Distinguishing Between the Spinal OLIF and OLLIF Procedures

Confusion with the War of the LIF’s

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Providing Revolutionary, Patient-Inspired Spinal Care!
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Let’s assume you require spine surgery after conservative therapy has been exhausted, and let’s assume you need a lumbar spine fusion, which is the standard of care today, but you are confused by all the options, as you hear about the array of procedures ending with “LIF” (Lumbar Interbody Fusion). Specifically, OLIF versus OLLIF—what is the difference? In short, a lot! Please pay attention.

For practical purposes, we will discuss only methods that are still routinely performed and not obsolete. This approach will therefore focus on PLIF, TLIF, MIS TLIF, XLIF/DLIF, ALIF, OLIF and OLLIF. The first letter represents an indication of the direction with which the spine is approached.

Generally, in an open approach posterior to the transverse process, all muscle is stripped off the bone, which can cause substantial bleeding, not to mention denervate and devascularize the tissue which leads to scarring. Additionally, significant time is exhausted to perform this approach and to stop the bleeding. Minimally invasive posterior options, with placement of an anterior graft (e.g., MIS
TLIF), decrease the muscle damage but still require direct visualization and destruction of part of the bones (facets) to access the anterior column and insert the bone graft. In general, if the spine is approached anterior to transvers process, the surgeon can bypass the above shortcomings which provides substantial advantages and benefits in comparison to the posterior approach.

<table>
<thead>
<tr>
<th>Name</th>
<th>Approach Direction</th>
<th>Description</th>
<th>Initiated</th>
<th>Relationship to TP, Cage and/or Pedicle screws</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLIF</td>
<td>directly from back</td>
<td>Posterior LIF (2)</td>
<td>1950’s</td>
<td>Posterior Only Cage same position</td>
<td>Traditional open approach with anterior graft placement</td>
</tr>
<tr>
<td>TLIF</td>
<td>from back at an angle</td>
<td>Transforaminal LIF</td>
<td>1982</td>
<td>Posterior Only Cage same position</td>
<td>Modified open approach with anterior graft placement</td>
</tr>
<tr>
<td>MIS TLIF</td>
<td>from back at an angle</td>
<td>Minimally Invasive Transforaminal LIF</td>
<td>2005¹²</td>
<td>Posterior Only Cage same position</td>
<td>Less traumatic than TLIF but no time savings, and very steep learning curve (5)</td>
</tr>
<tr>
<td>XLIF/DLIF</td>
<td>from side</td>
<td>eXtreme or Direct Lateral LIF</td>
<td>2006⁶</td>
<td>Anterior Only Cage same position</td>
<td>Same procedure, different names depending on company</td>
</tr>
<tr>
<td>ALIF</td>
<td>from front</td>
<td>Anterior LIF</td>
<td>1930-2000</td>
<td>Anterior Only Cage same position</td>
<td>Started in 1930’s but revived in 1970’s and generally accepted in 2000’s.</td>
</tr>
<tr>
<td>OLIF/ (OALIF)</td>
<td>from front and side</td>
<td>Oblique (Anterior) LIF</td>
<td>1977⁶ but not popularized until c.a. 2010</td>
<td>Anterior Only Cage same position</td>
<td>Traditionally abbreviated OLIF but more appropriately OALIF to avoid ambiguity. As with ALIF, anterior and posterior part cannot be addressed with same positioning</td>
</tr>
<tr>
<td>OLLIF</td>
<td>from back and side</td>
<td>Oblique Lateral Lumbar Interbody Fusion</td>
<td>2012⁷</td>
<td>Anterior Only Cage same position</td>
<td></td>
</tr>
</tbody>
</table>

Key: LIF - Lumbar Interbody Fusion, TP - Transverse Process
Defining Ollif Versus Olif

