# Options for Spine Treatments

## Advancements in Spine Care and Spine Surgery

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**Spine Navigation Technology and Image-Guided Surgery**

One of the greatest advances in spine surgery has been the emergence of image-guided surgery. Image-guided surgery enables spine surgeons to see and navigate through the patient's anatomy in a three-dimensional (3D) format in real time before and during surgery. The ability to perform image-guided surgery is the result of the merging of a variety of technologies including computers, sophisticated software, specialized surgical tools, accurate lighting, instrument sensors, virtual measurements, and precision position-measurement systems. The use of such technologies results in greater surgical accuracy, increased ability to apply minimally invasive surgical techniques and improved patient outcome.

Computer image-guided spine surgery is much more capable of precise localization than plain X-rays. The technology incorporates a combination of X-ray studies and computer processing of images to provide the surgeon with precise intra-operative guidance. It is important for the surgeon to know where he or she is at all times to minimize tissue compromise and to help ensure adequate tissue resection. In summary, advanced spinal navigation technology allows the surgeon to be more accurate in the placement of spinal instrumentation, to be more precise during nerve decompression and to be more exact during tumor or other tissue resection.

Acquired 3D images can be magnified, rotated, enlarged, flipped, angled, or manipulated in a variety of other important ways. Virtual lighting can be modified to enhance visualization on the multidimensional model. This type of modeling allows the surgeon to accurately plan the surgical procedure including precise determination of the type and size of instrumentation required (e.g. screws), as well as the path of implant placement and trajectory. This type of sophisticated pre-operative planning will help ensure a successful post-operative outcome. This type of technology is extremely helpful when dealing with a patient who has a unique spinal deformity or anomaly.

During spine surgery instruments can communicate information to a computer and the surgeon in real time. The spine surgeon can view this relationship to the spine on a computer monitor as he precisely operates on the spine. The digital projection allows the surgeon to see a perspective or relative position of the surgical instruments that cannot be directly observed during the operative procedure. On the computer monitor, the surgeon can see the position of the instrument as it relates the patient's anatomy helping to orient the physician to the position of the surgical instruments.

Computer assisted spine navigation or image guided surgical technology provides the surgeon with an opportunity to view the spine from multiple perspectives during the operative procedure. Pre-operative image acquisitions and three-dimensional modeling can assist surgical planning. Pre-operative virtual surgical planning can be very important especially when utilizing

instrumentation. The dimensions of spinal implants can be entered into the computer and virtual placement can occur making the surgeon aware of the physical relationships between the spine, its contents and the surgical implants.

**Endoscopic Microdiscectomy**

Microdiscectomy refers to a procedure used to remove herniated disc material that lies in the spinal canal adjacent to a nerve or the spinal cord. The procedure usually requires the removal of a segment of bone (laminectomy) creating an operative window requiring an incision approximately one to two inches long. In some cases the surgical incision may be longer. The traditional laminectomy and microdiscectomy is performed with external visualization of the surgical field magnified with an operating microscope.

An endoscopic discectomy refers to the surgical removal of an intervertebral disk using an endoscope. An endoscope is a device that utilizes a tube with an optical system mounted at the end of it. This small optical system can be inserted through a relatively small incision or puncture opening and is used to guide the operative procedure.

Endoscopic microdiscectomy is often performed as an outpatient surgical procedure. On the average, the procedure performed at one spinal level takes about an hour. X-ray exposure is minimal. An individual may experience a little pain or discomfort after the procedure. The amount of disc material removed will vary from patient to patient. The overall supporting structure of the disc is not compromised by the procedure. During endoscopic microdiscectomy the window of access and the access route to the disc consists of only the probe's small puncture site, usually the size of a large freckle.

An endoscopic discectomy is less invasive than open lumbar disc surgery. Sometimes a surgeon may prefer an open surgical procedure so that they can better visualize and investigate the area in question or to perform the procedures necessary. An open incision may be required to perform additional procedures after microdiscectomy. The endoscopic procedure does not typically require back muscle dissection or bone removal. A large skin incision is usually not necessary. The risks of complications from scarring, blood loss, infection, and anesthesia that may occur with conventional surgery are reduced with endoscopic microdiscectomy. There are generally no stitches used. Endoscopic microdiscectomy may not require general anesthesia. Most patients are discharged within a few hours of the procedure. A band aide or butterfly is often used to close the skin entry site.

**Intra-Operative Neurophysiological Monitoring**

When surgery on or near the spinal cord or spinal nerve root is required, careful neurophysiological monitoring of spinal function during the operation can be performed. Intra-operative neurophysiological monitoring encompasses a variety of procedures that have been used to monitor the integrity of neural pathways during high-risk neurosurgical procedures that could result in damage to the nervous system.