Case Report

Median Sternotomy as a Useful Adjunct to Anterior Cervicothoracic Spine Decompression and Fixation: A Plea for Its Popularity among Spine Surgeons in West Africa

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Abstract

Direct anterior approach to the cervicothoracic spine (C7-T4) for surgery can be challenging via a standard anterior cervical incision as a result of the important neurovascular structures crowding the cervicothoracic junction. Where indicated, median sternotomy provides improved access to this region of the spine for interventions. From the paucity of published literature in West Africa, this adjunct appears to be quite unpopular among spine surgeons in our sub-region. We report the presentation, preoperative evaluation, operative technique and outcome of treatment of a 66-year-old man with multiple myeloma affecting T1 with the same vertebral body collapse, who had full median sternotomy, anterior T1 decompression with C7-T2 Spinal fixation. Where indicated, an anterior trans-sternal approach to the cervicothoracic spine offers good exposure to T2/T3 vertebral body for decompression and instrumentation with minimal risks and morbidity. Spine surgeons in the West African subregion should utilize this important collaboration with thoracic surgeons to achieve satisfactory access to spine surgery within the thoracic cavity.

Keywords: *Anterior approach, cervicothoracic junction, median sternotomy, tumour*

Introduction

Direct anterior approach to the cervicothoracic spine (C7-T4) for surgery can be challenging via a strictly cervical incision as a result of the neurovascular structures crowding the superior thoracic aperture (anterior to the cervicothoracic junction) and the limiting manubrium. Partial or full median sternotomy is sometimes advocated to aid access to T2–T4 vertebral bodies for spine surgery. Although Cauchoix and Binet were the first to ventrally approach the cervicothoracic spine by attempting a direct median sternotomy in 1957,[1] this well-established approach was only first reported in the West African sub-region by Okyere *et al*.[2] Where indicated (and with meticulous dissection in experienced hands), median sternotomy provides improved access to as low as T4 vertebral body for an anterior approach to the spine. From the paucity of published literature in the West African sub-region, this invaluable adjunct appears to be quite unpopular among our spine surgeons.

Case Report

The patient was a 66-year-old man who presented with neck pains and progressive bilateral lower limb weakness. He occasionally had shocking sensations at C8/T1 dermatome with sensory level at the same region. He was constipated but had no urinary incontinence. computerized tomography (CT) scan revealed destruction of the whole of T1 and upper part of T2 vertebral bodies [Figure 1] whereas magnetic resonance imaging (MRI) revealed the collapse of the T1 vertebral body with pressure on the spinal cord [Figure 2]. Multiple other small lytic lesions were noted in other cervical vertebrae. He was scheduled for T1 vertebrectomy and C7-T2 fixation with an expandable cage, plate and screws via an anterior approach. To gain satisfactory access to the T2 vertebra, a median sternotomy was considered necessary as a useful adjunct. The necessary pre-operative preparation was done. Intra-operatively, after instituting general anaesthesia with cuffed endotracheal intubation, the incision was marked [Figure 3]. The cervical incision and dissection were made before

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Figure 1: Computerized tomography scan revealing destruction of the whole of T1 and upper part of T2 vertebral bodies with cord compression

Figure 2: Magnetic resonance imaging scan revealing collapse of T1 vertebral body with pressure on the spinal cord

Figure 3: Incision marked

median sternotomy in the standard fashion. With the new exposure, the cervical dissection was continued, displacing the trachea and oesophagus to the left and the carotid sheath and subsequently the brachiocephalic artery to the right. With a gentle retraction of the left brachiocephalic vein and proximal parts of the brachiocephalic artery inferiorly, T2/T3 vertebrae were accessed. Throughout the access procedure, the vertebrae served as a guide to the dissection. Excision of the tumour with cord decompression and C7-T2 fixation with an expandable cage, plate and screws was done. Haemostasis was secured and the wound was closed in standard fashion over mediastinal drains [Figure 4]. Post-operative CT scan revealed satisfactory spine fixation [Figure 5]. The operation time was 250 min (15 min of which was attributed to the median sternotomy procedure) whereas the estimated blood loss was 1800 mL (150 mL of which was attributed to the median sternotomy procedure). The patient had recovery of neurological functions evidenced by the full recovery of power in the legs and bowel functions. Post-operative admission was 2 weeks due to the treatment of acute renal failure from myeloma kidney dysfunction from which he recovered fully before discharge to the oncologist. The pain score was 2 on a numeric scale of 1 to 10.

Histology of the tumour specimen and bone marrow biopsy revealed plasmablastic lymphoma. Other supportive investigation was corroboratory. The patient has commenced standard treatment.

