Delayed Abdominal Pseudohernia in Young Patient After Lateral Lumbar Interbody Fusion Procedure: Case Report

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Key words
- Abdominal pseudohernia
- Complication
- Incisional hernia
- Lateral lumbar interbody fusion
- Risk factors

Abbreviations and Acryonyms
LLIF: Lateral lumbar interbody fusion
IONM: Intraoperative neuromonitoring

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OBJECTIVE: **To describe a rare complication of the extreme lateral interbody fusion technique.**

BACKGROUND: **Lateral lumbar interbody fusion (LLIF) is a minimally invasive technique that has achieved great reputation among spine surgeons because of its advantages over other procedures. However, complication rates of this technique have not been definitively assessed so far.**

CASE REPORT: **A 44-year-old male smoker, presenting with pseudoarthrosis of a previous posterior stabilization, underwent an LLIF procedure. The operation was uneventful, and an appropriate functional recovery was achieved by 2 months after surgery. Nevertheless, 5 months after surgery, the patient developed pulmonary tuberculosis and a mass in the proximity of the LLIF incision appeared. This mass was finally diagnosed as abdominal pseudohernia and had to be surgically repaired.**

CONCLUSIONS: **Abdominal pseudohernia is a rare complication of LLIF procedures. The interest of the present case is 3-fold: 1) it is the first delayed case of abdominal pseudohernia after an LLIF procedure; 2) it is the first case described in a young patient in whom risk factors have been identified and discussed; and 3) it is the first case that did not resolve spontaneously and required surgical repair. This exceptional complication must be borne in the mind of the spine surgeon when using the LLIF technique, and special precautions, such as laxatives or respiratory physiotherapy, apart from meticulous atraumatic dissection and closure of the abdominal wall and specific intraoperative monitoring, should be taken in high-risk patients to prevent it.**

INTRODUCTION

The lateral transpsoas approach to the lumbar spine was first described by Ozgur et al. in 2006 and has become popular as "the extreme lateral lumbar interbody fusion (LLIF)."[1] LLIF is a minimally invasive technique that provides access to the lateral aspect of the disk space using a working channel through the psoas muscle, with progressive dilators or blunt dissection.[1] The LLIF approach has been described for the treatment of a variety of lumbar conditions, including adult degenerative scoliosis,[2] total disk replacement,[3] traumatic spine injuries, tumoral or osteomyelitis lesions,[4-6] pseudoarthrosis, etc. The indications for lateral access surgery continue to expand as more surgeons adopt this technique.

Despite the increasing number of transpsoas interbody fusions being performed, complication reports are still initial in the literature[7] with a high variation in their rates. Therefore making conclusions on the safety of the procedure is still a challenge.[8] In any case LLIF complications include neural injury as the most common one,[8] but visceral, vascular, and wound problems may also happen.[9]

The purpose of this paper is to describe a rare complication of an LLIF procedure and discuss the factors that may have contributed.

CASE PRESENTATION

A 44-year-old male smoker of more than 10 cigarettes per day had undergone surgery in 2002 for an L3-L4 herniated disk and in 2005 for a posterolateral instrumented fusion at the same level. He presented with severe low back pain that radiated down both lower limbs without a clear metameric pattern. He had not shown any significant response to conservative treatment for 12 months. Pseudoarthrosis at L3-L4 was identified in dynamic radiographs, computed tomography scan, and bone scan. With this diagnosis an LLIF procedure was offered to him. His Oswestry Disability Index score at the moment of the last surgery was 70%, and his visual analog scale score was 8/10.

The patient was placed on the left lateral decubitus position, and a 6-cm oblique incision was made on the right flank after fluoroscopic control. Through a miniopen approach, the external oblique fascia was cut with scissors and the muscular layers of the external and internal obliques and the transversus abdominis were bluntly dissected. The transversalis fascia was cut with Metzenbaum scissors, and the retroperitoneum was entered with blunt dissection until the psoas muscle was visualized.

The muscular fibers of the psoas muscle were carefully split under intraoperative neuromonitoring (IONM), and a distractor was placed (Synframe Retractor System, Synthes, Paoli, Pensylvania, USA). The IONM consisted of a continuous intraoperative free-running electromyography (EMG) from lower limbs and abdominal wall and direct electrical stimulation using a hand-held monopolar stimulation probe (Ambu Disposable Pedicle Screw Probe, Cambridgeshire, UK) in order to identify nerve branches of the abdominal wall and the lumbar plexus. The IONM (Cadwell Cascade, Cadwell Laboratories Inc., Kennewick, Washington, USA) was performed following the standard procedure setup.[10]

Lateral diskectomy was performed in the usual fashion, and an Oracle cage (Synthes, Paoli, Pennsylvania, USA) was inserted. The transversalis fascia was carefully closed with o-Vicryl sutures, the external oblique fascia with o-Vicryl, subcutaneous tissue with 2-o Vicryl, and the skin with staples.

