Back pain is one of the most common conditions in any population and have a variety of etiologies. The costs for treatment and absence from work are tremendous. Low back pain originates from paraspinal muscles, facet joints, spinal ligaments, failed endplates, or degenerative intervertebral discs. Current strategy for back pain aims to alleviate the symptom and to resolve etiology itself. Surgical options have been considered when conservative treatment fails. Conservative therapies include reduced activity and bed rest, analgesics, muscle relaxants, nonsteroidal anti-inflammatory drugs (NSAID) and/or rehabilitation programs. When the conservative therapies fail, patients undergo a surgical treatment, which includes decompression, stabilisation and/or fusion. Spinal fusion is the surgical connection of two or more adjacent vertebrae to immobilise. To relieve pain, correct deformity, and improve stability. Indications for spinal fusion include evidence of instability, stenosis that may result in progressive deformity after surgical decompression, i.e. iatrogenic instability, and recurrent disc herniations in some patients caused by segmentary instability. Spinal fusions have been performed for conditions such as infection, trauma, deformity, degenerative conditions, resection for spinal tumours for more than a century. Surgical fusion requires bone graft use to facilitate fusion. Bone grafts are either autograft (patient’s own bone source), or allograft from a donor.

The first lumbar anterior interbody fusion was reported in the 1930s. That was open technique. The development of new techniques and technologies and better understanding of surgical anatomy gave rise to minimally invasive spine surgery (MISS).

A. Presacral ALIF (anterior lumbar interbody fusion)

Presacral ALIF or AXIALIF is performed for the interbody fusion of the lower lumbar vertebrae. Instability due to degenerative disc disease and spondylolisthesis is frequently seen at L4–L5 and L5–S1 levels, which may require fusion to achieve stability and relieve symptoms. Presacral ALIF or transaxial anterior lumbar interbody fusion involves an incision either midline or lateral to the coccyx. The sacrum is separated from the rectum with a mesorectum covered by visceral fascia. This plane serves as the minimally invasive route to the sacrum and the anterior lower lumbar vertebrae. A guide pin introducer is advanced gently along the anterior midline of the sacrum. Tactile feedback and fluoroscopic guidance is essential during the entire AXILIF process to avoid iatrogenic complications of vasculature and intrapelvic organs. Once a tunnel is achieved to the
inferior endplate of L5 through the sacrum discectomy is performed using specially designed cutting-loop devices and wire brushes, then bone graft material is packed directly into the disc space. (figure 1-5) Finally, a drill is used to penetrate the upper lumbar vertebrae (the one which will be fused) then a titanium-threaded rod is implanted. The system is often strengthened with posterior percutaneous pedicle screws.14-16

Figure 1: Direction of the fixation screw and anatomic relations

Figure 2: Opening and dissecting the presacral space to place working cannul.

Figure 3: Drilling upto the above vertebrae to be fused to place screw.
Disadvantages of the AXIALIF

Most of the spinal surgeons are less familiar with presacral anatomy than general or colorectal surgeons are; therefore, evaluating the presacral anatomy is critical before performing the procedure in order to reduce the risk of complications.

Direct visualization of the discectomy directly is not possible due to the minimally invasive nature of the procedure.

Advantages of the AXIALIF

Reduced injury and disruption of the posterior musculature, ligaments, because the disc space is accessed through small incision to access the presacral space.

The abdominal cavity is not entered and mobilization or retraction of the vasculature or intra-abdominal viscera is not necessary.

AXIALIF process or interbody fusion can be achieved through open or minimally invasive approaches. Open techniques involve dissection, retraction, and mobilization of soft tissues and vital structures such as nerve roots, major vessels, ligaments, annuli, and abdominal viscera. The traditional open approach is often associated with significant postoperative pain, disability, and dysfunction. Minimally invasive techniques are more technically challenging for inexperienced surgeons but they provide symptomatic relief equivalent to that of open approaches based on short-term clinical data. Moreover, clinical benefits of minimally invasive techniques include
significantly reduced blood loss, postoperative pain, hospital stays, and narcotic usage.  

B. Mini Anterior Lumbar Interbody Fusion (ALIF):

This surgical procedure is performed for lumbar spinal fusion. Approach is from the anterior (front) of the patient. L2-3-4-5-S1 levels can be approached through a limited anterior abdominal incision. A surgical microscope or an open video endoscopy can be helpful in ALIF procedure. Mini ALIF is first described in 1995 and first preliminary results have been released in 1997. The advantages of this technique are as follows: Since it is a retroperitoneal spinal procedure this technique is not unknown for spinal surgeons, with the use of retractors only one assistant is enough for the procedure, the risk for intraabdominal structures is minimal since it is a retroperitoneal approach, positioning and surgery: Patient is positioned supine and a roll under the back to exaggerate the lumbar has been placed or the table is broken to increase lordosis which is very important to expose disc space and to capture the implant inserted in the disc space in compression after excess lordosis has been corrected to prevent graft and implant slippage. Generally a lower midline abdominal oblique incision is performed at the level of disc under realtime C-arm scopy. Surgeon generally stands on the right of the patient. Rectus abdominus sheath has been identified and transversely incised after the skin incision. Then laterally under the rectus dissection is carried to enter the retroperitoneal area at the linea arcuata. The anterior lumbar spine is exposed medial to the psoas muscle. Retractors are either fixed to the vertebrae by screws or pins or to the table. (figure 6,7) Mini-ALIF followed by percutaneous PF is an efficacious alternative for low-grade isthmic spondylolisthesis, and posterior decompression is not necessary to relieve leg symptoms. This minimally invasive combined procedure offers many advantages, such as preservation of posterior arch, no nerve retraction, less blood loss, excellent cosmetic results, high fusion rate and early discharge. 

![Figure 6: Anatomic relations and the entry route for the mini ALIF procedure](image)

![Figure 7: Postoperative x-ray of the mini L5-S1 ALIF](image)
Indications for Mini-ALIF

1. Degenerative disc disease (DDD) with or without disc herniation that may require a total lumbar disc replacement;
2. For fusion-cases like degenerative instability, tumors, isthmic and
3. Degenerative spondylolisthesis: with
   a. Instability
   b. Backpain due to instability
4. Fractures, spondylodiscitis,
5. Failed back syndrome (pseudoarthrosis, post-discectomy)

Relative Contraindications

1. Previous abdominal surgeries;
2. Aortic bifurcation and/or venous confluens directly in front of the disc space;
3. Infections with the formation of a large prevertebral granulation tissue or psoas abscess
4. No radiculopathy
5. No resting backpain
6. Absence of complete block on myelography

Patients are candidates for mini ALIF. It may be performed either open mini-ALIF or with the help of microscope or endoscopy.\footnote{15}

As a result, if a patient has pure mechanical backache an anterior fusion and stabilization is a good choice to preserve the disc height, achieve fusion, preserve the posterior stabilizing soft tissues to prevent iatrogenic instability and adjacent segment degeneration. However there is a high incidence of graft slippage and subsidence risk has been reported in the stand alone grafting and fusion cases. So implants to help the stabilization and to decrease the risk of subsidence and graft slippage have been developed such as cages and anterior instrumentation including plates, screws and rods. Bone grafting and fusion process can be achieved either posteriorly or anteriorly directly between the vertebral bodies. When it is processed anteriorly, first intervertebral disc is removed entirely, then the space is filled with a spinal implant and bone graft to form a cast and a support in between vertebral bodies during fusion period. Even though there is a controversy in naming the fusion processes the site of the surgery to the spinal column has a pivot role in the naming. Such as ALIF or AXIALIF.\footnote{5-7,20-23}
References


