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UBE TLIF, our experience, tips and tricks. Initial experience in an Iberic hospital (Viseu, Portugal)

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The surgical technique has developed continuously from open surgery to minimally invasive methods and the spine surgeons are always looking for better solutions, trying to improve patient satisfaction. The concept and goal of minimally invasive surgery is to diminish the destruction of muscles and bony structures, thus reducing the pain and shortening the recovery of the operated patients. We report our first experience with UBE TLIF with normal used cages and with large cages used for OLIF. All colleagues recommend doing some decompressions by UBE technique to gain experience before attempting UBE TLIF. We broke the paradigm and started to do TLIF without any experience in performing UBE decompression. Our team is composed by a neurosurgeon and orthopedic surgeons, and the facilitating factor was some anterior experience with uniportal endoscopy, and the orthopedic surgeons were skilled in triangulation due to prior experience in arthroscopic knee surgeries. We do not advise this type of learning curve; we just want to document our experience.

Keywords: biportal, endoscopy, decompression

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Односторонняя двухпортовая эндоскопическая трансфораминальная поясничная межтеловая фиксация: наш опыт, советы и рекомендации Опыт португальской больницы (Визеу, Португалия)

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Хирургические методы постоянно развиваются: на смену открытой хирургии приходят минимально инвазивные методы. Спинальные хирурги постоянно находятся в поиске решений, улучшающих исходы у пациентов. Концепция и цель минимально инвазивной хирургии – снизить разрушение мышц и костей пациентов. Мы описываем свой первый опыт односторонней двухпортовой эндоскопической трансфораминальной поясничной межтеловой фиксации (unilateral biportal endoscopic transforaminal lumbar interbody fusion – UBE-TLIF) с использованием нормальных кейджей и больших кейджей, предназначенных для косого бокового межтелового спондилодеза. Все коллеги рекомендуют провести несколько декомпрессий с использованием техники UBE перед выполнением UBE-TLIF. Мы пошли против парадигмы и начали выполнять TLIF без опыта декомпрессии UBE. Наша команда состоит из нейрохирурга и хирургов-ортопедов. У нас был опыт однопортовой эндоскопии, и хирурги-ортопеды имели навыки триангуляции благодаря предшествующему опыту артроскопических операций на коленях. Мы не рекомендуем такую кривую обучения, но хотим описать свой опыт.

Ключевые слова: двухпортальный, эндоскопия, декомпрессия

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BACKGROUND

Spine surgery since its apparition has had a continuous and dynamic evolution, and the most important achievements are summarized below. In 1944, Briggs and Milligan published their novel technique, the posterior lumbar interbody fusion (PLIF), involving continuous removal of vertebral bone chips and replacement of the disc with a round bone peg [1]. In 1952, PLIF was proposed by Cloward using banked bone [2] in 1973, Philadelphia orthopedic surgeon Parviz Kambin, Professor of Orthopedic Surgery and Endowed Chair of Spinal Surgery Research at Drexel University College of Medicine, introduced a transforaminal route to the disc space, exploiting an access corridor free of significant vascular and neural structures. Kambin initially explored this pathway in percutaneous posterolateral resection of herniated L3–4 and L4–5 discs, using fluoroscopic guidance and an incision 8–9 cm from the midline [3]. "Kambin's triangle", recently described three-dimensionally as "Kambin's prism", is enclosed anteriorly by the exiting nerve root, inferiorly by the proximal endplate of the lower vertebral body, posteriorly by the superior articular process of the ower

