Vertebral column resection for thoracic hyperkyphosis in Pott's disease

Yann Philippe Charles · Sébastien Schuller ·
Gergi Sfeir · Jean-Paul Steib

© Springer-Verlag Berlin Heidelberg 2014

Keywords Tuberculosis · Pott's disease · Thoracic hyperkyphosis · Deformity correction · Vertebral column resection

Learning targets

- To demonstrate the steps of vertebral column resection (VCR) in the thoracic spine.
- To show kyphotic deformity correction by in situ bending of rods under somatosensory and motor evoked potential (SSEP, MEP) control.
- To demonstrate the technique of anterior column reconstruction using a titanium mesh cage filled with autologous bone graft.

Introduction

Tuberculosis (TB) is still causing a major health burden in the WHO European Region (estimation of 418,000 new patients and 60,000 deaths per year), with an increasing trend of multidrug resistance [1]. The portion of reported extrapulmonary TB cases and spondylitis (Pott's disease) accounts for 17 % on average, but the exact magnitude of

this disease is unknown and rates over 40 % are reported in some European countries [2]. Patients treated with anti-TB chemotherapy alone or with simple surgical debridement without fusion may result in disease reactivation, severe kyphosis or late instability, which in turn may lead to late onset paraplegia, back pain, sagittal imbalance and compromised pulmonary function [3]. With the destruction of the anterior column of the spine by the infection, kyphosis resulting from the progressive anterior collapse may represent one of the main criteria for surgical indication. Debridement combined with kyphosis correction by posterior instrumentation and anterior column grafting enhances the efficacy of chemotherapy at short term, and has a positive effect on sagittal balance and neurologic outcome at long term [4, 5]. The late correction of stiff and sharp angular deformities (more than 60°) is only feasible with three-column osteotomies or VCR [6]. The VCR technique provides the greatest amount of multi-planar correction. It involves the resection of posterior elements and two vertebral bodies with adjacent discs, and the anterior column reconstruction through a posterior approach [7].

Case description

A 28-year-old male complained of back pain due to a severe thoracic hyperkyphosis. A TB spondylitis at T6–T7 had been diagnosed in June 2012 and treated by Isoniazid, Rifampicin, Pyrazinamide and Ethambutol. An incomplete

Electronic supplementary material The online version of this article (doi:10.1007/s00586-014-3225-y) contains supplementary material, which is available to authorized users.

Y. P. Charles (✉) · S. Schuller · G. Sfeir · J.-P. Steib
Service de Chirurgie du Rachis, Hôpitaux Universitaires de
Strasbourg, Fédération de Médecine Translationnelle (FMTS),
Université de Strasbourg, 1, Place de l'Hôpital, B.P. 426,
67091 Strasbourg Cedex, France
e-mail: yann.philippe.charles@chru-strasbourg.fr

Watch surgery online

paraplegia developed in January 2013 and required spinal cord decompression that was not instrumented at that time. A thoracolumbar brace was then worn full time because of a progressive kyphotic deformity of the thoracic spine. Clinical examination revealed a tenderness of the paravertebral musculature and a posterior facet pain in extension at the thoracolumbar junction and the cranial lumbar segments. Neurologic examination evidenced a bilateral hyperreflexia of the patellar reflex but the Babinski test was negative. Preoperative neuromonitoring was performed: MEP and SSEP confirmed slight residual changes of the cortical responses in the territory of lower limbs. Thoracic and lateral full spine radiographs evidenced the deformity with a regional kyphosis of 60° at T6–T7 that was reducible to 50° on a fulcrum. Computed tomography (CT) demonstrated the collapse of both vertebral bodies and the angular kyphosis post laminectomy. Magnetic resonance imaging (MRI) showed residual paravertebral abscess formations. The spinal cord appeared tethered on the apex of the kyphosis, without intramedullary hypersignal.

