Revision surgery for implant failure after PSO

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Learning targets

- Management of implant failure after PSO.
- Double approach in revision surgery.
- Mini-invasive lateral lumbar fusion.

Introduction

In the last years, vertebral osteotomies have been progressively used as effective techniques for the treatment of severe spinal deformities, in particular for fixed sagittal imbalance.

Pedicle subtraction osteotomy (PSO) has shown to allow correction up to 30°, but with a significant risk of pseudarthrosis, and for that reason, implant failures within approximately 2 years from surgery were reported [1–3].

The high rate of pseudarthrosis and implant failure after PSO could be related to the important mechanical stress of

the hardware, due to the wide resection of the posterior elements, combined with the anterior instability, consequence of the osteotomy inside the vertebral body and of the residual flexibility of the disc above and below it [4].

Revision surgery for implant failure after PSO is a high-demanding salvage procedure and should be carefully planned before surgery.

The goals are to restore the sagittal balance, through a posterior approach (correction and hardware revision and implementation) and to get a solid anterior fusion. This can be achieved by a traditional approach (anterior hemi-corpectomy and mesh cage) or, as recently described, by a XLIF at the disc below and above the osteotomy.

Case description

The patient is a 38-year-old female, treated with Harrington instrumentation from T2 to L3 for an adolescent idiopathic scoliosis when she was 12 years old. At the age of 32, a posterior L3–S1 fusion was performed and the Harrington rod removed, because of degenerative low back pain.

After 4 years, the patient underwent a posterior revision and a PSO at L3 was performed because of a sagittal imbalance.

The sagittal balance was fully restored and a significant improvement of back pain and quality of life lasted 20 months until the two posterior rods broke. A new revision surgery was then planned.

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Surgical strategy

First step—posterior approach: implant revision (implementation)

The patient was placed in prone position. Through a conventional midline approach, the implant was exposed and the rod breakage detected.

A careful exposure of the bone has been performed and the scar tissue around the implant was removed.

After placing the hips in extension, the two broken rods were re-connected by a “domino strategy” (four connectors and two more rods were used in order to achieve the maximal stability of the implant).

The fusion area was accurately decorticated and a mixture of local autologous and allogenic bone graft used. An accurate closure of the anatomical layers was performed after positioning a subfascial drainage.

Second step: anterior interbody fusion (XLIF at L2–L3 and L3–L4) adjacent to the PSO (L3)

Under fluoroscopic control and intraoperative real-time directional electromyography, a left side lateral transpsoas approach to the L2–3 disc was performed according to the surgical protocol as described in the literature.

The L2–L3 discectomy was consequently completed and an interbody screwed PEEK cage, filled with rhBMP-2 was implanted. The screwed cage was chosen to prevent possible mobilization because of the asymmetry of the vertebral endplates of the osteotomized L3 vertebral body.

For the level below (L3–L4), the same procedure was planned, but during the psoas blunt dissection, the neuro-monitoring reported a nerve root just lying close to the dissection area. In order to avoid neurological complications, the transpsoas approach to the disc was completed through a direct mini-open visualization, keeping the nerve root posteriorly retracted with two K wires. After completed discectomy, an interbody PEEK cage supplemented with rhBMP-2 was then implanted.

Postoperative information

An ICU support of 18 h was planned and the drainages were removed after 24 h.

Mobilization of the patient was gradually performed after surgery and verticalization was achieved with good general conditions 2 days after surgery.

Discussion and conclusion

Revision surgery for implant failure after correction of severe imbalance either sagittal or coronal represents a demanding challenge for the surgeon.

It is still controversial how it should be addressed and many different solutions have been presented.

In our experience, a 360° treatment of the pseudoarthrosis is required to avoid further failures.

In other more complex situations, we address the pseudarthrosis by anterolateral approach, performing a partial corpectomy of the osteotomized vertebra and placing a titanium mesh with autologous bone graft.

Our preliminary results show good fusion and stability, but a longer follow-up is inevitable, since postoperative failure in similar cases may occur after several months.

Conflict of interest None.

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