



ANTERIOR LUMBAR INTERBODY FUSION

ANTERIOR LOMBER INTERBODY FÜZYON

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SUMMARY

Anterior lumbar interbody fusion has been developing in parallel with industrial development during the last 20 years, and nowadays is becoming more popular at the L2–5 level. As the technique develops, the advantages are increasing and complications related to the approach are decreasing. In this review, the technical details and methods to protect from complications are underlined.

Key words: ALIF, discogenic lower back and leg pain, sagittal balance.

Level of evidence: Review article, level V

ÖZET

Anterior lomber interbody füzyon tekniği son 20 yıl içerisinde endüstrinin gelişimi ile paralellik göstererek günümüzde L2-L5 seviyesinde popülaritesini arttırmaktadır. Tekniğin uygulamasında ustalaşılması ile beraberinde getirdiği avantajlar yadsınmayacak derecededir. Tekniğe bağlı komplikasyonların öğrenme eğrisi ile azalması bu tekniği uygulanabilir kılmaktadır. Bu derlemede ALIF ile ilgili teknik detayları ve komplikasyonlardan korunmanın yolları vurgulanmıştır.

Anahtar Kelimeler: ALIF, diskojenik bel ve bacak ağrısı, sagittal denge

Kanıt Düzeyi: Derleme, Düzey V

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Received: 04th April, 2013
Accepted: 14th June, 2013

INTRODUCTION:

Medical and surgical treatment options are available for discogenic lower back and leg pains. The range of surgical treatment options vary from basic discectomy to interbody fusion and disc prosthesis. The advantages of interbody fusion can be to provide solid, stable arthrodesis, to protect the disc height, and to restore the sagittal balance¹⁴. The ALIF (Anterior Lumbar Interbody Fusion) technique was first used in cases of lumbar spondylolisthesis by Capaner in 1932³. ALIF was recommended to totally remove the disc that might be the cause of pain, to restore disc and foramen heights, and to remove abnormal segmental movement due to disc degeneration, and the first lumbar ALIF approach was defined using a retroperitoneal approach. Over time, both retroperitoneal and transperitoneal ways have been defined and used.

In this review, we will discuss the ALIF method of interbody fusion in detail.

ADVANTAGES:

1. Shorter operation period;
2. Less blood loss;
3. Removing the possibility of additional discogenic pain, due to total disc excision;
4. Minimizing the risk of epidural scar formation due to the absence of a posterior element approach^{12,22,24};
5. Increasing fusion by structurally supporting the anterior column and reducing stress on the pedicular screws⁵⁻¹⁹;
6. Providing central canal and foramina decompression indirectly as a result of restoration of disc distance²⁰.

INDICATIONS:

The indications for ALIF include:

1. Symptomatic post-traumatic kyphosis;
2. Iatrogenic lumbar kyphosis (flat back syndrome);
3. Painful lumbar degenerative scoliosis with disc disease;
4. Pseudoarthrosis (as in unsuccessful PLIF);
5. Secondary instability to wide laminectomy/posterior decompression;
6. High-grade spondylolisthesis or spondyloptosis;
7. Degenerative instability (especially in patients with

- Modic type I changes in MRI)¹⁸;
8. Spinal stenosis with instability¹⁵.

CONTRAINDICATIONS:

Definite contraindications include:

1. Having previously had large abdominal or gynecological surgery (hysterectomy, column resection, etc.);
2. Having had vascular bifurcation at a low level (in front of L5–S1).

The relative contraindications include:

1. Spondylitis/spondylodiscitis with large pre-vertebral soft tissue mass or psoas abscess;
2. Having previously had an ALIF operation at the same level;
3. Abdominal diseases (such as Crohn's, ulcerative colitis);
4. Morbid obesity;
5. An inappropriate course of the common iliac vein, close to the left lateral of the L4–5 disc level¹⁵.

SURGICAL TECHNIQUE:

ALIF can be performed with lateral lumbotomy between L2 and L5, and can be performed in the midline between L3 and S1, retroperitoneally or transperitoneally. In this review, interbody fusion between the anterior L3–S1 with a retroperitoneal approach will be discussed, because surgeries are frequently performed in such a way that the left side of the patient stays at the upper site with classic lumbotomy. In some cases, it is possible to reach the L2–3 disc, but it is important to be careful of the renal vein.

In this surgery, it is important for cases that have previously had surgery with a retroperitoneal approach, that this is discussed before surgery.

