

Intervention - Spinal Disorders

Minimally Invasive Intervention for Spine Pain

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MINIMALLY INVASIVE SPINE INTERVENTION

Patient Evaluation and Selection for Minimally Invasive Spine Procedures

A minimally invasive spine procedure may be performed as part of a diagnostic workup or as a primary form of treatment. This form of intervention usually involves a minimal incision and/or the use of needles, probes and/or fiber optic imaging devices. One of the most common reasons for having a minimally invasive approach is for the treatment of pain that is felt to be arising from the spine.

Individuals who suffer from severe or chronic back pain are usually best served by a multidisciplinary team approach. Prior to treating pain it is important to try to identify the primary source of pain. This requires a diagnostic process. The first step in the evaluation process is the history and physical examination. This may be followed by more advanced diagnostic procedures in order to render an accurate diagnosis. After a diagnosis is reached the attending physician(s) can then decide what the best approach is to treat the condition. Determining the primary source of spinal pain can be a daunting challenge even for the most experienced physician. There are a vast number of spinal structures that are pain sensitive including but not limited to bone, muscles, ligaments, nerve structures and various membranes.

The Purpose of Image Guided Spine Intervention

The precise placement of needles and probes in and around the spine requires dynamic imaging for guidance. Most image-guided spine procedures are accomplished with fluoroscopy, a specialized application of X-ray imaging. Fluoroscopy uses X-ray to provide imaging from multiple projections. To accomplish this most fluoroscopy units have a C-arm configuration that wraps around an exam table. The head of the X-ray unit is on the C-arm that is motorized and can revolve around the table that the patient is on. This setup allows for dynamic imaging during diagnostic and interventional procedures. Image-guided therapy is typically performed in a specialized room permanently set up with fluoroscopy. Fixed based base C-arm systems are generally preferred over portable systems.

Other forms of imaging technology such as computerized tomography and open magnetic resonance imaging are also used for image-guided therapy. The use of CT has grown due to some of the limitations of fluoroscopy. While CT provides some advantages it is generally less available and more expensive than fluoroscopy.

Image Guided Percutaneous Biopsy

Background: Prior to the development of percutaneous biopsy techniques, an open biopsy was required. One of the advantages of open biopsy is that a larger incision is made allowing for greater visualization of the tissue landscape and the ability to extract larger tissue samples. The open biopsy can also be performed during a spinal surgical decompression or stabilization procedure. Current imaging technology can be used to dynamically guide minimally invasive percutaneous biopsy. The percutaneous approach offers several advantages over an open biopsy that includes a faster approach, cost efficient application and overall lower risk of complications. The healing time is also faster. Image-guided spine biopsy can be performed in order to reach small areas surrounded by vital structures with less risk to the surrounding structures and blood vessels.

Procedure: Percutaneous biopsy can be performed in an inpatient or outpatient setting. A variety of laboratory studies are usually performed prior to biopsy. Local or general anesthesia may be used. It is usually performed with local anesthesia and intravenous conscious sedation. The patient is positioned according to the spinal level to be investigated. A needle is carefully placed under CT or fluoroscopic guidance. An excision or aspiration technique is used to extract tissue or fluid.

Indications for Procedure: A spinal biopsy is often performed to assess the tissue characteristics of a destructive or space-occupying lesion. Other indications for image-guided percutaneous spine biopsy include evaluation of a primary or secondary spinal tumor, assessment of the cause of a spinal compression fracture, to help rule out an infectious process, to perform tests to identify infectious organisms and to assess the cause of a localized inflammatory process.

Goals of the Procedure: The primary goal of the procedures is to obtain the necessary amount of tissue required for adequate evaluation while exposing the patient to the least amount of risk possible.

Radiofrequency Facet Denervation

Radiofrequency facet denervation is a procedure that is performed to anesthetize the nerve that goes to the facet joint. The procedure is performed with a needle that is placed under the guidance of X-ray. Once the needle is in place an electrode containing a heat sensor is passed through the needle. The electrode is used to apply a current that heats the nerve up just enough to destroy pain fibers within the nerve. Typically several points along the nerve are treated this way. The procedure commonly last between 30 and 60 minutes. If the facet joint was the primary source of pain successful radiofrequency denervation of that joint is usually effective at reducing or eliminating back pain.

Epidural Steroid Injection and Selective Nerve Blocks

Background: The placement of steroidal material into the epidural space has been utilized since the early 1900s. Lower back epidural injections were first described in 1901. The basis for anti-inflammatory injections within the vertebral column is based

on the presence of pain sensitive nerve fibers within many of the spinal tissues. There is a double-layered membrane, which forms the outer margin of the central space within the spinal canal. This membrane and the epidural space lie within the entire length of the bony spinal canal. The epidural space completely surrounds the thecal sac, which contains all the nerve roots in the low back. Nerve root symptoms and sciatic pain are sometimes the result of a combination of mechanical compression as well as inflammatory changes. One of the more common causes of nerve compromise is degenerative disc disease and resultant disc bulge or herniation. Research has shown the presence of inflammatory cells as well as increased protein levels within the cerebrospinal of many patients with degenerative spine changes. The pharmacological basis for the use of epidural steroid injections is the presence of inflammatory changes.