Case report - Thoracic oncologic

Use of the titanium vertical ribs osteosynthesis system for reconstruction of large posterolateral chest wall defect in lung cancer

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Abstract

We report a case of reconstruction of a large full-thickness posterolateral defect of the chest wall after resection of a stage III non-small cell lung carcinoma (NSCLC) using the combination of a vertical expandable prosthetic titanium device and a polytetrafluoroethylene (PTFE) mesh. A 40-year-old female presented with a NSCLC classified as type IIIA and required both neoadjuvant radiotherapy and chemotherapy. An en bloc resection including the left upper lobe, posterolateral segments of five ribs (K3–K7) and vertebral bodies (T3–T6) was performed through a posterior J-shaped approach. A vertical rib osteosynthesis system was used to ensure thoracic wall stability and mechanical organ protection, prevent ventilatory impairment, avoid incarceration of the tip of the scapula, and maintain an acceptable cosmetic aspect. The device was locked onto the middle arch of the second and eighth ribs. We hung the PTFE mesh from the titanium bars with multiple non-absorbable sutures under maximal tension. Final pathological classification was T4N0M0 with an R0 final resection status. After an uneventful course, the patient was discharged on postoperative day 10. This first experience indicates that vertical rib osteosynthesis combined with a PTFE mesh can be used safely and easily in a one-stage procedure for major posterior chest wall defects.

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Keywords: Chest wall; Chest wall tumor; Rib prosthesis

1. Introduction

The reconstruction of large chest wall defects after resection of stage III non-small cell lung carcinoma (NSCLC) remains challenging for thoracic surgeons. In cases of a full-thickness defect, many rigid implants are available. We report a new indication of the vertical expandable prosthetic titanium rib system (VEPTR; Synthes, West Chester, PA, USA), usually described in expansion thoracoplasty for congenital scoliosis [1]. Combined with a polytetrafluoroethylene (PTFE) Dualmesh (Dualmesh 2 mm; Gore-Tex, W.L. Gore and Associates, Flagstaff, AZ, USA) in order to prevent ventilatory impairment, optimize lung function, and avoid incarceration of the tip of the scapula, this device was used for a large posterolateral chest wall defect where a classical titanium horizontal bar could not be fixed.

2. Material and methods

A 40-year-old female had an NSCLC of the right upper lobe involving the third, fourth, fifth, and sixth ribs and the corresponding vertebral bodies. The clinical presenta-
the second and seventh ribs. We laid and hung the Dualmesh from the titanium bars with multiple non-absorbable sutures under maximal tension (Figs. 1b and 2). The final pathological classification was T4N0M0, with a R0 final resection status. After an uneventful course, the patient was discharged on postoperative day 10. No paradoxical motion of the chest wall, respiratory failure, or infection was reported during follow-up. Pulmonary function revealed no difference between the preoperative and postoperative (six-month) forced expiratory volumes in one second. There was no restriction pattern.

4. Discussion

When a full-thickness chest wall defect is located posteriorly, the basic rule is to reconstruct those larger than 10 cm in size [1]. In cases of a full-thickness chest wall defect, many rigid implants are available [2, 3]. Titanium devices are used as modern rigid, corrosion-free, chemically inert implants that are quickly and precisely adaptable to the shape of the thoracic wall. Moreover, titanium can be imaged safely with both computed tomography scanning and magnetic resonance imaging, and therefore does not affect the oncological follow-up. The main interest in the VEPTR is the verticality of the thoracic osteosynthesis system. This characteristic permits a stable thoracic wall repair in cases of a very large posterior chest wall defect associated with multiple transverse process resections. Campbell et al. [4] first described this device in children with congenital thoracic scoliosis associated with fused ribs.

The surgical technique required a thoracostomy of the fused ribs and the insertion of a vertical expandable titanium prosthetic device to stabilize and distracte the thorax. Since the description of the surgical technique in 2004 [5], several authors have used the VEPTR in young patients with congenital thoracic scoliosis. This vertical rib osteosynthesis appeared to be useful in the context of a chest wall defect after lung cancer surgery.

Horizontal titanium rib implants [6] are used worldwide to reconstruct full-thickness chest wall defects. The main drawback of these systems is the need for an available posterior segment of disease-free rib to lock the clip or screw the titanium implant onto. In this situation, a vertical osteosynthesis is possible to prevent ventilatory impairment, optimize lung function, and avoid incarceration of the tip of the scapula. VEPTR rib-to-rib components are composed of two attachments to the superior and inferior ribs presented as cradles, jointed with rib sleeves and locks. Combined with a Dualmesh, this allowed a chest wall...
reconstruction when other horizontal devices were not suitable.

5. Conclusion

This first experience seems to indicate that titanium vertical rib osteosynthesis can be used safely and easily in a one-stage procedure for major chest wall defects in lung cancer and primary chest wall tumors.

References


