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Minimally Invasive Spine Surgery

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Minimally invasive spine surgery is an evolving concept. What was minimally invasive 10 years ago is likely not considered to be minimally invasive today. The technique transcends small incision operations. The surgical envelope of small incisions is constantly challenged with the idea of creating less soft tissue injury, swelling, and therefore pain. This translates to shorter recovery times and less pain. Less pain is what outpatient surgery represents.

There is a myriad of pathologic conditions that can now be approached with so called minimally invasive approaches and the indications continue to expand. The ability to approach the spine from a minimally invasive standpoint can occur through small incisions, through tubular retraction systems, or through endoscopic or laparoscopic techniques.

From a surgeon's standpoint the technique can be mentally as well as physically challenging. There is, by definition, a limited view of anatomy. This requires an expert understanding of local anatomy, as well as localization of the pathologic area with pre-operative imaging studies. Three dimensional imaging is helpful and allows for localizing incisions directly over the area of pathology. Fluoroscopic/ imaging guidance is required for minimal access techniques.

Procedures are basically the same as with standard open techniques; neural decompression, discectomy, and fusion procedures. The major difference occurs in the direction to which the procedure proceeds from. Many times this procedure will be a muscle splitting approach which means that the procedure is carried out through the muscle which allows for normal, uneventful healing of tissue as opposed to muscle tearing approaches which can result in permanent scarring and dysfunction of normal muscle tissue. What can occur when the muscle is retracted extensively is that the muscle will lose the nerve input to the individual myofascicles which results in muscle scarring and subsequent dysfunction.

Anatomically the procedure commences as with any open procedure, only the field has been significantly coned down. Therefore, what typically must be done is to utilize fluoroscopy or some form of image guidance. This helps the surgeon know exactly the location in the anatomic field. At this point the procedure would be performed with utilization of one of these techniques to ensure proper surgical location. The limited exposure requires a three dimensional understanding of anatomy and therefore the pathologic condition.

Generally a tubular retractor system is required which functions to retract the muscles out of the way as well as focus the field through a narrow operating window. The incision would be placed directly over the field of pathology. The surgeon will either use operating loupes or a microscope to visualize the operating field. The evolution and improvement of equipment in the OR facilitates the performance of a proper operative procedure.

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Procedures that can be carried out with minimally invasive techniques are many. Nerve root decompressions such as discectomy or osteophytectomy are easily performed. Additionally fusion surgeries can be completed via small incisions with muscle splitting approaches and the use of x-ray equipment. Also special applications such as using BMP's (bone morphogenetic protein) or other special grafting substrates precludes the need to painfully remove bone from the patient to facilitate fusion formation.

Fusion techniques performed from the back, front, side, or underneath are all available. Not only can this be performed in the back but can be performed in the neck as well. It becomes ordinary that what can be done in the low back can be done elsewhere in the spine i.e. cervical and thoracic.

Lastly the use of minimally invasive techniques can be utilized for traumatic injuries as well. The need to stabilize the spine can be assisted by the use of placing screws and rods with minimally invasive procedures. Several levels above and below an injury can be stabilized by the use of minimal access techniques. This minimizes muscle trauma, allows for stabilization which facilitates early patient mobilization improving the outcomes of traumatic injuries.

The use of microinvasive spinal technologies continue to evolve. Improvement in patient recovery time, less post-op pain, and enchanced outcomes can be expected with these techniques. However, these procedures do have a significant learning curve and surgeon experience will show shorter operating times and lower complication rates with repetition.