Anterior Decompression for Cervicothoracic Pathology: A Study of 14 Patients

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Abstract

Introduction: Various anterior approaches to the cervicothoracic junction have been described. This study reports our experience with 14 patients who had cervical anterior approaches to the cervicothoracic junction (C6-T2). This technique was evaluated with regard to the extent of exposure, ease of technique, and postoperative morbidity. We have chosen the low cervical approach to obtain exposure up to T2. For T3-T4 pathology, we use the transthoracic, periscapular approach. We do not practice bone-splitting approaches because of the morbidity associated with these approaches.

Methods: Fourteen patients with C6-T2 pathology who required anterior decompression and fusion were studied for a period of 2 years. In all cases, the low cervical anterior approach was used.

Results: This approach is simple, requires less operative time, and provides excellent exposure up to the level of T2. There was no long-term morbidity attributed to the approach and procedure.

Conclusion: The low cervical anterior approach is an excellent approach that provides adequate exposure for spinal pathology to T2 that requires anterior decompression and fusion.

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Key Words: Spinal cord injuries; Spinal surgery; Cervicothoracic spine; Anterior surgical decompression; Tuberculosis of the spine

INTRODUCTION

Exposure of the cervicothoracic junction presents a significant challenge to the spine surgeon, especially when destruction by tumor and infection leads to kyphosis and collapse. Kyphosis causes obstruction from the clavicle, sternum, and vital structures, making the surgical exposure difficult. For this reason, various techniques of exposure have been described. Available standard approaches are the standard anterior approach to T1, the sternal-splitting approach for T1 to T3 (1) (Figure 1), and the medial end clavicle excision approach (2).

Disadvantages of standard approaches are lack of access, especially to T1-T2, and at times, exposure to C6-C7 and C7-T1 may also be difficult. Splitting the sternum provides some access (3,4), but the exposure is still limited by the sternomastoid muscle around the clavicles (3). Partial resection of the medial end of the clavicle allows good access to the upper thoracic spine but seems

unnecessarily destructive (5). We present 14 patients with cervicothoracic pathology treated by anterior decompression utilizing an extended anterior approach of cervical spine in which exposure to T2 was possible without any bony resection or dissection of the sternomastoid muscle from the sternum.

METHODS

We treated 18 patients with cervicothoracic pathology (C6-T2); details are available for 14 patients with 2 years' follow-up; the remaining 4 patients were lost during follow-up. There were 8 male and 6 female patients who ranged in age from 6 to 58 years.

All patients were nonambulatory: 10 patients had paraparesis and 4 had complete paraplegia. All the patients who had tuberculosis were operated on under chemotherapeutic coverage according to category I Directly Observed Therapy.

In all 14 patients, corpectomy of the affected level, with fusion extending up to the adjacent levels, was done using tricortical iliac crest bone graft. One patient who had T1-T3 fusion also underwent posterolateral de-

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Figure 1. The sternal-splitting approach from C4-T4. Left drawing. Copyright The Royal College of Surgeons of England. Reproduced with permission from Cauchoix J, Binet JP. Anterior surgical approaches to the spine. *Ann R Coll Surg Engl.* 1957;83:811–822 (1). Right drawing. Copyright Lippincott Williams & Wilkins. Reproduced with permission from Kurz LT, Pursel SE, Herkowitz HN. Modified anterior approach to the cervico-thoracic junction. *Spine.* 1991;16(suppl 10):S542–S547 (3).

compression for tuberculosis of the T5-T6 level. Here, the presence of a large abscess anteriorly at T1 forced us to treat the patient in 2 stages.

Surgical Technique

A left oblique incision was made along the medial border of the sternocleidomastoid muscle to the sternal notch (Figure 2). The platysma was incised, and the plane between the carotid and tracheoesophageal sheaths was separated using the finger. The anterior aspect of the low cervical spine was exposed after retracting the tracheoesophageal sheath laterally. The strap muscles were detached at their origins. The lateral margin of dissection extended to the longus colli muscle on either side. Using metal markers, a radiograph was taken to confirm the target level. Using this low cervical approach, we were able to expose to the T2-T3 level.

After completion of the corpectomy, the bony defect was reconstructed with a tricortical iliac bone graft taken from anterior iliac crest of the same side. Postoperatively, cervical tongs were maintained for 2 to 3 weeks with a 2-kg weight. Tilt table movement, sitting, and ambulation were performed as tolerated based on the neurological status of the patient.