Surgical procedure

The patient was placed on a Jackson table in supine position. SSEP and MEP monitoring was performed by a neurophysiologist throughout the operation. A midline posterior approach was made from T3 to T10. The dura mater was carefully dissected at the levels of the former laminectomies from T5 to T8 and a lateral exposure of transverse processes and ribs was performed. Pins were placed into the pedicles of T3–T5 and T8–T10 and their position was controlled by fluoroscopy. This would allow further exact positioning of the pedicle screw following a trajectory parallel to the endplate. Monoaxial screws were used at the levels T5 and T8 to enhance the potential for sagittal deformity correction when using the in situ bending technique with a 90° rod-screw connection, and all other screws were polyaxial. After screw placement, the transverse processes T6–T8 and proximal portions of the ribs were resected using an ultrasonic bone scalpel. The pedicles were resected which allowed dissection between the anterior dural sac and the posterior wall. The nerve roots were ligated and sectioned at T6 and T7. An anterior blunt dissection was then performed around the vertebral bodies and a curved retractor protected the aorta. A unilateral rod temporarily stabilized the spine. The vertebral bodies of T6 and T7 were then resected en bloc by removing the adjacent discs. The second rod was placed on the contralateral side. The 5.5 mm rods were made of a cobalt chromium (CoCr) alloy, thus allowing gentle bilateral in situ bending maneuvers. Deformity correction was achieved by decreasing segmental kyphosis without stretching the

spinal cord. A titanium mesh cage filled with cancellous bone from the iliac crest reconstructed the gap between T5 and T8 vertebral bodies. Two cross-links were added to the instrumentation to enhance stability in axial rotation. A deep and a subcutaneous drain were placed and wound closure was performed.

Postoperative information

The patient was transferred to the intensive care unit for 24 h postoperatively and the total hospital stay in a conventional department of spine surgery was 7 days. Ambulation without a brace was started on the second day after surgery. After 6 weeks, physical therapy was performed on an ambulatory basis. Back pain had significantly decreased at this time and the patient went back to university after 2 months. At 3 months follow-up, the thoracic spine was well balanced and a regional kyphosis of 15° was measured on radiographs.

Discussion and conclusion

TB spondylitis can lead to a significant osteolysis and collapse of the vertebral bodies, which results in hyperkyphosis and tethering of the spinal cord. Instrumented fusion should always be considered if decompression becomes necessary, since multilevel laminectomies increase the kyphotic deformity. Surgical debridement, posterior deformity correction and grafting of the anterior column provide satisfying long-term results with regard to sagittal balance, back pain and neurologic function [4, 5]. Late stages of rigid hyperkyphosis are more difficult to treat because they may require complex three-column osteotomies [6]. VCR represents an efficient method to correct sharp angular hyperkyphosis [7]. Nevertheless, the potential neurologic risk needs to be carefully evaluated and discussed with the patient, and neurophysiologic monitoring appears mandatory for this type of surgery.

Conflict of interest None.

References

1. World Health Organisation (2013) Tuberculosis in the WHO European region: fact sheet 2012. <http://www.euro.who.int/tb>
2. Dara M, Dadu A, Kremer K et al (2013) Epidemiology of tuberculosis in WHO European region and public health response. *Eur Spine J* 22(Suppl 4):S549–S555
3. Cheung WY, Luk KDK (2013) Clinical and radiological outcomes after conservative treatment of TB spondylitis: is the 15 years'

- follow-up in the MRC study long enough? *Eur Spine J* 22(Suppl 4):S594–S602
4. Mak KC, Cheung KMC (2013) Surgical treatment of acute TB spondylitis: indications and outcomes. *Eur Spine J* 22(Suppl 4):S603–S611
  5. Qureshi MA, Khalique AB, Afzal W et al (2013) Surgical management of contiguous multilevel thoracolumbar tuberculous spondylitis. *Eur Spine J* 22(Suppl 4):S618–S623
  6. Boachie-Adjei O, Papadopoulos EC, Pellisé F et al (2013) Late treatment of tuberculosis-associated kyphosis: literature review and experience from a SRS-GOP site. *Eur Spine J* 22(Suppl 4):S641–S646
  7. Enercan M, Ozturk C, Kahraman S et al (2013) Osteotomies/spinal column resections in adult deformity. *Eur Spine J* 22(Suppl 2):S254–S264