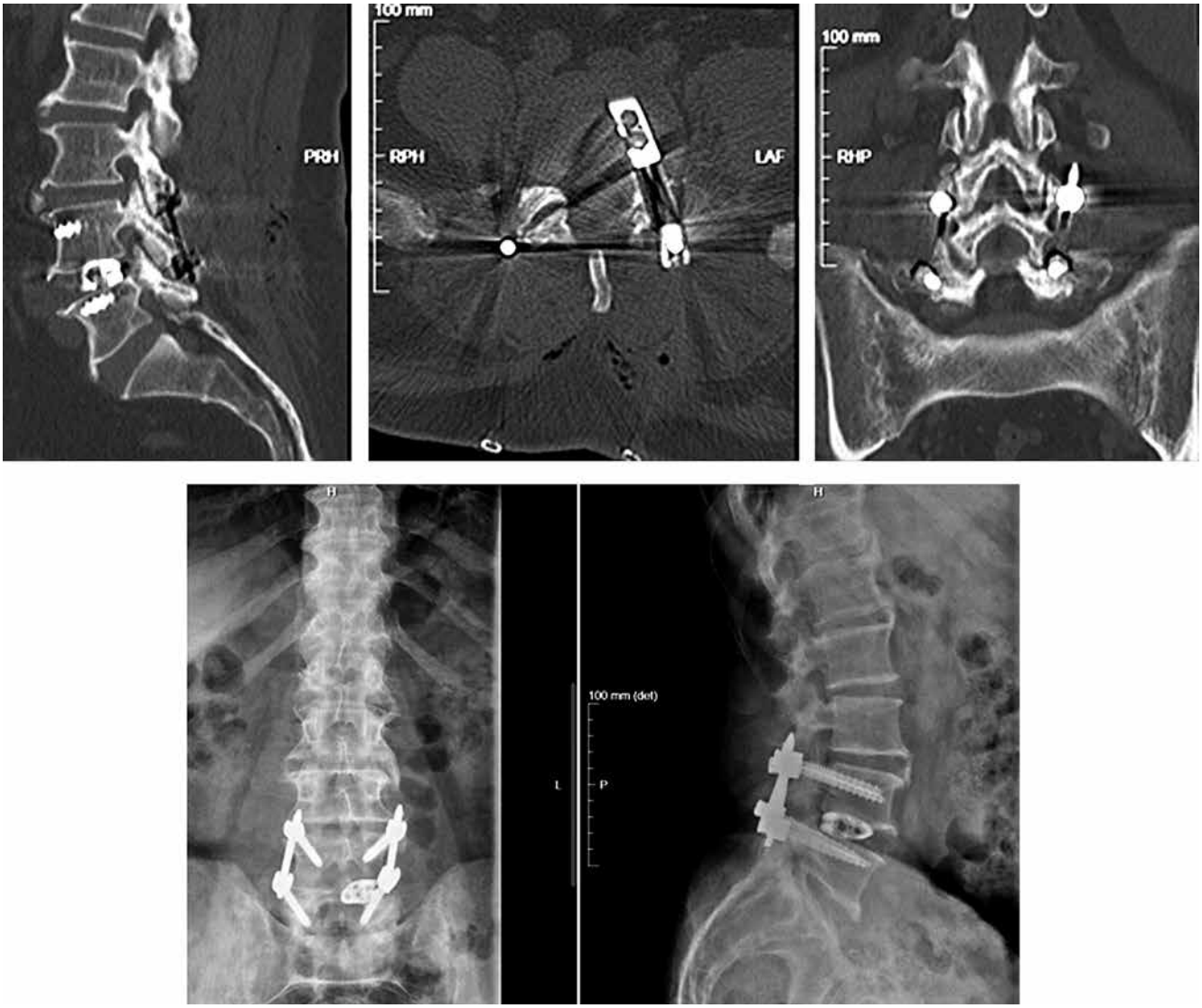

Fig. 1. UBE TLIF with bullet cage
Рис. 1. UBE-TLIF с пулевидным кейджем

vertebra, and medially by the traversing nerve root and thecal sac [4]. Without necessitating bone removal, this anatomical prism enabled Kambin to perform endoscopic discectomy procedures while avoiding neural retraction [5].

In 1982, Harms and Rolinger redefined the posterior corridor by approaching the disc space through the intervertebral foramen, establishing the transforaminal lumbar interbody fusion (TLIF) [6].

In 1996 Daniel Julio de Antonio from Argentina described unilateral biportal endoscopic (UBE) technique decompression [7]. 6 years after UBE decompression was described, Foley and Lefkowitz published the novel MIS-TLIF technique in 2002. UBE technique became attractive for spine surgeons and has a burst of evolution during the last years [8].

