ANTERIOR SURGICAL MANAGEMENT OF THE CERVICO THORACIC JUNCTION LESIONS AT T1 AND T2 VERTEBRAL BODIES

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Abstract – Lesions of the cervicothoracic junction have a high propensity for causing instability and present unique challenges in the surgical treatment. Several surgical approaches to this region have been described in the literature. We report our experience in the surgical treatment of six patients with unstable lesions involving the cervicothoracic junction at T1 and T2 vertebral bodies. The patients underwent an anterior left Smith-Robinson approach and manubriotomy. Mesh and cervical plate system were used for stabilization and reconstruction of the region. No complication related to the surgical procedure was observed. In our experience, in injuries involving the T1 and T2 vertebral bodies, the transmanubrial approach offers good working room to remove the lesions and anterior reconstruction.

KEY WORDS: spine, cervicothoracic junction, instability, surgical treatment.

Manejo cirúrgico via anterior das lesões da junção cérvico-torácica nos corpos vertebrais de T1 e T2

Resumo – Lesões da junção cervico-torácica têm alta tendência em causar instabilidade e apresentam grandes desafios ao tratamento cirúrgico. Diversas abordagens cirúrgicas a esta região foram descritas na literatura. Relatamos nossa experiência no tratamento cirúrgico de seis pacientes com lesões instáveis envolvendo a junção cervico-torácica em corpos vertebrais de T1 e T2. Os pacientes foram submetidos a uma abordagem anterior de Smith-Robinson pela esquerda e manubriotomia. Mesh e placa cervical foram utilizados para estabilização e reconstrução da região. Nenhuma complicaçã o relacionada ao procedimento cirúrgico foi observada. Em nossa experiência, em lesões que envolvem os corpos vertebrais de T1 e T2, a abordagem transmanubrial oferece bom campo de trabalho para remoção das lesões e estabilização anterior.

PALAVRAS-CHAVE: coluna, junção cervico-torácica, instabilidade, tratamento cirúrgico.

The cervicothoracic junction is defined as the area extending from vertebral segments C7 to T4, and includes the lower brachial plexus, the thoracic outlet and the par enchymatous, vascular and nervous structures of the upper mediastinum. This region is a transition area from a mobile, lordotic cervical spine to a rigid, kyphotic thoracic spine1. It is susceptible to injury because of the weight transfer from the anterior column to the posterior column2 and the vertebral index decreases from C6 to T1 verte brae, causing added stress to be applied to the more narrow and thinner vertebrae1. Several studies demonstrate that surgical procedures in the cervicothoracic junction can destabilize this region, mainly laminectomies at C7 T14 and spinal fusions ending at this junction45. Pathological processes such as tumors, trauma, degeneration and infection, which usually occur in the anterior segment of the vertebrae, frequently determine instability of this segment5. Progressive instability of this area ultimately leads to kyphosis and spinal cord compression, neurological involvement being a common complication as high as 80%68. This predisposition may be due to the small spinal canal and the tenuous blood supply78. The surgical treatment goals of cervicothoracic pathologies are neural decompression, immediate stabilization, restoration of anatomical spinal alignment and early rehabilitation. Different surgical approaches to the cervicothoracic junction have been described14729. As most pathologies affect the anterior column often an anterior approach is required to treat these lesions. Access to the anterior aspect of the cervicothoracic junction is difficult.
and potentially dangerous because of bony obstructions such as the manubrium, clavicle and ribs and because of nearby vital structures such as great blood vessels, esophagus, trachea, recurrent laryngeal nerve, thoracic duct and sympathetic ganglia.

We report our experience with the anterior approach to the cervicothoracic junction at T1 and T2 vertebral bodies and its results.

METHOD

We reviewed the records of six patients with unstable lesion of the cervicothoracic junction at T1 and T2 vertebral bodies surgically treated by anterior surgical approach. All patients had metastatic or traumatic vertebral body lesions diagnosed by computed tomography and magnetic resonance image. Clinical data of patients are summarized in Table.

All patients underwent an anterior approach to the cervicothoracic junction by a left Smith-Robinson approach and manubriotomy. The patient was placed in the supine position on the operating table under general endotracheal anaesthesia. The neck was extended slightly using a folded sheet. Both wrists have traction bands applied to pull the arms down for lateral radiographic imaging during the procedure. Left vertical incision was performed along the medial aspect of the sternocleidomastoid extending along the midline of the sternum down two centimeters from the Louis angle to permit manubriotomy. Subplatysmal flaps were elevated and retained by sutures. The sternomastoid, sternohyoid and sternothyroid muscles were sectioned, allowing connection of the region of the lower cervical and the upper thoracic spine. The sternum was split partially (manubriotomy) and the level of dissection was confirmed by fluoroscopy. The lesion was removed using a microscope and the reconstruction was done using mesh and a cervical plate system. A suction drain was used in the substernal space. The manubriotomy was closed with steel wires number three. The patients kept 48 hours in the intensive care unit and then discharged to a hospital room.