The immediate postoperative period was uneventful, and the patient was discharged 2 days after surgery. An important improvement in pain was confirmed 2 months after the procedure. The Oswestry Disability Index score dropped to 15%, and his visual analog scale score was 2/10. The patient continued to smoke after surgery. Five months after surgery, the patient started with fever, intense cough, and hemoptysis. Pulmonary tuberculosis was diagnosed, and tuberculostatic treatment was initiated. Soon after the onset of respiratory symptoms, an anterolateral abdominal wall mass appeared close to the lateral surgical wound (Figure 1). The mass was painless, disappeared in the supine position, and increased during Valsalva maneuvers. A lateral abdominal pseudohernia was confirmed with ultrasonography, with a portion of small bowel inside. Conservative treatment with a brace during 6 months was completed without any results. General surgeons performed thereafter a reconstruction of the abdominal wall with plication of the transversalis fascia and insertion of a mesh. They found atrophy of oblique muscles but neither wound dehiscence nor any defect in the external oblique or in the transversus abdominis muscles.

After 6 months of follow-up, there is no recurrence of the abdominal pseudohernia, and the improvement in the clinical situation of the patient in terms of pain and ability to carry out the activities of daily life remains unchanged.

Informed consent for publication of information and imaging about his case was given by the patient.

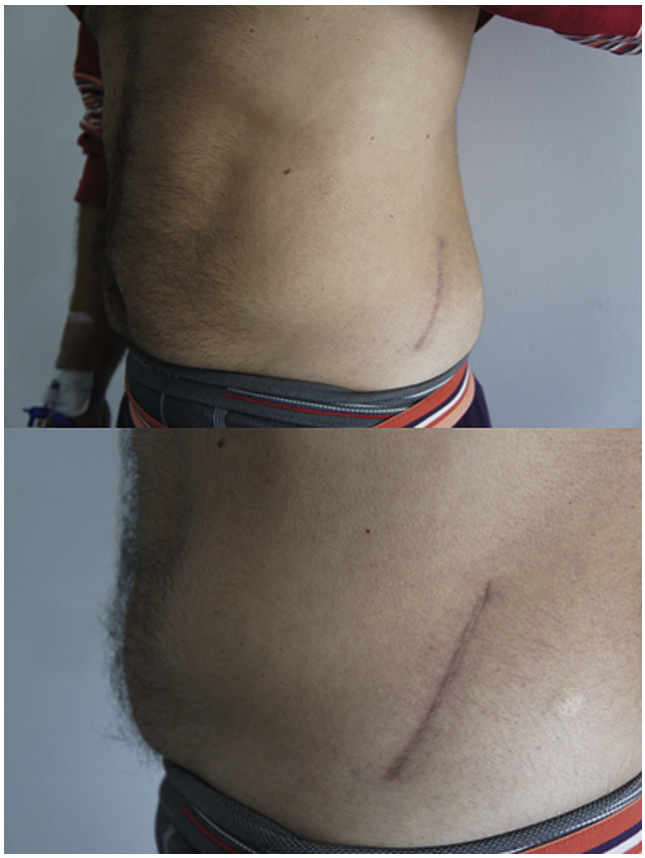

Figure 1. Pictures showing the bulging mass in the anterolateral abdominal wall, close to the lateral surgical wound. The mass was painless and increased during Valsalva maneuvers.

DISCUSSION

The reported case presented a postsurgical abdominal pseudohernia after an LLIF procedure. This is a rare complication of the transpsoas approach to the lumbar spine, as only a case series of 10 patients has been reported in the literature thus far.[11]

A distinction has to be made between true abdominal incisional hernias and abdominal pseudohernias. An incisional hernia implies that there is a defect in the fasciae of the abdominal wall, so intraabdominal tissue is allowed to protrude through, whereas an abdominal pseudohernia comes from abdominal wall paresis and there is no real dehiscence of the abdominal muscles. In most series, both incisional hernias and abdominal pseudohernias are considered together, and they seem to be a relatively common complication after abdominal surgery, including anterior approaches to the spine (overall risk between 2% and 14%).[12,13] When lateral abdominal wall approaches in urologic procedures are considered alone, the reported incidence rises to approximately 10%–30%.[14-16] Although Dakwar et al. estimated an incidence of 1.8% of abdominal wall paresis after an LLIF procedure,[11] the overall risk of abdominal wall herniation, both incisional and pseudohernias, for LLIF procedures is not well documented. In our case, a miniopen approach was used

and blunt dissection was applied. Because the general surgeons did not find any wound dehiscence in the fascia when the field was revised and the mass was at a distance from the incision, our hernia cannot be considered as a true incisional one related to a deficient repair of the external oblique fascia, but rather a pseudohernia caused by neurologic weakness of the abdominal wall.