MATERIALS AND METHODS

Our first experience with UBE TLIF consists of 12 operated patients, the cages used were bullet, banana titanium and large OLIF PEEK cages. The main indication for surgery was central, foraminal stenosis, low grade listhesis. Our purpose is not statistical or clinical, we want to share our experience, as we stated with UBE TLIF without any experience in UBE decompression. We did not use any protocol to choose the type of cage used for arthrodesis. For the first cases, as our experience was nil, we used bullet

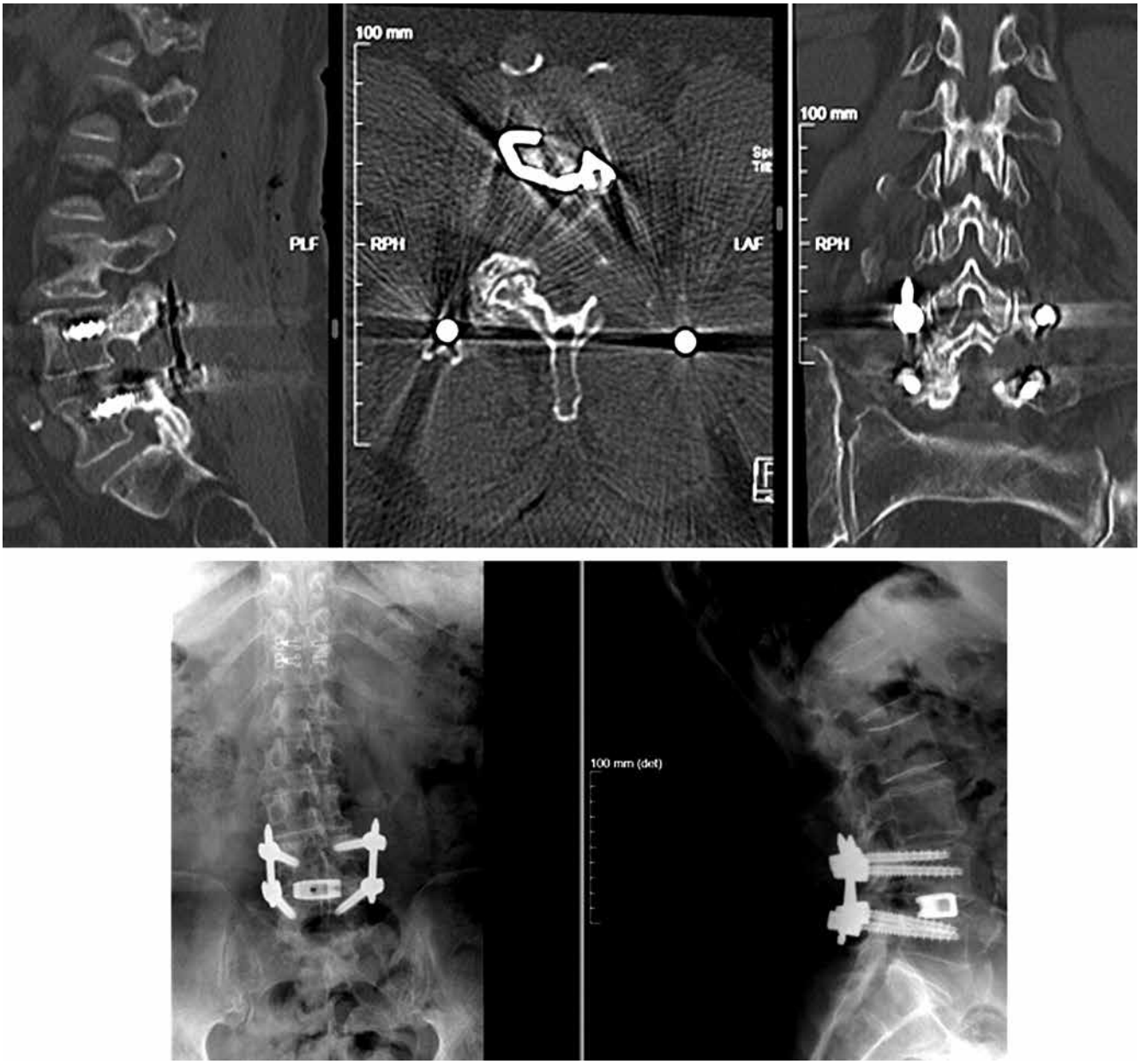

Fig. 2. UBE TLIF with banana shape cage

Рис. 2. UBE-TLIF с банановидным кейджем

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Fig. 3. L5–S1 UBE TLIF

Рис. 3. UBE-TLIF позвонков L5–S1

cage, because it needs less space to be introduced. For the following cases the choice of cage depended on the anatomical peculiarities and the Kambin space.