In our practice, while we accept previous retroperitoneal vein or disc surgeries as contraindications, other abdomen surgeries or caesarean sections are not considered contraindications. Young male patients should be informed about the possibility of retrograde ejaculation due to damage to the hypogastric plexus found at the left of the L5–S1 disc with this surgery. Young female patients should be informed about vaginal dryness⁸.

For surgeons new to this technique, it will be reassuring to detect the level of the aorta and vena cava bifurcation, and any anomalies of this region, with BT or MRI angiography before surgery. Preoperative detection of anomalies and revealing the relationship between the disc and the vein will be helpful to detect any requirement for assistance from vascular surgery in advance. In our daily practice, BT, MRI angiography or vascular surgery experts are not routinely referenced.

In Figure-1, the equipment used for the classic anterior retroperitoneal approach and the table layout is shown. Automatic retractor sets or deep retractors will be needed for surgery of the deepest level of the abdomen. In addition, longer punches, curettes, forceps, aspirators and Karreson rongeurs will be needed for overweight patients, as classic posterior surgical equipment cannot be used at the deepest levels.



Figure-1. Anterior necessary equipment for anterior object interfusion

The patient is laid down with abducted legs in a supine position on the operating table (French position) (Figure-2). The table is positioned to allow AP and lateral fluoroscopy. Positioning of the patient in the Trendelenburg position at about 15–20° will relieve exclusion by allowing the abdomen contents to slide upwards. This position will also help the surgeon to easily work between the legs.

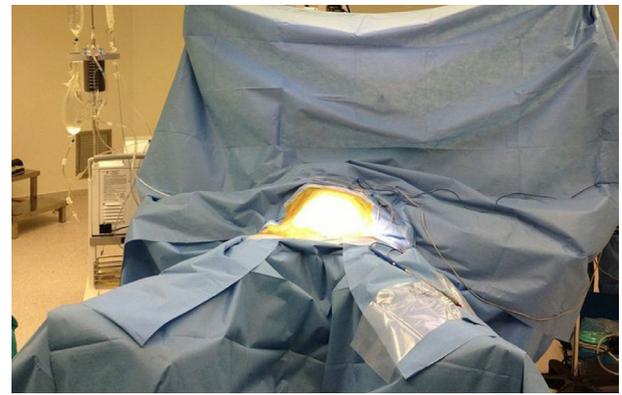


Figure-2. Position of patient

We usually use a lower abdomen midline incision but we reach proximally with a para-median incision or median incision when we want to access the L3–4 and L2–3 levels, in particular (Figure-3). If only the L5–S1 disc is to be accessed, the use of a bucket handle incision under the bikini region will be appropriate.

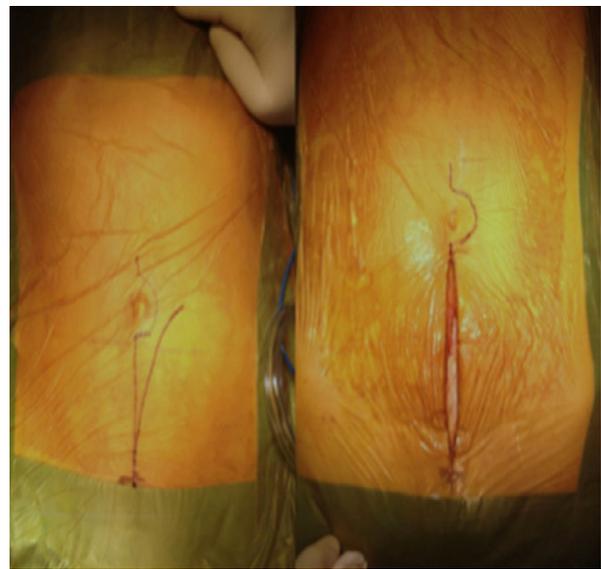


Figure-3. Incision image

We generally prefer the lower abdomen median incision in our practice. After passing the skin and subcutaneous fatty tissue, the abdominal fascia is longitudinally and carefully opened from 3–4 mm left of the midline. It is moved towards the lateral from the midline over the left peritoneum between both rectus abdominus muscles. The retroperitoneal fatty tissue is found. In this phase, the epigastric inferior vein found underneath the rectus

muscle, extending from the lateral to the top, is clearly seen and protected. The iliopsoas muscle is found in the lateral, and the iliac artery can be palpated at the medial (Figure-4). In some female patients, the ligamentum rotundum can prevent access to the medial in this phase. It can be cut after burning it with a clamp. While processing to the proximal of the incision with blunt dissection, the fascia transversalis and peritoneal sac should be cut and removed from the abdomen lateral wall with cautery or scissors against the abdominus internus muscle. Peritoneal rupture occurs most frequently in this phase, and repair is difficult due to the location. After the transversalis fascia and peritoneal sac are removed from the abdomen lateral wall, it is easy to move proximally.