The longest series of abdominal pseudohernias after LLIF procedures was described by Dakwar et al. in 2011.[11] They propose direct surgical trauma during wall or retroperitoneum dissection as the cause of injury to the motor branches of the subcostal, iliohypogastric, and ilioinguinal nerves that innervate the internal oblique, external oblique, and transverse abdominis. This nerve injury seems to lead to paralysis of the muscles and weakening of the abdominal wall. This paresis was transient in all their cases and resolved after 6 months of surgery.[11] After incising the external oblique fascia, Dakwar et al. advocate blunt careful dissection of both the muscle fibers and retroperitoneal fat in order to identify and respect nerve branches.[11,17-20] Because the subcostal and iliohypogastric nerves, which are the most important in our approach, course in close relation with the transversalis fascia,[11,21] its opening and closure could endanger them. In our case, the fascia was opened with scissors and closed with stitches. We might hypothesize that percutaneous LLIF may be advantageous over miniopen procedures as the incision is shorter, and there might be less risk of nerve injury. Furthermore, the longer incisions used in miniopen techniques could injure more than 1 nerve, in comparison with percutaneous approaches. Longitudinal or very oblique incisions may damage the nerve perpendicularly, so there is more chance of nerve transection instead of stretching or mere displacement, as opposed to transverse incisions.

Curiously enough, in our case the patient presented with the bulging mass 5 months after surgery, when in most of the reported cases the muscular weakness is supposed to be resolved, at least partially. Although it remains speculative, the abdominal wall paresis may have been present in the first weeks after surgery, but it only became apparent after 5 months. Even though coughing is apparently more related to true incisional herniation,[16] we hypothesize that it may have played a role in the delayed appearance of the pseudohernia, as the Valsalva maneuvers exerted by coughing may have worsened a preexisting lesser or subclinical abdominal wall paresis. If this hypothesis is true, special measures to avoid Valsalva maneuvers such as preoperative smoking abstinence or physiotherapy in heavy smokers or patients with chronic obstructive pulmonary disease, as well as laxatives or enemas in case of severe constipation, might have to be undertaken.

Our patient was a chronic smoker who, moreover, developed pulmonary tuberculosis in the fifth month postoperatively. Even though all of the cases in the Dakwar's series of abdominal pseudohernias were self-limited, ours was diagnosed after 5 months of surgery and was followed up conservatively for another 6 months without resolution of the bulging mass. This is the reason why surgical repair of the hernia was carried out. Whether the paresis would have been transient in the absence of the added Valsalva maneuvers caused by the pulmonary tuberculosis cannot be proved.

Although not standardized, IONM of the nerve branches supplying the abdominal wall (**Table 1**), such as the subcostal, iliohypogastric, and ilioinguinal nerves, may be of utmost importance in order to avoid definitive injury to them.[21] However, no considerations about subcostal nerve monitoring during LLIF procedures have been reported thus far. Some efforts have been made in order to avoid damage to the lumbar plexus with transpsoas stimulation and electromyographic recordings,[22-24] but the popularization of the LLIF technique should be also associated with an improvement in IONM for preserving the innervation of the main abdominal wall muscles. Furthermore, it has been highlighted how importance it is to not only avoid damage to the lumbar plexus but also standardize the diagnosis of the injury in order to make an adequate management.[21]

Table 1. Nerves Involved in Abdominal Wall Muscle Innervation

Nerve	Levels	Intraoperative Monitoring (Target Muscle)
Subcostal	T12	External oblique muscle
Iliohypogastric	L1	Transverse abdominal muscle
Ilioinguinal	L1	Lower abdominal wall muscles

The LLIF technique is considered in the literature to be a safe, minimally invasive approach to the lumbar spine. The abdominal pseudohernia is an infrequent complication that must be borne in the mind of the spine surgeon using this technique. Meticulous atraumatic dissection and closure of the abdominal wall and specific intraoperative monitoring should be undertaken for every single case, but special precautions, such as laxatives or respiratory physiotherapy, might have to be taken in high-risk patients to prevent it.

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