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Disposable instrumentation for lumbar pedicle screw and rod constructs

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Keywords Lumbar fusion · Disposable instrumentation · Cost efficiency

Learning targets

- New solutions for cost efficiency in spine surgery

Introduction

The number of spinal surgeries has been steadily increasing these last years due to a constant ageing of the population. In the USA, the rate of instrumented fusion has tremendously increased since 1996 and cost-effectiveness has become a major concern [1, 2].

There is thus a need to improve cost-effectiveness at all stages of the therapeutic process of spinal instrumented fusion.

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Case description

The patient is a 52-year-old man who has followed a more than 6-month non-surgical treatment without success. The MRI shows a two-level disc degeneration at L3–L4 and L4–L5, with central disc herniation at this former level (Fig. 1a, b). As a last resort, he agreed to undergo a posterolateral and interbody fusion L3–L5. As in all of our patients, a detailed sagittal balance parameters analysis on a low-dose full spine X-ray was performed to respect patient's spinopelvic balance (Fig. 2).

Surgical procedure

The patient underwent a two-level classic posterolateral lumbar fusion under general anaesthesia. We used a high technology instrumentation and implants, delivered in several fully traceable sterile kits: two kits each containing a couple of pre-loaded pedicle screws, one kit of two sterile rods, one set of sterile implantation instrumentation. The preloaded pedicle screws were implanted using a standard transpedicular technique. We performed a classic transforaminal interbody fusion using a PEEK cage filled with allograft. Special care was taken to insert the interbody fusion cage the most anteriorly possible, to be able to gain the most possible segmental lordosis (cantilever technique) [3]. Posterolateral bone decortication and fusion was carried out with a mix of locally harvested autograft, allograft and demineralised bone matrix. The rod's shape was adapted to fit the patient's lordosis as determined preoperatively by sagittal balance analysis [4, 5].

Watch surgery online

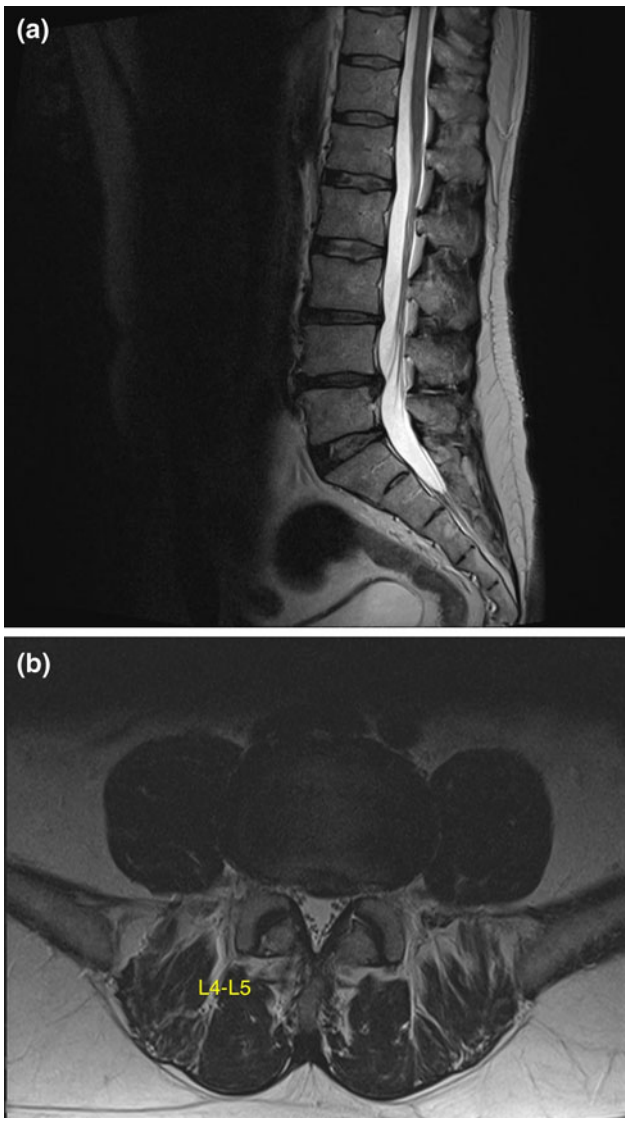

Fig. 1 Preoperative MRI of the lumbar spine of the treated patient. A two level disc degeneration L3–L5 is seen (**a**). A central disc herniation is also present at the L4–L5 level (**b**)

