfaces of the joint. This requires an arthroscopic procedure only. It often requires limited weight bearing with crutches for six weeks and the success rate appears to be 80%. It is a one stage procedure and does not require any other treatment. There is some difficulty with matching the size and the shape of the grafts and although in short term studies this had a better than 80% success rate long- term studies still have not been done.
5. Autologous chondrocyte implementation. Alternative sources of biological materials have been pursued over the years. The FDA had recently approved Genzyme tissue repairs, Carticel service for patients who present with significant defects in the weight bearing areas of the knee. This technique was developed in Sweden, and has now been used in this country for several years. The procedure involves arthroscopically evaluating the knee and harvesting cells through the arthroscope from minor load-bearing area and then sending these off to the laboratory to have these grown and then after two or three re-implanting these in the knee. The second stage is an open arthrotomy where a flap of periosteal tissue from the proximal tibia is sutured over top of the defect and these cells are injected underneath. Partial weight bearing with crutches was then used for approximately two months. The advantage of this technique is that articular cartilage is reformulated that appears to be normal articular cartilage and not scar tissue, and that this technique seems to have an approximately 90% success rate in restoring pain free motion; however, this sometimes can require more than a year to obtain and this point it does not appear to be effective for lesions of the knee cap. This autologous chondrocyte implantation is particularly advantageous for healthy, young and active patients with significant injuries of more than 2 cm in diameter to the articular cartilage. People who have moderate to severe osteoarthritis are not suitable candidates for this procedure. So, what is one to do? The general approach with these lesions is to make the diagnosis arthroscopically, to debride and wash out the defects and this if the is a full thickness lesion to do the micro fracture at the time of the initial arthroscopy. If this is not successful then one has to debride whether one should do the osteochondral autograft where the plug of bone and cartilage is planted in the defect. The advantage of this procedure is that it is a one stage procedure which has much less rehabilitation involved and much less expense.

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The data seemed to recommend that if the lesion is more than 2 cm in diameter the best success rate is from more the autologous chondrocyte implantation or Carticel technique. This seems to have a 90% success rate but, again, is much more expensive and involves two operations, the second of which is an open procedure and may take 12-18 months to recuperate from. Research is presently being done on using cells from other parts of the body to be implanted in different types of carriers that may significantly increase the results of success with this procedure and make this much less invasive.

For those people who already have significant arthritis, arthroscopic debridement by simply washing out the knee can be helpful but the other types of cartilage replacements are not indicated. There are several new things, though, that can be helpful. Dr. Jason Theodosakis has written a book "The Arthritis Cure". Rebuilding damaged articular cartilage has been a dream of doctors for years and Dr. Theodosakis has written that taking nutritional supplements can be helpful in reducing the symptoms of arthritis. Glucosamine and Chondroitin sulfate are nutritional supplements that are carried in health food stores that appear to be safe and there is certainly research that suggests that these can be helpful in reducing the inflammation associated with arthritis and some studies have shown that even articular cartilage can be regenerated by taking these food additives. Dr. Theodosakis also recommends a program of regular physical exercise and losing excessive weight. Many studies are underway, but at this point it certainly looks like it is a promising alternative to nonsteroidal medications.

A second alternative for treatment had recently been approved by the FDA. This is the use of Hyaluronic Acid treatment for osteoarthritis of the knee. Hyaluronic Acid is naturally produced by the body and lubricates cartilage within the joint. With osteoarthritis the cartilage and other structure of the joint begin to break down. A small amount of inflammation breaks down the Hyaluronic Acid so that lubrication is lost. Hyaluronic Acid injections supplement the body's natural Hyaluronic Acid that is broken down by inflammation. A series of injections once week for five consecutive weeks have shown to be helpful in relieving the pain of arthritis. This may last several months but does not appear to stop the progression of osteoarthritis and is not considered a curative therapy. Minor side effects including irritation at the injection site occasionally occur. The medicine that has been approved in this country is called Hyalgan. This medicine has been in use in Europe and Canada for years, and used in the veterinarian community for horses and dogs with great success. This is given as an injection into the knee joint and is minimally painful. Some patients feel immediate relief after the first injection; some do not get relief until after the fifth injection. These injections are indicated only if patients have failed the normal routine of nonsteroidal medications and injections of Cortisone. We do not know how Medicare and other insurances are going to reimburse this because they are quite costly.

There is still no cure for defect of the articular cartilage and resultant osteoarthritis but there are many things we can do now to relieve the symptoms of this often painful condition. A moderate program of exercise, weight loss, cane and strengthening the surrounding muscles can be quite helpful and new techniques and products are being developed to try to assist patients in returning to a more active lifestyle without pain.

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