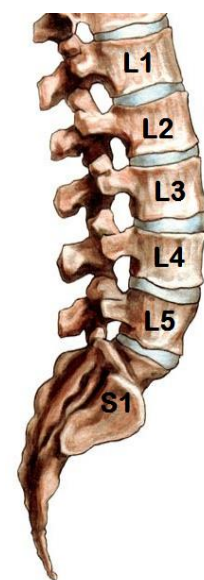


Your Lumbar Spine:

Degenerative Scoliosis: ☐Yes ☐No

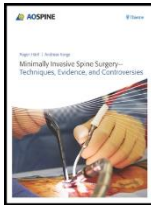


	Lumbar Stenosis	Degenerative Disc Disease	Disc Herniation	Right Foraminal Stenosis	Left Foraminal Stenosis	Spondylo- listhesis	Synovial Cyst
L1/L2							
L2/L3							
L3/L4							
L4/L5							
L5/S1							

Dr. Härtl's Recommendation



Weill Cornell Medicine
Brain & Spine Center



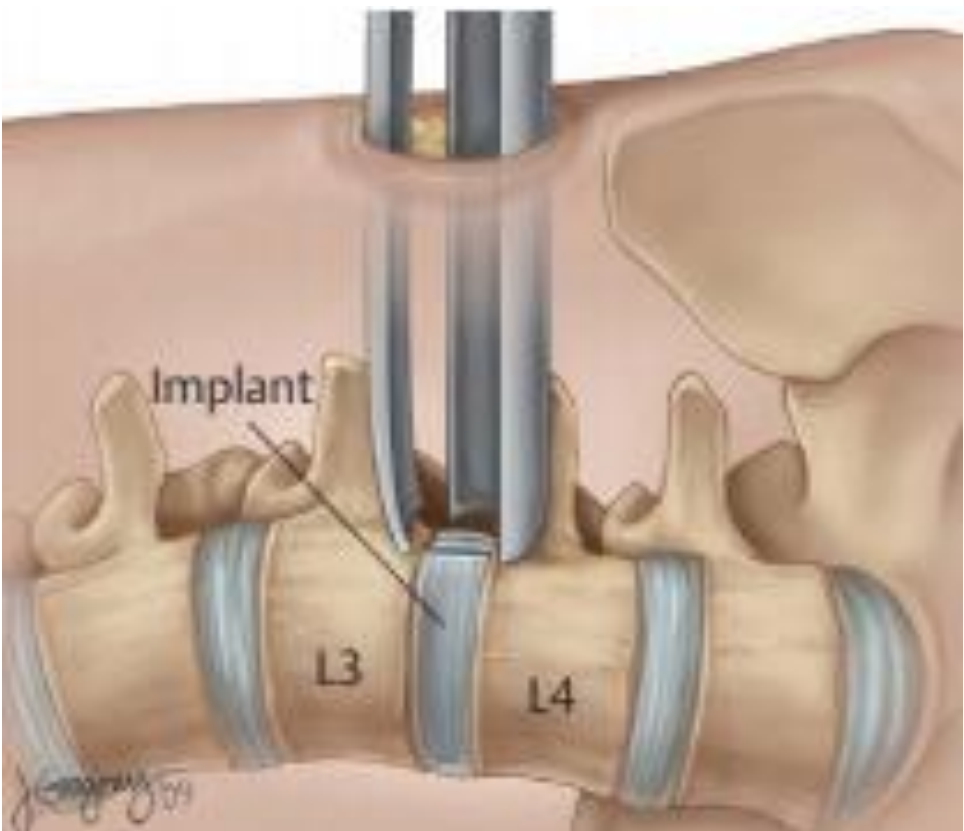
Roger Härtl, MD
525 East 68th Street, Box 99
New York, NY 10065
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If you would like to proceed with recommended surgery, please call:
Rebecca Cramer, FNP-BC 212-746-2152
Alba Briceño, Surgical Coordinator 646-962-9755
Fax: 646-962-0640



Weill Cornell Medicine
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**Minimally Invasive Spinal Fusion
Through A Lateral Approach**



**Extreme Lateral Interbody Fusion
(ELIF, XLIF, LLIF, DLIF)**

Understanding the Spine

The spine is made up of vertebrae, which are bones that are stacked on top of each other in a column. Between these bones are discs that act as cushions. The discs have a tough outer ring called the annulus fibrosus. This outer layer covers the inner gel-like center of the disc, called the nucleus pulposus. The vertebrae meet at bony junctions called facet joints connected by ligaments called ligamentum flavum. The spinal cord and nerves are contained in the spinal canal, which runs through the column made by the vertebrae. Nerves exit the spinal canal on each side through the foramina, which are openings between the vertebrae.