OLLIF (Oblique Lateral Lumbar Interbody Fusion) and OLIF (Oblique Lumbar Interbody Fusion) are the newest techniques of the group. OLIF should more appropriately be named Oblique Anterior Lumbar Interbody Fusion (OALIF). Both techniques approach the disc space anterior to the transverse process. OALIF requires an opening in the abdominal wall, whereas OLLIF is truly minimally invasive with an approach far away from the abdominal cavity and requiring no direct visualization. (See Figure 2)

OLIF (OALIF – which is also referred to as OLIF/ATP, Anterior To Psoas) is an anterior oblique approach that still traverses through the abdominal cavity, as does ALIF (Anterior Lumbar Interbody Fusion). In ALIF and OLIF (OALIF), due to the more anterior approach, major abdominal organs, arteries and veins need to be mobilized, some ligated, and injury to the sympathetic chain or ureters can occur. The ALIF is performed with the patient in the supine position whereas the OLIF (OALIF) is performed in the lateral or supine position. The positioning in XLIF/DLIF (Extreme or Direct Lateral Lumbar Interbody Fusion) is even more awkward than in OLIF (OALIF). It involves “breaking the table” to open up space between the ribs.
and pelvis (see Figure 1). Some experts believe that this time consuming process is one source of the significant side effects associated with XLIF/DLIF procedures.\(^2\)

OLLIF (Oblique Lateral Lumbar Interbody Fusion) is performed in the prone position with minimal rotation of the table required to achieve an adequate angle. There is no lengthy positioning time. The disc preparation and spacer placement are performed with a single half inch incision.

**Approach Considerations**

OLLIF is the most recent and advanced approach which accesses the disc space through Kambin’s triangle at the disc’s most posteriorly lateral point. No direct visualization is needed. The graft placement can be easily achieved with real time biplanar X-ray guidance, which is most likely the reason for OLLIF’s superior safety record. This technique does require posterior instrumentation which is inserted minimally invasively (percutaneously). See Figure 3.

ALIF requires significant mobilization of the vessels and requires an experienced access surgeon for the vast majority of cases (usually a vascular or experienced general surgeon), because major vessels and abdominal organs are in the direct access field. The rule of thumb is
that surgeons who need an access surgeon for ALIF will also need one for OLIF (OALIF). OLLIF, on the other hand, is a truly single surgeon procedure as the abdominal organs and vessels are bypassed through a posterior lateral oblique approach.

Both OLIF (OALIF) and ALIF require posterior stabilization. Pedicle screw placement is proven to be the best method of stabilization in the spine. With the Inspired Spine OLLIF, through the employment of proprietary technology, posterior stabilization is accelerated and complimented with fusion in addition to instrumentation. Anterior column grafting delivers more structural support and helps to minimize failed fusions by distributing some of the stress on the posterior hardware.
Indicated Levels

PLIF (Posterior Lumbar Interbody Fusion) and TLIF (Transforaminal Lumbar Interbody Fusion) are indicated for all Lumbar levels.

DLIF is traditionally indicated for L1–L5, but L4/5 approaches are risky due to the possibility of nerve damage and are often avoided.

ALIF is indicated for treating several levels but is commonly used at L5/S1 to avoid moving the blood vessels unilaterally, it can be performed at higher levels including L4/5 and, although rarely, L3/4.

OLIF (OALIF) is predominantly used at L2–5. A modified OLIF approach will provide access to L5/S1, as seen in this video presentation by VuMedi. However, as shown in the video, two different facia incisions and two different retractor systems are used, adding to this surgery’s complexity.