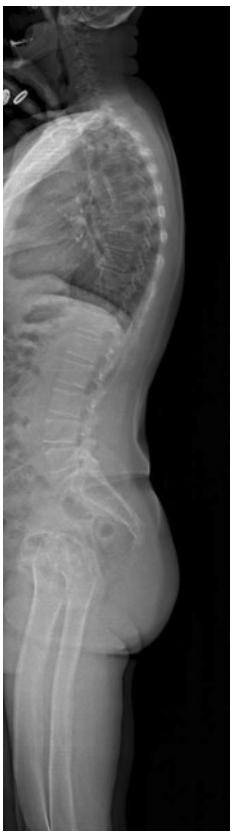

Fig. 2 Preoperative low radiation dose full spine X-ray of the patient. Before any surgical treatment, it is mandatory to analyze spino-pelvic parameters to adapt our therapeutic strategy to each individual

Postoperative information

The patient was allowed to walk freely 2 days after surgery. The postoperative course was uneventful and the patient was discharged from the hospital 5 days after surgery. The postoperative low-dose full spine X-ray confirmed correct implant positioning and respect of sagittal alignment (Fig. 3).

Discussion and conclusion

Fusion surgery is a well-documented and well-recognized treatment for several lumbar spine pathologies, from etiologies such as trauma or physiologic degeneration. The number of lumbar fusion surgeries has dramatically increased, 77 % between 1996 and 2001 in the USA and represents a major health economics issue, even if recent reports suggest that cost-effectiveness is improving with time [1, 2].

We present here a potentially new cost-efficient approach for lumbar fusion: a high technology lumbar pedicle screw and rod fusion system, implanted with a disposable instrumentation set. The implants and instruments are preoperatively sterilized, wrapped and delivered in ready-to-use kits, thus eliminating the usual need for OR nurses to re-sterilize implant and instrumentation sets. The implants are made of classic titanium alloy. Different screw and rod sizes are available in various packages. Instruments are made of a material, which can be recycled after use. Pre-loaded pedicle screws facilitate nurse's implant manipulation in the operating theatre. One more advantage is the significant weight reduction of the ready-to-use sterile kits compared to classic lumbar fusion kits made of titanium, stainless steel and aluminium. For example, for a one-level lumbar fusion, this disposable instrumentation and implant kits have a total weight of 2.8 kg, whereas classic re-usable instrumentation trays weigh an average of 12 kg.

The results of a preliminary mono-centric observational study have recently been published by Thompson et al. [6].

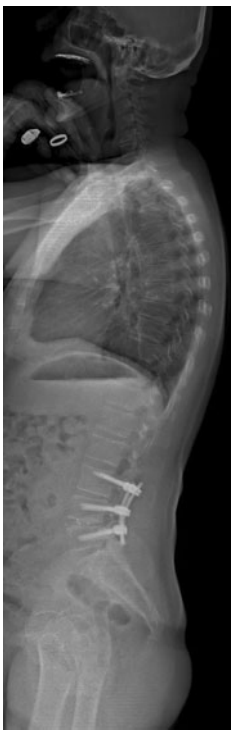

Fig. 3 Postoperative full spine X-ray, showing that the global sagittal balance has been respected

This ready-to-use lumbar fusion system was used to perform lumbar fusions on 12 patients, mean age 60 years. Indications for surgery included lumbar pathologies from degenerative or traumatic aetiologies. One or more levels were treated. From a clinical point of view, patients had an uneventful postoperative course, after a mean follow-up period of minimum 6 weeks. The authors have identified several fields of potential surgical cost reduction, including the sterilization process (160–204 Euro less for patients in this study), and the implant elimination process (mean of 0.73 Euro cents per surgery), which is much less than reprocessing the classic instrumentation trays. Those results will have to be confirmed by further detailed cost-efficiency studies.

Conflict of interest None.

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