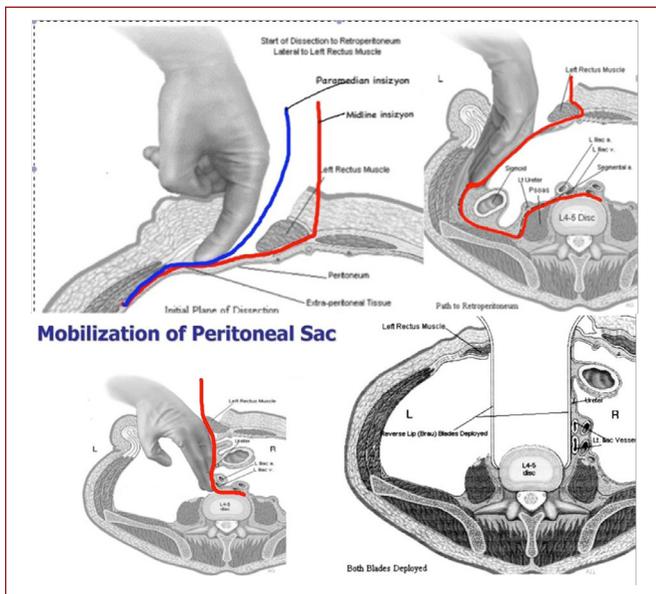


Figure-4. Palpation of the iliac artery

The ureter should be found and protected by reaching the medial with blunt dissection over the iliac artery. At the left side, the ureter goes to the bladder, crossing over the iliac artery and vein. The most important test for detection of the ureter is to see obvious peristalsis when it is squeezed and left with blank, flat forceps. The ureter is excluded to the medial (to the right) after peristalsis. The promontorium is palpated with a fingertip in this phase and bluntly dissected towards the midline by a gassy tampon. In this phase, the left common iliac artery and vein should be seen and carefully protected. The L5–S1 disc is seen, and the sacralis media artery and vein

over the disc should be carefully burned and cut. In most cases, fusion can be performed due to easy drainage of the L5–S1 disc bifurcation location.

For the L4–5 level, blunt dissection is continued at the left side over the left iliac artery and vein. The most important point to be considered here is the presence of the iliolumbar vein. It should be carefully tied and cut, as it will be near or over the L4–5 disc. If it is not considered, severe bleeding can occur. The most important structure that should be considered and protected is the sympathetic chain. If the L3–4 and renal vein allows, the L2–3 discs can be reached by proceeding to the proximal from the same cleavage site. Proximal to the L2–3 disc level, lateral approaches should be considered for the L2–3 disc and proximal levels, because the potential of damaging the renal vein is high.

COMPLICATIONS:

Most of the complications of ALIF are due to the surgical approach^{16,17,21}. The main complications are lymphocele, pseudoarthrosis, cage subsidence, postoperative hernia, bowel obstructions, postoperative ileus, iliac vein thrombosis², urological injuries (1.4%) and retrograde ejaculation (0.4–2%)¹⁶. Major vascular complications have been reported at a rate of 0.5–4%¹⁰⁻¹¹. While working at the L4–5 level, the left iliolumbar vein, in particular, is at risk during the mobilization of the iliac vein¹.

DISCUSSION:

When compared with other interbody fusion techniques, the superiority of ALIF for restoration of disc height and providing sagittal balance has been reported in the literature. In a study by Hsieh et al., they stated that ALIF was more effective than TLIF in terms of providing local disc height and lumbar lordosis⁶. While the local disc height and lumbar lordosis can be increased 8.3 and 6.2 times, respectively, by ALIF, they can be increased 0.1 and 2.1 times, respectively, by TLIF.

When comparisons are made in terms of the clinical results, there are studies reporting similar results between ALIF and TLIF in the literature⁴⁻⁹.

However, it should be considered that different levels and different pathologies can affect these results.

The ALIF technique is an important tool for the treatment of some spinal pathologies, due to the advantages mentioned above. When compared with other techniques, although the rate of complication is higher, being aware of these complications and knowing ways to protect from them will allow surgeons to use this technique safely. Despite the complications, we consider ALIF to be a good technique with a 90% fusion rate, when it is applied using the proper technique^{7,13,23}.

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