Common Low Back Issues Requiring Fusion

Spondylolisthesis

- Slipping of one vertebra forward or backward relative to one another
- Can be congenital (born with it) or result from normal the aging process, trauma, or prior surgery
- Narrowing of the spinal canal and neural foramen may cause pressure on the nerves which can also cause low back pain, leg pain, numbness, or weakness

Foraminal Stenosis

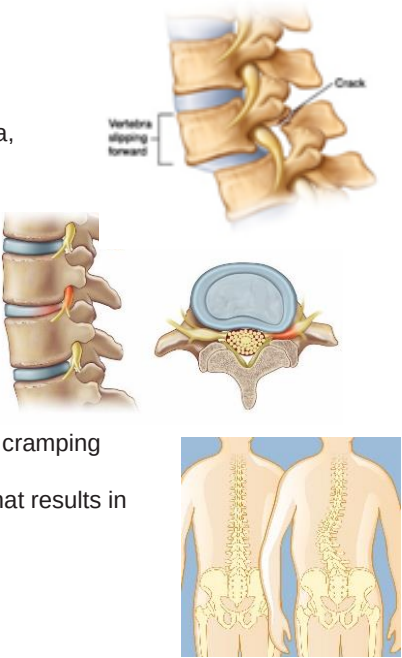
- Narrowing of the openings between vertebrae where the spinal nerves exit the spinal column
- May be caused by bone spurs (outgrowth of bone), and/or herniated or bulging discs
- Foraminal narrowing may lead to compression of the nerves which can cause low back pain, hip pain, buttock pain, leg pain, numbness, weakness, or cramping

Degenerative Scoliosis

- With the normal aging process, degenerative changes can occur in the spine that results in scoliosis, or curvature of the normally straight spinal column
- The abnormal curve of the vertebrae can result in compression of the spinal nerves, causing low back pain, leg pain, numbness, weakness and/or cramping

Degenerative Disc Disease

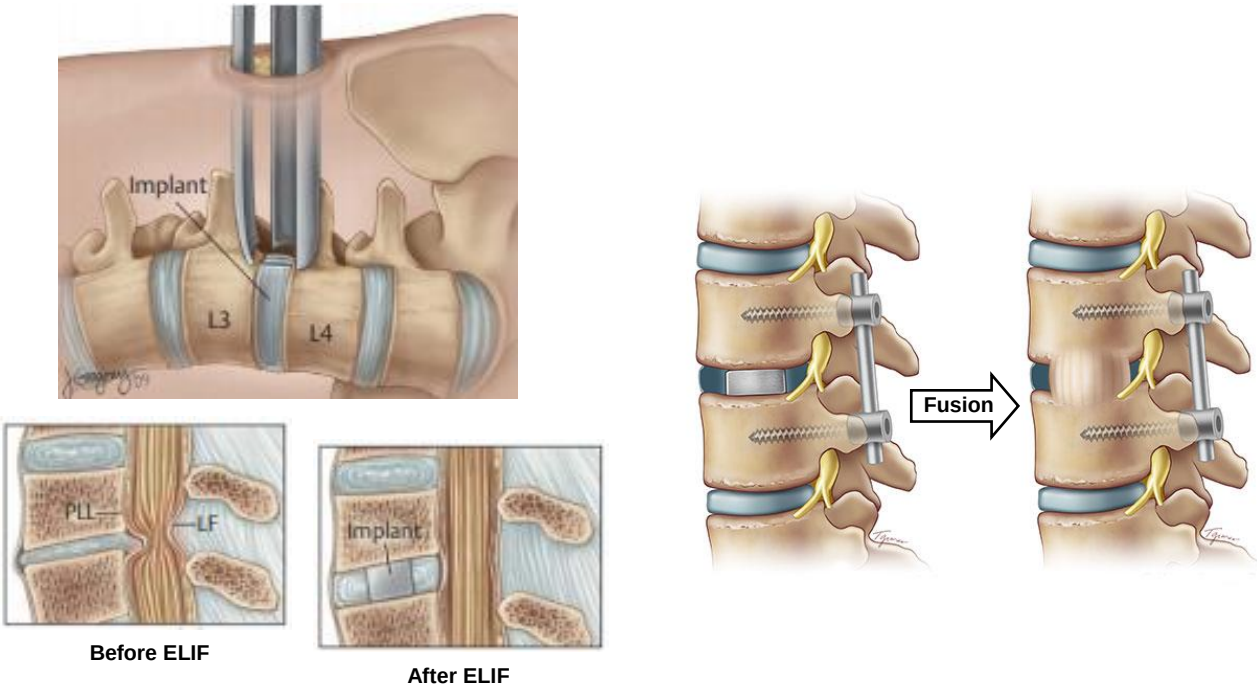
- Degeneration of the intervertebral disc is normal as we age
- Can result in disc space collapse, which can result in compression of the nerves and lead to low back pain, buttock pain, leg pain, numbness, tingling, or weakness