RESULTS

The mean age was 58.4 years (range, 30–72 years) and three patients were male. All patients had T1 involvement and two of them had T2 involvement. Most patients had metastatic disease and presented with severe local pain. Two patients had signs of spinal cord compression at the time of diagnosis, one had suffered a traumatic spinal cord injury. The mean surgical time was 3.7 hours (range, 2.8–5.2 hours) and the mean bleeding was 310 mL (range, 180–520 mL). No complication related to the surgical procedure was observed. One patient had a lung infection few days after the surgery. All the patients had significant relief from pain and good neurological recovery. Case 4...
was submitted to posterior fixation of the spine because of posterior ligament and bone instability. The patients stayed in hospital for 7 days in average (range, 6–9 days). Figure illustrates the case 2.

DISCUSSION

Lesions of the cervicothoracic junction have a high propensity for causing instability and present unique challenges in surgical treatment. The pathologies involving this region often produce spinal cord compression, which was noted in three of seven cases presented in this series. Several surgical approaches to the cervicothoracic junction have been described in the literature. Posterior approaches are disadvantageous because of a destabilization effect, inadequate visualization of the vertebral body pathology, and the need for a long posterior construct to restore stability with a higher complication rate than anterior or lateral approaches. The limitations of a posterior exposure have resulted in the development of various posterolateral and anterior approaches. The first description of a posterolateral approach to the cervicothoracic area was the costotransversectomy described in 1894 by Ménard. Capener described the lateral thoracotomy approach, which provided a more extensive posterolateral exposure afforded by a resection of a longer rib segment. A modification of Capener's technique was described by Larson into the lateral extracavitary approach, which improved exposure and reduced morbidity. Fessler and colleagues proposed the parascapular extrapleural lateral approach, which improved exposure of all the upper thoracic vertebrae. The disadvantages of this procedure are prolonged surgery (10–12 hours), excessive blood loss and inefficiency for the pathologies extending into the C7 vertebrae. Furthermore, pulmonary-related complications are common following this approach.

Many authors suggest a simple anterior supramanubrial cervicotomy to be used to reach the anterior portion of the proximal dorsal vertebrae. Although this approach is not very invasive, it does not permit good visualization and anterior reconstruction below T1, which results from the patient's anatomical characteristics, such as marked junctional kyphosis, congenital high sternum, short neck or large shoulders. Cauroix and Binet proposed an anterior approach combining the supraclavicular approach with a median sternotomy. This sternal splitting approach enables the exposure of the whole cervicothoracic junction up to T4. Hodgson et al. reported a surgical mortality rate of 40% with the sternal splitting approach and recommended the anterolateral thoracotomy approach to the cervicothoracic junction, which had only 4% mortality. However, the anterolateral thoracotomy approach provides limited access to the lower cervical spine because of obstruction by the scapula and upper ribs. Louis improved the sternal splitting approach combining this procedure with the anterior Smith-Robinson approach, permitting access from C2 to T5. In our experience, performing a partial sternotomy (manubriotomy) we are able to reach until T4, but are unable to achieve additional caudal exposure despite using a complete sternotomy because of the limited retraction of the aortic arc and this procedure can minimize the risks of sub-sternal dissection. Upper lateral transthoracic or extrapleural approach is mandatory for total removal and reconstruction of the lesions of T4 and below. Despite the high mortality reported by Hodgson et al. following an anterior surgical procedure of the cervicothoracic junction, many authors believe that the...
A trend toward treatment failure was noted in cases involving multilevel corpectomies, posterior instability or dorsal cervicothoracic laminectomies with extension of the dorsal hardware to T1 or T2. Besides, treatment failure was also associated with histories of prior cervical surgery, deformity correction and tobacco use. In case 4, we performed an anterior decompression followed by a posterior stabilization because of posterior ligament and bone instability.

In our experience, a left Smith-Robinson approach combined with manubriotomy offers good exposure and working room for the cervicothoracic lesions involving T1 and T2 vertebral bodies. This approach requires accurate knowledge of surgical anatomy, as many vital structures are present in this area. We used mesh and a cervical plate system with good results for stabilize and reconstruct this region.

REFERENCES