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Incomplete cranial burst fracture of L1 treated by mini-open thoracoscopically-assisted anterior vertebral column reconstruction

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Introduction

Incomplete cranial burst fractures are often associated with destruction of the neighbouring intervertebral disc. In these cases additional anterior vertebral column reconstruction might be beneficial to avoid posterior implant failure and secondary loss of correction with kyphotic deformity.

Thoracotomy is the standard approach to reconstruct the anterior vertebral column in the thoracolumbar junction; however, classic thoracotomy has potential disadvantages like the development of a chronic postthoracotomy pain syndrome, long hospital stay, long rehabilitation and postoperative pulmonary or scapular dysfunction. Therefore, less invasive approaches like mini-open thoracotomy, mini-open thoracoscopically-assisted thoracotomy or fully (video-assisted) thoracoscopic approaches have gained increasing popularity.

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Case description

A 61-year-old male had a fall from the roof of his SUV at a break during his off-road tour. He had significant back pain, but no neurologic deficit. X-ray and CT scans demonstrated an incomplete cranial burst fracture of L1 (Type 3 according to the AOSpine classification [1]). After initial short segment percutaneous posterior stabilisation from Th12 to L2 without decompression and fusion an MRI was done showing significant disc destruction at the level Th12/L1. Hence, a secondary anterior column reconstruction was planned to address the disc lesion and to establish a monosegmental fusion.

Surgical procedure

Anterior vertebral column reconstruction was performed by a standard left side mini-open thoracoscopically-assisted thoracotomy approach. The patient was positioned in a lateral decubitus position with the left side up. Under fluoroscopic control the Th12/L1 disc and adjacent vertebrae were marked on the skin and a 5 cm long skin incision was performed. The mini-thoracotomy was conducted at the upper edge of the 10th rip. After retraction of the lung and the diaphragm with a self retaining spreader system (Synframe) the spine was exposed. The portal for the thoracoscope was generated cranial and slightly medial to the mini-thoracotomy. Single lung ventilation is normally

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not necessary for an approach between Th12 and L2. Under thoracoscopic and direct visual control the pleura was opened and a discectomy Th12/L1 was performed preserving the integrity of the lower endplate of Th12. Due to the vertebral body destruction parts of the upper endplate of L1 were removed. A tricortical iliac crest bone graft, taken from the left iliac crest, was transplanted to bridge the existing defect and to establish fusion. Finally an angle stable plate fixed with 4 screws (MACS II) was used to create a mono-segmental fixation of Th12/L1. The correct position of the implants was controlled by biplane fluoroscopy. A pleura drain was positioned via the thoracoscope portal and a pleura catheter was inserted to allow continuous postoperative pain therapy. After approximating the rips with a suture and closing the mini-thoracotomy a subcutaneous drain was inserted and the skin was closed. Blood loss was 400 ml and operation time was 1 h 50 min.

Postoperative procedure

The patient was fully mobilized on the first day after surgery. No brace was applied. Wound drain was removed on the second postoperative day, pleura drain and catheter on the third. A standardised rehabilitation program was conducted. Postoperative plain X-rays showed good position of implants and a good restoration of sagittal alignment.

Discussion and conclusion

In central Europe classic open thoracotomy has been widely replaced by less invasive approaches. After having performed fully thoracoscopic approaches for many years the mini-open thoracoscopically-assisted thoracotomy is now our standard procedure for anterior instrumentation between Th4 to L2. Fully (video-assisted) thoracoscopic approaches with instrumentation regularly necessitated an enlargement of one portal to get the implants in. From this point it is only a very small step to the 5 cm mini-open thoracoscopically-assisted thoracotomy.

Mini-open thoracoscopically-assisted thoracotomy reduces the trauma to the chest, resulting in reduced pain, quicker recovery, minimised pulmonary and scapular dysfunction and better subjective and cosmetic results compared to open surgery [2]. In contrast to fully thoracoscopic procedures, mini-open techniques with the use of a thoracoscope combine the benefits of thoracoscopy like optimal illumination, visualisation and magnification and the benefits of mini-open surgery like direct visualisation, good tactile feedback and simplified instrumentation procedures. In our hands mini-open thoracoscopically-assisted thoracotomy is much faster and less difficult than fully thoracoscopic procedures especially in instrumented cases and therefore beneficial for our patients. However, the fully thoracoscopic procedures still play an important role in the non-instrumented cases.

The challenges and associated costs of minimal invasive surgery are only justified if the results of open surgery regarding deformity correction, safety and efficacy are not compromised. Mini-open thoracoscopically-assisted thoracotomy allows instrumentation and decompression of the anterior column similar to open surgery and provides the same complication rates, clinical and radiographic results [3], however, with less operative trauma.

Conflict of interest None.

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