The Procedure: ELIF

With the patient lying on his or her side, a small incision is made on the flank. Dilating tubes are used to gently spread the psoas muscle apart so a retractor can be placed to access the lateral vertebrae and disc space. The intervertebral disc is then removed and a metal “cage” is placed into the disc space to lift up the bony anatomy and relieve pressure on the nerves. Intraoperative neuromonitoring is used throughout the case to avoid injury to the nerves. If only one level is being treated, while the patient is still on his or her side, screws and a rod are placed on one side of the spine through one small incision in the back. If more than 1 or 2 levels are being treated, the patient is placed on his or her stomach and screws and rods are placed on both sides of the spine through 2 small incisions. Screws are placed on both sides of the spine and are connected with a rod on each side of the spine to fix the bones in place. This is achieved through 2 small incisions.

Extreme Lateral Interbody Fusion (ELIF)



Treatment Options:

Conservative Treatment Options

These common low back issues may first be treated with conservative management. This may include rest, weight reduction, medication, physical therapy, and/or steroid injections.

Surgical Options

Surgery is usually saved as the last treatment option for those who have not had improvement of symptoms with conservative treatments. Surgery involves fusion of the bones in the spine. This requires placement of screws and rods, and a metal “cage” in between the vertebrae. There are several surgical techniques for the performance of spinal fusion. Traditional open approaches require extensive muscle dissection and large incisions, and may be associated with increased blood loss during surgery and infection risk.

An alternative approach is a minimally invasive procedure called an extreme lateral interbody fusion (ELIF). There are several other names for this procedure including XLIF, DLIF, and the lateral transpsoas approach. This minimally invasive technique is performed through a small incision on the side of the abdomen.

How is ELIF Better?

The surgical outcome and relief of symptoms with MIS TLIF is similar to a traditional open procedure. However, since tubular retractors allow surgeons to decompress nerves through a small tube, it offers several advantages:

- Two small incisions
- Less muscle damage – retractor tools spread the muscle instead of stripping or cutting it from the bone, which decreases post-operative pain and allow for an easier recovery
- Less post-operative pain
- Shorter hospitalization and speedier recovery
- High patient satisfaction scores
- Lower risk of infection

Another Key Benefit

We perform ELIF using computer-assisted navigation, which serves as a GPS of the patient's anatomy during the procedure. By using this GPS system, we can place the screws with very high accuracy.

The Results and Scientific Evidence

- Multiple studies by our group and others show that ELIF results in: ^{1,2}
 - correction of scoliosis (curvature of the spine)
 - increase in neural foramen and intervertebral disc height, which in turn results in indirect decompression of the nerves
 - relief of preoperative pain symptoms
 - low complication rates and low risk of infection
 - high fusion rates
- Our research also shows that with the use of computer-assisted navigation, a GPS-like system, we achieve extremely high accuracy for pedicle screw placement. ^{3,4}

References:

1. Alimi M, Hofstetter CP, Cong GT, et al. Radiological and clinical outcomes following extreme lateral interbody fusion. *J Neurosurg Spine*. 2014;20:623-635.
2. Lehmen JA and Gerber EJ. MIS lateral spine surgery: a systematic literature review of complications, outcomes, and economics. *Eur Spine J*. 2015;24:287-313.
3. Lian X, Navarro-Ramirez R, Berlin C, et al. Total 3D AIRO® navigation for minimally invasive transforaminal lumbar interbody fusion. *Biomed Res Int*. 2016;2016: 5027340.
4. Torres J, James AR, Alimi M, et al. Screw placement accuracy for minimally invasive transforaminal lumbar interbody fusion surgery: a study on 3-D neuronavigation-guided surgery. *Global Spine J*. 2012;2:143-152.