Figure 4: Wound closed over mediastinal drains

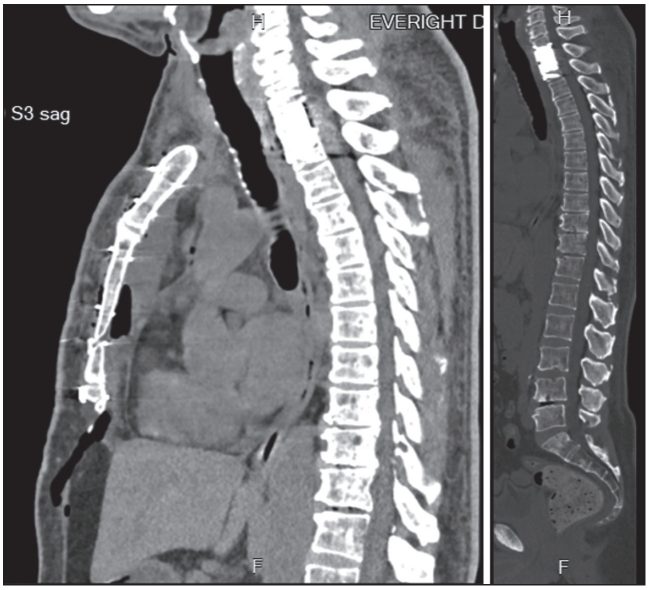

Figure 5: After T1 excision, decompression of the spinal canal and C7-T2 spine fixation

Discussion

Current approaches to the cervicothoracic spine include the conventional anterior cervical approach, standard trans-clavicular approach, anterior approach combined with manubriotomy or sternotomy, anterolateral trans-thoracic approach, approach by resection of the manubrio-clavicular complex and combined approaches.[3,4] The conventional anterior cervical approach is the easiest and offers access to as low as T1/T2 for both decompression and instrumentation and T3 for decompression only (in long-neck individuals) without instrumentation.[3] Karikari *et al*.[5] had proposed that the lowest accessible disc space by the conventional anterior cervical approach can be determined by the lowest intervertebral disc line (a straight line passing through and parallel to the disc space) that passes above the manubrium on a pre-operative CT or MRI image. They proposed that manubriotomy or sternotomy should be considered for any intervertebral disc line that passes below the manubrium. In our patient, with the destruction of T1/T2 intervertebral disc and upper margins of T2 vertebrae, it was desirable to potentially gain access to the T2/T3 intervertebral disc for satisfactory C7-T2 fixation. This desired intervertebral disc line was way below the manubrium, hence the decision for a trans-sternal approach. The trans-sternal approach appears to be unpopular in our subregion evidenced by the paucity of reports in that regard. This is due to the important regional structures that pose a challenge in gaining access to the spine for decompression and fixation.[3,6] However, despite all odds, this approach may be more appropriate in selected pathologies (based on the anatomy, type and level of cervicothoracic spine lesion) to yield the best results.[7] This offers an important collaboration between the spine and thoracic surgeons. This approach has been described as aiding anterior access to as low as T4/T5 vertebral bodies. Access to T1/T2 is achieved by the dissection of the "inside window" whereas access to T3-T5 can be achieved by the dissection of the "outside window" as compiled by Fiani *et al*.[1] However, a trans-thoracic approach may be more suitable for access below T3 to mitigate avoidable access challenges and the risk of major vascular injuries.[7]

Although there are modifications of the trans-sternal approach such as manubriotomy and the approach by resection of the manubrio-clavicular complex, the full median sternotomy approach is technically easier and offers excellent exposure amidst other advantages as enumerated by Okyere *et al*.[2]

For spine surgeons wishing to gain anterior access to T2/T3 for spine fixation, the consideration of median sternotomy as an adjunct is considered one significant morbidity too many.[8] Whereas this consideration may be true in the hands of the inexperienced, it is frequently too exaggerated. With more collaboration with the experienced thoracic surgeon who routinely carries out median sternotomy, such fears are rapidly relegated to their proper place.[9]

Although the operation time for our patient was 250 min, only 15 min was attributed to the median sternotomy procedure, whereas the estimated blood loss of 1500 mL was attributed to the bleeding from the body of the T1 vertebral body during the decompression. Only an estimated 150 mL of blood was attributed to the median sternotomy

procedure. The long post-operative admission of 2 weeks was attributed to the treatment of acute renal failure from myeloma kidney dysfunction from which he recovered fully before discharge to the oncologist. All the management of sternotomy wound and mediastinal drains were concluded in 48 h with the removal of the drains. There was no added pain attributed to the median sternotomy procedure.

Although possible early complications of this procedure include injury to the recurrent laryngeal nerve with hoarseness, major vascular injuries, tracheoesophageal injury, mediastinitis and inadequate spine decompression,[3] none of these occurred in our patient.

Conclusion

Where indicated, an anterior trans-sternal approach to the cervicothoracic spine offers good exposure to T2/T3 vertebral body for decompression and instrumentation with very minimal risks and morbidity. Spine surgeons in the West African subregion should utilize this important collaboration with thoracic surgeons to achieve the best results in spine surgery.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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