How-to-do-it

Modified transmanubrial osteomuscular sparing approach for resection of T1 vertebral tumor

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Abstract

We report a technical modification of the classic transmanubrial osteomuscular sparing approach described by Grünenwald and Spaggiari for the treatment of a T1 vertebral tumor. The goal of the surgical treatment for spinal tumors of the cervico-thoracic area is to excise the vertebral tumor, reconstruct the spinal column, and place an internal fixation device to achieve immediate stabilization. The procedure was necessary for treating a patient who presented with an invasion of T1 vertebral body by multiple myeloma with initial neurological symptoms of epidural spinal cord compression. This approach requires a multidisciplinary team, essentially composed by the thoracic surgeon, who performs the anatomical dissection of the cervico-thoracic area, and the neurosurgeon, who performs the vertebrectomy and placement of a titanium prosthesis (Harm’s cage). The operation was successful; the follow-up 6 months after the surgical procedure is normal.

Keywords: Cervico-thoracic tumors; Transmanubrial approach; Vertebrectomy

1. Introduction

In the treatment of the thoracic inlet tumors with invasion of neurovascular or vertebral structures, different techniques [1–6] have been developed in recent years, providing excellent exposure to undertake safe dissection of any involved structures. Some of these [1,4] imply the section of the clavicle, while others [2,6] extend the cervicotomy to a partial sternotomy. The most invasive is the anterior ‘trapdoor’ approach as per Masaoka et al. [5].

The goal of the surgical treatment for spinal tumors of the cervico-thoracic area is to excise the vertebral tumor, reconstruct the spinal column, and place an internal fixation device to achieve immediate stabilization. The position of the tumor at T1 level, as in the presented case, requires a combined cervico-thoracic and neurosurgical approach. The anterior approach provides direct access to the vertebral body, in order to perform the T1 vertebrectomy. We describe a transmanubrial osteomuscular sparing approach for the treatment of a T1 tumor, modified from the original description of Grünenwald and Spaggiari [2].

2. Technique and case report

A 39-year-old male patient was diagnosed in November 2006 as multiple myeloma with invasion of T1 vertebral body. The patient presented initial symptoms of neurological deficit (motor and sensitive dysfunction of upper and lower limbs) as a result of epidural spinal cord compression at T1 level.

The vertebral magnetic resonance showed a somatic fracture of T1, with tumor invasion of the residual vertebral body and compression of the dura and spinal cord. We decided to operate on the patient because of the spinal instability, and the initial neural compression secondary to the vertebral collapse. A combined multidisciplinary approach (cervico-thoracic and neurosurgical) was undertaken.

The patient was placed in a supine position with his neck hyperextended and the head turned away to the left. A bolster was placed behind the shoulder to elevate the operative field. A modification of the classic transmanubrial osteomuscular sparing approach described by Grünenwald and Spaggiari in 1997 [2] was performed.

The skin incision was done through an inverse L-shaped right cervicotomy anterior to the sternocleidomastoid muscle (SCM) directed inferiorly to the manubrium sterni where it turns following the second intercostal space, two fingers below the clavicle, up to the right delto-pectoral groove.

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A dissection along the anterior edge of the SCM gave access to the internal jugular vein. The major pectoral muscle was spared, and the manubrium sterni was partially freed from its ligament connections only as necessary for inserting the sternal saw. The internal thoracic artery and vein were divided. The manubrium sterni was sectioned through an inverse L-shaped incision, respecting the sternoclavicle articulation, and the first rib costal cartilage was resected.

A lace around the manubrial edge was used to elevate the osteomuscular flap, and the dissection of the vascular plan became possible. The subclavian vessels were identified, but their complete dissection was not required to gain access to the C7—T2 vertebral area. The brachiocephalic trunk was first dissected and then the common carotid artery almost to its bifurcation (Fig. 1; Video 1).

The vertebral plan was reached shifting laterally to the right of the vascular axis and medially the tracheoesophageal axis (Fig. 2). Care must be taken during this phase to the right recurrent laryngeal nerve, and to recognize the esophagus.

At this point, the neurosurgical time of the operation started. The T1 vertebrectomy was performed, completed by the vertebral reconstruction positioning a titanium prosthesis (Harm’s cage) stabilized by fixation to C7 and T2, and covered with methylmethacrylate. Redon drainage was positioned in the paravertebral area and two separate steel threads reapproximated the manubrium sterni (Video 2).

The patient had an uneventful recovery, except for a modest wound inflammation with non-purulent secretion. The clinical and radiological follow-up 6 months after the operation is satisfying.

3. Comments

The surgical approach to the cervico-thoracic vertebral area is complex. In recent years several techniques have been developed to treat different tumors involving the thoracic inlet and adjacent structures, including superior sulcus tumors, neurogenic tumors, soft tissue neoplasms, and metastatic lesions [6,7]. In the surgical treatment of C7—T2 vertebral tumors, the Grünenwald and Spaggiari approach [2] provides excellent exposure of the anatomical structures, without the necessity of resecting the clavicle as with the Dartevelle technique [1]. We modified the original approach described by Grünenwald and Spaggiari [2] because a complete dissection of the subclavian vessels and brachial plexus is not required to gain the T1 vertebral area. The surgeon can choose either a right-sided or a left-sided approach, because the vascular dissection is quite similar on both sides. The exposure of the C7—T2 level gained by this technique is satisfying, and the cosmetic and functional results are very good.

References


Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.ejcts.2007.07.019.