RESULTS

At the end of 2 years, all 14 patients were able to be assessed. All the patients were satisfied with the results. All patients regained ambulatory status. All 11 patients with tuberculosis continued with chemotherapy for 15 to 18 months. Preoperatively, 4 patients were Frankel grade A, 6 patients were Frankel grade B, and 4 were Frankel

Figure 2. The low cervical approach allows exposure to T1-T2 level. The metal marker marks the target area between T1 and T2.

grade C. At 2-year follow-up, all patients had recovered to Frankel grade D. Fusion status (Figure 3) was not easy to assess as a result of difficulty in interpreting post-operative radiographs (Figure 4). Computerized tomography scans were done in only one patient, as such scans would have added considerably to the patients' health care costs (Figure 5).

Partial dislodgement of the graft occurred in one case. The patient was kept in bed for 3 months, and ultimately the graft was well incorporated. Hoarseness due to retraction on the recurrent laryngeal nerve occurred in one patient; it resolved spontaneously in 3 months. Infection was not a problem in our series, nor was damage to the thoracic duct.

DISCUSSION

Anterior surgical approaches to the cervicothoracic spine have been extensively described in the literature. These include low cervical, supraclavicular, and combined cervical and thoracic approaches and their modifications (6–8). The combined approaches involve resection of the medial part of the clavicle, the sternoclavicular joint, the manubrium, and sternum. Each approach has its

Figure 3. (A) Radiograph showing tuberculosis of C7 with prevertebral abscess. (B) Eighteen-month postoperative (C7 corpectomy and fusion) radiograph showing solid bony fusion from C6 to T1.

Figure 5. Tuberculosis of T2 with abscess (A) and picture (B and C) showing postoperative CT scan illustrating the position of the iliac crest graft in the decompressed space.

Figure 4. (A) Tuberculosis of T2 with epidural abscess. (B) Postoperative view after anterior curettage with fusion and posterior Hartshill fixation. (C) Postoperative clinical picture.

Table 1. Levels of Spinal Pathology

Level of Pathology	No. of Patients
C6–7-T1	3
C7-T1	3
T1-T2	8

strengths and weaknesses. The low cervical or supraclavicular approach may be simple and least traumatic, but exposure is limited to T2. A better exposure down to T4 is obtained through a combined cervical and thoracic approach. However, this incision requires extensive dissection and may be associated with nonunion of the clavicle, instability of the sternoclavicular joint, and injury to the major neurovascular structures (6). The modified anterior approach, as described by Darling and colleagues (7), may offer better exposure from C3 to T3 than does the low cervical or supraclavicular approach and may be less traumatic than the combined cervical and thoracic approach.

We used the low cervical approach in all our cases. For pathology involving T3 and T4, we choose to perform the transthoracic periscapular approach. The combined cervical and thoracic approach is not practiced at our institution. It is important to know the anatomic characteristics of the cervicothoracic junction. In the cadaver study by Xu and others (9), the left brachiocephalic vein was at the level of T1 to T2 in 80% of the cadavers; the aortic arch was located at T2 to T3 in 90% of the cadavers. The right recurrent laryngeal nerve reaches the tracheoesophageal groove at the lower third of C6 in more than 50% of patients. The thoracic duct empties at the junction of the left subclavian vein and the left internal jugular vein in the region between C7 to T2.

As described by Sharan et al (10), midsagittal cervicothoracic magnetic resonance imaging can identify the thoracic vertebrae above the sternum, thereby determining whether a low suprasternal approach is feasible. Otherwise, a lateral extracavitary or transpedicular approach can be used to avoid sternotomy or thoracotomy. We routinely perform the low cervical approach through the left side. Adequate decompression was achieved in all 9 patients. A tricortical iliac crest graft from the anterior iliac crest was harvested and press-fitted into the defect after decompression. In the 8 patients with tuberculosis, it was easier to achieve the decompression because of the presence of abscess.

Various complications of the procedure have been described in the literature. We have encountered transient recurrent laryngeal nerve palsy in one patient

Table 2. Types of Spinal Pathology

Type of Pathology	No. of Patients
Tuberculosis	11
Traumatic	2
Hemangioma	1

treated with C7 corpectomy and fusion who recovered spontaneously at 3 months. There was one case of anterior graft displacement T1-T3 fusion, but, finally, the graft was well incorporated after 3 months of enforced bed rest.

CONCLUSION

The low cervical approach is a reasonably safe approach that provides access to T2. It avoids the complications associated with the supraclavicular and combined cervical and thoracic approaches. However, this approach may not provide enough access when there is kyphosis, retro-pulsed fragments, or when instrumentation may be necessary. Any surgeon operating in this region must be aware of the anatomic variances of the C6-T4 region.

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