The first case was a bullet cage (Fig. 1) and as seen in the postoperative pictures it was a small IAP (inferior articular process) resection.

In the next case we became more confident, and the decompression was larger (Fig. 2), and the implant was a banana shape cage.

The following cases were L5–S1 left side UBE TLIF (Fig. 3) and L4–L5 right side UBE TLIF (Fig. 4).

Our seventh case was UBE TLIF with large OLIF (oblique lateral interbody fusion) cage (Fig. 5) for severe L4–L5 stenosis and degenerative olisthesis with good evolution and good disc height restoration, adequate decompression (Fig. 6).

Our series of large cage TLIF were followed by three more OLIF cages, four cases in total, and in the last case we had a major complication. Until this moment we had one case with postoperative partial neural deficit, in progressive recuperation.

The cage was mispositioned in the retroperitoneal space, diagnosed intraoperatively (Fig. 7). The cage was removed 1 week later through retroperitoneal approach, assisted by the vascular surgeon that sutured the cava vein. As seen on Fig. 8 the posterior opposite quarter of the

Fig. 4. Right side L4–L5 UBE TIF
Рис. 4. UBE-TLIF позвонков L4–L5 справа

intervertebral disc was not sufficiently prepared and at the moment of rotation of the cage, it penetrated the anterior longitudinal ligament and migrated to the retroperitoneal space. The patient had no neurological deficits; it was decided not to put another cage (Fig. 9).

RESULTS

In our series of 12 cases of UBE TLIF, four of them were with large sized cage (OLIF cage 45 × 18 mm, the height depending on the intervertebral space) we had two complications and both of them were with large sized cage. One complication was partial neurological deficit in progressive recuperation and one cage migration resolved surgically. In the rest of the group with normal sized cages we had no complications, the last case of UBE TLIF died three months after surgery due to a severe pulmonary infection.

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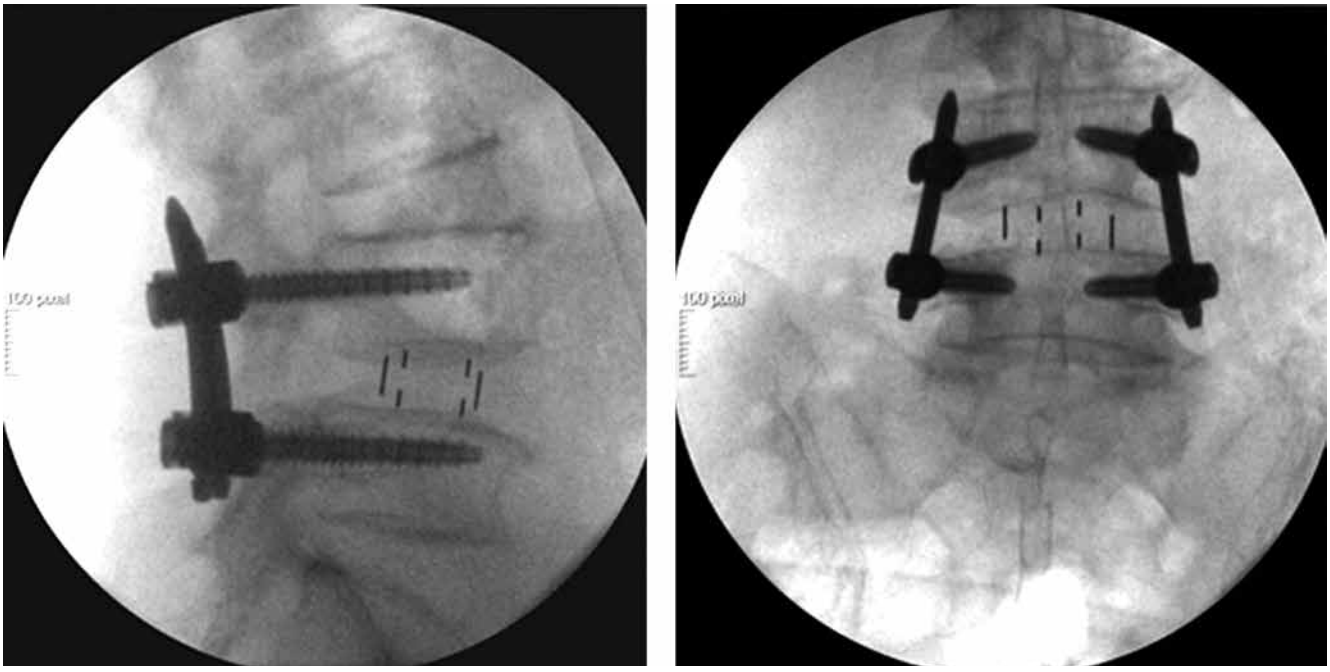