OLLIF can be performed at L1–S1, however, the iliac crest can present approach challenges at the L5/S1 level. The Inspired Spine OLLIF has overcome this obstacle and L5/S1 Inspired Spine procedures have become routine. Additionally, by employing Inspired Spine’s revolutionary approach, the same technology deployed by OLLIF in the lumbar spine can be used to minimally invasively fuse vertebrae in the chest area, enabling the OLLIF’s effective use from T6 to S1.
Operative Time

ALIF and OLIF (OALIF) with the required posterior fixation can require several hours to complete. The anterior portion of the case is a minimum of one hour. The graft portion of OLLIF is a 10 to 15 minute procedure. The posterior hardware placement time varies widely based upon surgeon experience and style. The Inspired Spine technique enables the placement of posterior hardware in 20 minutes. OLLIF patients are already prone, providing easy access to the posterior spine for screw placement. Whereas, in ALIF and OLIF (OALIF), the sterile field needs to be removed and the patient needs to be repositioned and re-prepped prior to commencing the posterior hardware placement. This preparation process usually requires at least 30 minutes.
Lumbar Interbody Fusion techniques are widely variable. Inspired Spine has redeveloped a traditional procedure and modified it to minimize exposure risks and minimize operating room and anesthesia time, while continuing to deliver 360 degree stabilization. The Inspired Spine technique also includes proprietary methods to refresh the facets and place biologics to promote fusion. This technique provides the opportunity for bone growth in 3 places (two posterior facets and the anterior intervertebral space). Also, Inspired Spine has introduced additional procedure manuals, creating a portfolio of procedures including OLLIF, minimally invasive DLIF, and a minimally invasive DTIF (Direct Lateral Thoracic Interbody Fusion) to provide effective and safe treatment options for T6–S1. Essentially, Inspired Spine has revolutionized thoracic to sacrum 360 degree fusions from a single position, employing a single surgeon, in an efficient and effective manner. See Table 2.
Fig. 1: XLIF/DLIF the positioning is complex and requires bending the patient by “breaking of the table” to open up the space.
Fig 3: Approaches for LIF Procedure

OLIF (OALIF)

DLIF, XLIF

OLLIF

TLIF

PLIF
<table>
<thead>
<tr>
<th></th>
<th>DLIF/XLIF</th>
<th>ALIF</th>
<th>OLIF (OALIF)</th>
<th>OLLIF</th>
<th>IS OLLIF and family (MIS-DLIF MIS-DTIF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position</td>
<td>Lateral</td>
<td>Supine</td>
<td>Lateral or supine</td>
<td>Prone</td>
<td>Prone</td>
</tr>
<tr>
<td>Level possible</td>
<td>L1-L5</td>
<td>L3-S1</td>
<td>L2-S1</td>
<td>L1-S1</td>
<td>T6-S1</td>
</tr>
<tr>
<td>Levels difficult</td>
<td>L1/2 &amp; L4/5</td>
<td>L3/4</td>
<td>L5/S1</td>
<td>L5/S1</td>
<td>none</td>
</tr>
<tr>
<td>Time for anterior portion</td>
<td>60-90 minutes</td>
<td>60-90 minutes</td>
<td>60-90 minutes</td>
<td>10-15</td>
<td>10-15</td>
</tr>
<tr>
<td>Time for repositioning, re-prepping and re-draping</td>
<td>30-60</td>
<td>30-60</td>
<td>30-60</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Time for Posterior portion</td>
<td>45-60 if minimally invasive (longer if open)</td>
<td>45-60 if minimally invasive (longer if open)</td>
<td>45-60 if minimally invasive (longer if open)</td>
<td>40-60 all done minimally invasive</td>
<td>20-30</td>
</tr>
<tr>
<td>Posterior fusion</td>
<td>Only if open</td>
<td>Only if open</td>
<td>Only if open</td>
<td>Only if OPEN otherwise only instrumenta</td>
<td>Yes all MIS</td>
</tr>
<tr>
<td>Breaking the table required</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Direct visualization required</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
</tbody>
</table>

(For a medical review please refer to [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5039869/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5039869/))

(for a great review of lumbar procedures including limitations and contraindications for each procedure see this [link](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5039869/))
1. ALIF
   http://indianaspinegroup.com/education/abstracts/THMP008-10-87-95.pdf
5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2966722/
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5039869/
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4652919/