The Anterior Retroperitoneal Approach to the Degenerative Lumbar Spine: Clinico-Therapeutic Remarks

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Keywords: ALIF; XLIF; Anterior lumbar surgery; Retroperitoneal surgery; Lumbar spine; Lumbar disc arthroplasty

Introduction

The anterior approach is a well-known surgical technique for the treatment of degenerative diseases of the lumbar spine. Through this approach is possible to perform arthrodesis, arthroplasty, discectomy, corpectomy to treat a lot of degenerative conditions. The ALIF procedure is one of the most widely used technique, and is argued to have biomechanical advantages over posterior approaches for lumbar spinal fusion: restoration of disc height and lumbar lordosis, reduction of lysis, restoring of coronal and sagittal balance. Through this approach is also possible to perform a lumbar disc arthroplasty, a motion preservation technique which aim is to restore the biomechanical properties of the lumbar spinal motor unit. Moreover, in a more recent period, a lot of alternative anterior approaches are described and used, such as Extreme Lateral trans-psoas approach (the XLIF technique). In the current clinical practice, anterior approaches seem to play an extremely important role for the management of degenerative diseases. In this editorial we want to describe systematically the classic anterior approach, highlighting advantages and disadvantages of the surgical technique and related complications based on personal experience and literature review. Aim of this article is to provide an updated window on the surgical technique for the anterior retroperitoneal approach, frequently used for the treatment of degenerative pathology of the lumbar spine.

The ALIF Technique

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with decompression and fusion with screws and rods must be always associated with an anterior support such as ALIF. The literature shows that ALIF is a long-term solution to radicular symptoms (leg pain and neurological deficits) because permits an indirect decompression through the enlargement of the neural foramen and the retensioning of the ligamentum flavum. In case of Degenerative Disc Disease (DDD), the clinico-radiological pathway should be extremely different: In DDD with mechanical pain, the disc is considered the primary pain generator: the surgical intervention is targeted to removing the intervertebral disc because disc degeneration and posterior annular fissuring are causes of mechanical pain; In DDD with foraminal stenosis the overriding issue is radiculopathy caused by nerve root compression. The segmental stenosis and radiculopathy is a result of disc herniation, posterior osteophyte formation, facet hypertrophy and hypertrophic synovial pannus that reduces neuroforaminal and canal volume. In this case the surgical choice is typically dependent to the grade of decompression, to the grade of deformity correction and the grade of stability that the pathology requires. In the light of this ALIF is considered a reliable option in degenerative lumbar scoliosis because it allows for thorough release of contracted tissue and osteophytes, complete discectomy and distraction of the intervertebral space and placement of a larger interbody fusion device. Additionally, ALIF can be used as a revision surgery option in case of pseudoarthrosis.

**Lumbar Total Disc Replacement Technique**

Through the same anterior retroperitoneal approach is possible to perform a Lumbar disc arthroplasty also called total disc replacement: The lumbar total disc replacement (LTDR) was introduced for the first time for the surgical management of DDD [14]. Lately, LTDR has been expected to replace fusion surgery therefore a great deal of LTDR reports has come out: the prospective randomized controlled studies were expected to elucidate whether for LTDR to have therapeutic benefit compared to fusion. The results revealed that LTDR was not inferior to fusion. In 1984, Schellnack and Buttner-Janz in Germany implanted the prosthesis using anterior approach [15] The implant was a semi-constrained type of lumbar artificial disc (LAD) and comprised two metallic upper and lower plates and a sliding polyethylene core. Since then, many different designs and composition of LAD have been launched. LAD can be classified into 3 types, per the direction of back motion limitation: non-constrained, semi-constrained with translation and semi-constrained without translation. Non-constrained design has no specific limitation in its mobility; semi-constrained design has two types, the one has no specific limitation including partial translation, the other no specific limitation but translation. The contraindications for LTDR include conditions that may compromise the safety and integrity of the implants as: vertebral fractures, spondylolisthesis of any grade, osteoporosis, previous laminectomy or laminotomy, history of major intraperitoneal surgeries, severe abdominal obesity. The efficacy of LTDR is extremely debated, in the light of controversies showed about posterior approaches to the lumbar spine and predominantly relate to visceral and vascular injuries. The published rates of vascular injury vary considerably, ranging from 1.9% to 24%, [17,18] and the complication occur most commonly in the L4–L5 disk space [19]. Laceration of the left common iliac vein is the most commonly reported injury [19], whereas arterial injuries are much less frequent, with the rate of injury to the left iliac artery reported to be 0% to 0.9% [19]. Other vascular complication includes laceration of the iliolumbar vein, avulsion of the median sacral and lumbar vein, and injury to the inferior vena cava or abdominal aorta, as well as thrombosis of the left iliac artery and retroperitoneal hematoma. Visceral complications are uncommon and include inadvertent enterotomy and ureteric injury. Injury to neural structures can result in femoral nerve palsy [20], retrograde ejaculation, erectile dysfunction, and sympathectomy manifesting in symptoms such as altered lower limb temperature and unilateral lower limb edema. Incomplete discectomy can result in retropulsion of fragments into the canal. A laterally and posteriorly placed implant can cause neuroforaminal impingement. Poor bone quality and healing potential may result in a symptomatic pseudoarthrosis. Retrograde ejaculation is rare but possible, particularly at the L5–S1 level.

**Conclusion**

Thoraco-lumbar spine is particularly affected by degenerative issues, affecting 60% to 70% of the population. Patients can present with a broad spectrum of problems from minimal symptoms to severe pain and marked disability, that often play a significant role in the surgical care and treatment offered by spine surgeons. The anterior retroperitoneal approach appears to be a viable option in several degenerative pathologies of the lumbar spine, clearly depending to the surgeon and to the patient conditions, and could be performed alone or in association to a posterior approach. In many cases the anterior approach must be always performed, such in high dysplastic spondylolisthesis in association with a posterior approach. In other cases, the surgical choice mainly depends to the surgeon and to the clinico-radiological results to be achieved.

**References**