Fig. 5. UBE TLIF L4–L5 with large cage

Рис. 5. UBE-TLIF позвонков L4–L5 с использованием большого кейджа

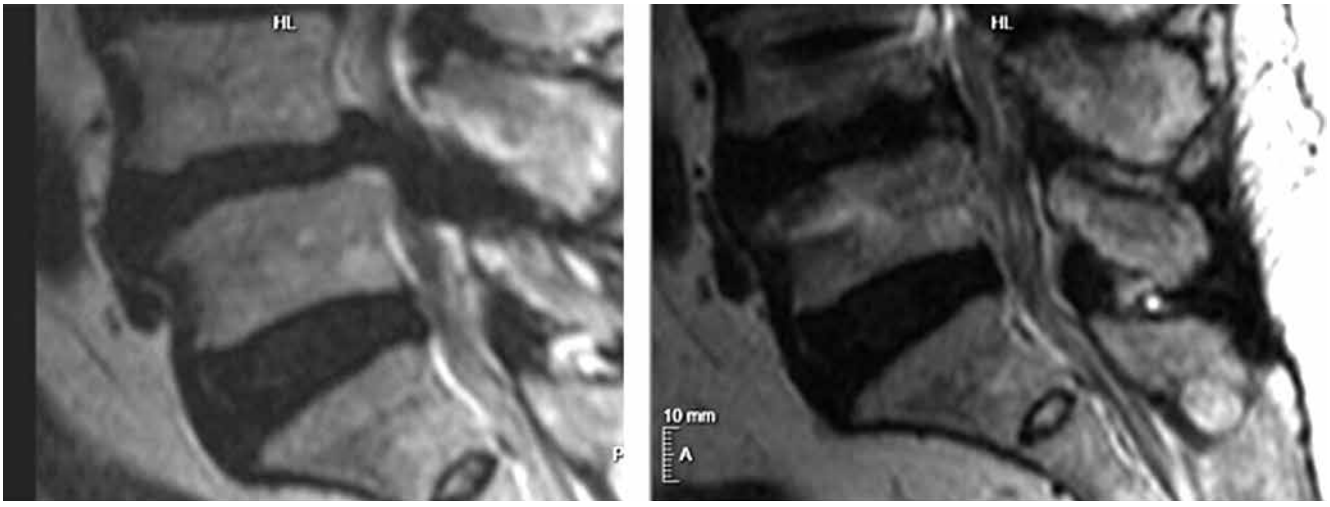

Fig. 6. Preoperative and postoperative MRI

Рис. 6. Магнитно-резонансная томография до и после операции

DISCUSSION

In conclusion we would like to outline the importance to avoid cage mispositioning and neurologic complication by:

1. Continuous increase of team experience.
2. Preoperative planning with measuring of extended Kambin's triangle.
3. Adequate disc preparation, especially the opposite posterior quarter.
4. Intraoperative ALL integrity check by palpating.
5. Preservation of yellow ligament as protection of dura and nerves during cage insertion.
6. Postoperative CT scan check of decompression and devices placement, at least at the beginning of the learning curve.

