

Intervertebral Disc

Artificial Disc Relacement

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The search in medicine is on for body part replacements. Many devices and parts have been developed to repair or replace large weight bearing joints and some small extremity joints. In fact, replacement of painful arthritic joints has become more and more common. Surgical replacement of hip and knee joints has become a very successful procedure. It has become one of the most reliable and functionally restorative operative procedures in the field of orthopedics. Most spine surgeons have become more conservative in their approaches attempting to minimize compromise of tissues in the involved spinal region while also trying to restore or preserve movement of the spinal segment.

Because of all of the research that is being done there is a growing respect for role of each part of the whole and this include the spine. This is particularly important when considering the mechanical properties of the spine. Spine specialists appreciate the role of the intervertebral disc of the spine as part of the mechanical system as well as its role as a spacer between the bones of the spine. The physical relationship between tissues of the spine influences the pattern of nerve signals which arise from the tissues during movement. Currently, many spinal surgical approaches involve fusion of adjacent vertebrae resulting in a loss of movement of the spinal segment. This alters the mechanics of that whole region of the spine with the greatest stress placed on neighboring spinal segments. Intervertebral disc replacement can be performed in some situations to help maintain motion at the level of the operation.

The concept of replacing a compromised intervertebral disc with artificial discs is not a new one. Disc replacement surgery has been performed in Europe for more than 10 years. Some spinal implant manufacturers have redirected some of their research funding to investigate the value of the artificial disc. The application of an artificial disc is also referred to as a disc replacement, disc prosthesis or spinal disc arthroplasty. It is essentially a man made device which is surgically placed in the spine between tow adjacent vertebrae to maintain or restore the functions of a normal disc. The primary physical functions are to serve as a spacer, function as a shock absorber, carry a load and to allow for movement. The majority of disc replacements will be in the low back (lumbar spine). Cervical disc replacement can also be performed.

Types of Artificial Discs

There are different types of artificial disc designs. They can general be classified into two primary categories. The first is the total disc replacement and the second the disc nucleus replacement. Total disc replacement requires the near complete or complete removal of the original disc. A replacement device is implemented between the flat surfaces of adjacent vertebrae. Replacement of the nucleus requires that the hard gel like material within the center of the disc be removed and replaced with an implant. The supportive outer fibers of the disc called the annular fibers are left to surround and support the implant placed within the center of the disc.

Artificial discs can be made of a variety of different materials. Further research will help identify which materials will work the

best during short term as well as in the long term. The current artificial discs are usually made of metal or plastic-like (biopolymer) materials. Some of them are made of a combination of these materials. These materials have been used as part of other body implants for many years with good success.

Who should have an Artificial Disc?

The most successful and common form of treatment for disc disorders is conservative non-operative care. The chiropractic physician is playing an increasingly important role in the non-operative care of the spine. Not everyone who is a candidate for disc surgery is a good candidate for disc replacement. The indications for disc replacement will vary for each type of implant. The indications for disc surgery include but are not limited to intractable discogenic pain, a disc herniation which compromises spinal nerves and/or the spinal cord, severe degenerative disc changes with loss of disc height and related pain. Typically, surgery is not considered for disc-related pain unless the pain has been present for more than 6 months and an adequate trial of non-operative care such as chiropractic treatment, physical therapy, medication, injections, and activity modification has been performed. The MRI is usually the test which is used to best identify the problems associated with disc disease. Other tests include CT, myelography and discography.

There are a number of conditions, which may prevent an otherwise good candidate from having a disc replacement procedure. These risk factors include the presence of spondylolisthesis (slippage of one vertebrae over another), thinning of the bone called osteoporosis, vertebral body fracture, a spinal tumor, history of the development of excessive scar tissue, a bleeding disorder, allergy to the materials in the device, obesity, severe arthritis of the spinal joints, pregnancy, chronic steroid use and autoimmune disease. Also, total disc replacements in the low back are usually performed by going through the abdomen. An individual may not be accepted as a surgical candidate if they have had extensive abdominal surgery or if there is any condition in the abdomen, which may increase the risk for surgical complications.

The indications for a total disc replacement versus a nucleus implant will be different. The type of artificial disc to use, will depend on many factors including the condition which is being treated and the integrity and health of the neighboring spinal segments.

There are risks associated with all surgeries including disc replacement. The complications associated with disc replacement are similar to those of other spine surgeries. The risks include but are not limited to infection, implant rejections, nerve damage, injury to nerves, injury to blood vessels, the development of painful and restrictive scar tissue, intraoperative stroke, drug mediated complications such as anaphylaxes. Long term risk include breakage of the device, dislodgement of the device, abnormal wear of material within the device, failure of adjacent bone, post-operative chronic pain, and the immune rejection of the device. As with any spine surgery there is a risk for the development of new signs or symptoms. Anyone who is a candidate for this procedure must discuss the risk and benefits associated with the procedure in detail. It is also wise to obtain a second and in some case a third opinion before making a final decision.

Artificial Cervical Disc

The artificial cervical disc has been used fairly extensively in Europe and is gaining favor in the United States. The theoretical

advantage of the use of an artificial disc includes the preservation of joint motion after decompressive discectomy. It will also provide stabilization of the involved spinal segment without requiring total immobilization or fusion of the spinal segment. An artificial disc also helps to preserve the space between adjacent cervical vertebrae. This maintains the openings along the side of the spine where the spinal nerve travels. The preservation of some motion at the site of surgery will also help reduce damaging compensatory stress placed upon adjacent spinal segments which could lead to accelerated degenerative changes. There is promise for the use of the artificial cervical disc to manage degenerative cervical disc disease.