Some publications enhance the importance to measure the distance between the exiting and traversing nerve roots preoperatively on axial MRI slices. According to Heo, if this distance is more than 16 mm, a large-sized cage could be safely inserted without neural injury. This distance is relatively wide in the lower lumbar area including the L4–L5 and L5–S1 levels. If the distance between the exiting and traversing nerve roots is narrow (less than 15 mm),

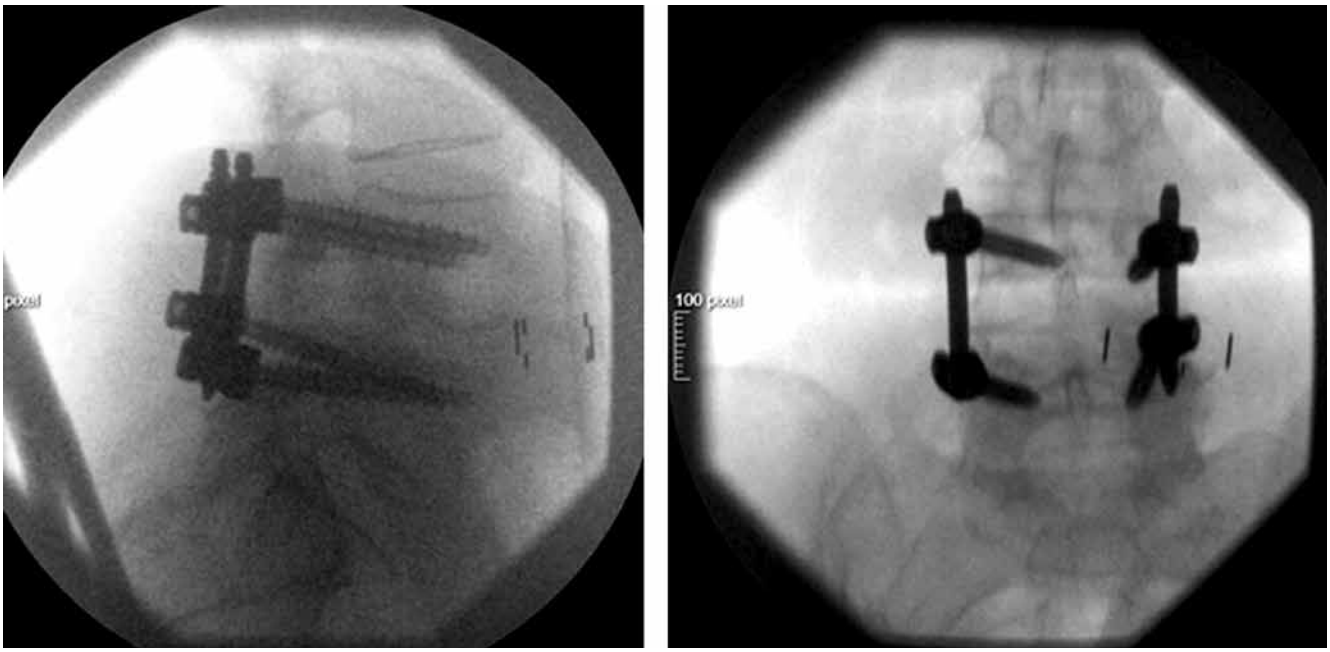

Fig. 7. Large cage positioned into the retroperitoneal space

Рис. 7. Большой кейдж в забрюшинном пространстве

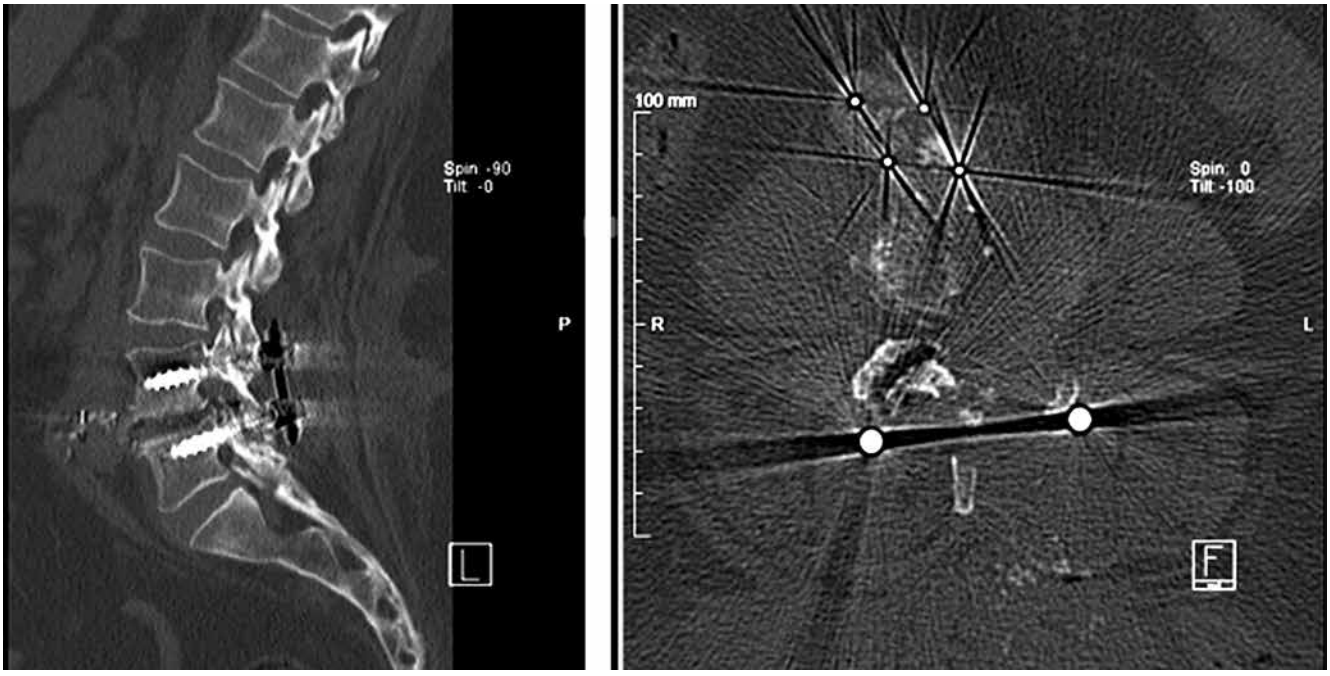

Fig. 8. CT scan showing the OLIF cage situated into retroperitoneal space

Рис. 8. Компьютерная томография, показывающая кейдж для косого бокового межтелового спондилодеза в забрюшинном пространстве

is recommended TLIF cages or two PLIF cages instead of a large-sized cage [9].

No data is available on the adequacy of disc space preparation in vivo; however, a cadaveric study with 40 lumbar levels compared the process in minimally invasive vs open approach and demonstrated that the percentage of disc material removed was approximately 75 % for either approach. The posterior contralateral quadrant of the disc space was the area with the lowest percentage of disc removed [10]. This data is applicable also to UBE TLIF and it is more important is case of large cage placement, because the lack of preparation of posterior contralateral quadrant of the disc does not permit good rotation of cage and promote different kind of complications.

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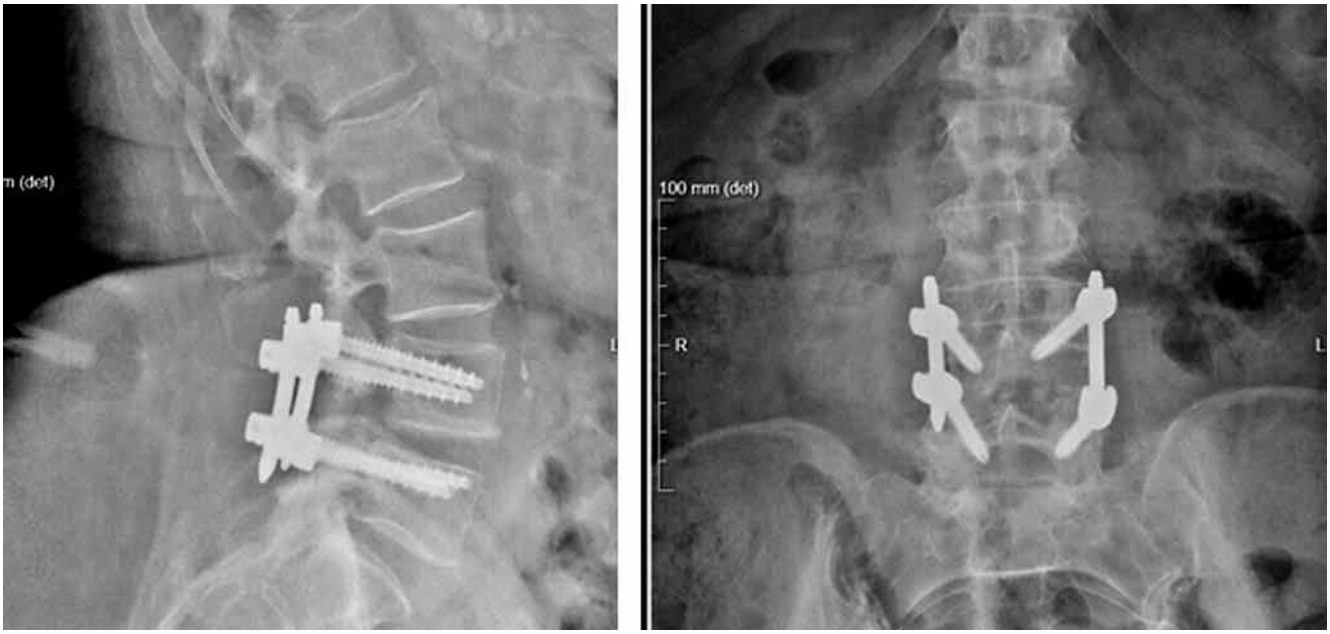

Fig. 9. Postoperative X-Ray

Рис. 9. Постоперационная рентгенография

Injury of the anterior longitudinal ligament was reported in one case of 7 [11], in spite of small incidence, it is not difficult to check its integrity during the surgery by palpating.

The yellow ligament and its foraminal extension serve as a protection for neural elements during cage insertion and after X-Ray confirmation of adequate positioning of the implant, it is safe to remove the ligament and proceed to decompression.

We think that it is important to perform CT scan postoperatively, first of all it detects any potential complication and arthrodesis material mispositioning early and second it has academic purpose, permitting to see the decompression adequacy and improving the technique in the future.

CONCLUSION

The incidence of complications of UBE technique is comparable or less in comparison with MISS TLIF, the results of a single-arm rate meta-analysis showed that the overall complication rate of UBE treatment of lumbar spine stenosis was 6.27 %, and the incidence of dural tear was 2.49 %, the incidence of transient paresthesia was 0.14 %, the incidence of postoperative spinal epidural hematoma was 0.27 %, the incidence of postoperative headache, inadequate decompression, root injury and infection was 0.00 % [12].

The incidence of postoperative spinal epidural hematoma in biportal endoscopic surgery observed on postoperative MRI (24.7 %) is higher than expected, although the number of those requiring revision (1.9 %) is significantly lower. Revision surgery is necessary when canal encroachment is >50 % as a result of postoperative spinal epidural hematoma [13]. The postoperative hematoma was always a debatable topic, in our small series, we did not put drains and had no hematoma, but we admit that the series is small.

UBE TLIF a safe and effective minimally invasive surgical method for treating patients with lumbar spinal stenosis and intervertebral disc herniation, low grade listhesis. UBE TLIF combined with endoscopic unilateral pedicle screw fixation can achieve excellent clinical results and may become a new minimally invasive endoscopic fusion method for lumbar degenerative diseases, the use of large cage is technically more demanding, but reduce the risk of subsidence and promotes better fusion.

As stated by some authors, cages with large footprints would enhance the segmental stability and more evenly distribute the loading between the adjacent vertebrae at the endplate, resulting in less likelihood of endplate point-loading and resultant subsidence. Moreover, larger cages generally have bigger hollow space within the cage to accommodate larger graft volume [14].

UBE TLIF with large cage permits better restoration of disc height, provides better conditions for fusion, less probability of subsidence, is technically more demanding with more probability of neurological complications that is why you should do it when you feel prepared and always do a good preoperative planning.

UBE TLIF with large cage is not a criterion of your professionalism, its purpose is the patient well-being. In case of the smallest doubt, it is better to bet on the safest method, like UBE TLIF with TLIF, PLIF cage, double cage, etc. Sometimes, minimum is maximum.

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L. Guerra: material check;
M.-D. Sincari: spelling.
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