SPINE

Transsternal Transclavicular Approach to the Cervicothoracic Junction

Servikotorasik Bileşkeye Transsternal Transklavikuler Yaklaşım

OSMAN NİYAZİ AKIN, AHMET ÇOLAK, MUTASIM SÜNGÜN

GATA Haydarpaşa Training Hospital,Departments of Neurosurgery (ONA,AÇ), and Cardiovascular Surgery (MS), İstanbul,Turkey

Abstract : The surgical management of the pathologies at the cervicothoracic junction is hindered by various structures. Standart approaches to the cervical or thoracic spine provide inadequate exposure. We used a method which involves elevation of the medial corner of the manubrium,the sternoclavicular joint and medial half of the clavicle on a pedicle of the sternocleidomastoid muscle for a tuberculosis abcess of T1 vertebra. After surgery neurologic functions improved and the patient had pain relief.

Key Words: Approach, cervicothoracic junction, vertebral body tumor

Özet: Servikotorakal bileşkenin patolojilerinde uygulanacak cerrahi girişimler çok çeşitli yapıların bileşkede olması nedeniyle güçtür. Servikal ya da torakal omurgalara standart yaklaşımlar yeterli cerrahi alan sağlayamamaktadır. Biz torakal birinci omurgada tüberküloz apsesi olan bir olguda manubriyum orta köşesini, sternoklaviküler eklemi, klavikulanın iç yarısını sternokleidomastoid adalenin bir bölümüne tutunur şekilde kaldırarark apseye müdahale ettik. Ameliyattan sonra hastada nörolojik işlevler gelişirken ağrısı da azaldı.

Anahtar Sözcükler: Omurga gövde tümörleri, servikotorakal bileşke, yaklaşım

INTRODUCTION

Anterior surgical approaches to the upper thoracic region are generally regarded as difficult. The distance to the vertebral bodies from a ventral approach, and the presence of thoracic kyphosis which angles the first several thoracic bodies from the surgical area are the main problems for the surgeon. Nerves, lymphatics, and vascular structures that cross the upper mediastinum also complicate the operative exposure.

To reach the upper thoracic vertebrae a number of extensive approaches combining thoracotomy, sternotomy or clavicle resection with anterior dissection at the upper mediastinum have been proposed. Cauchoix and Binet (4) and Hodgson et al. (9) reported an anterior cervical approach combined with median sternotomy. Many other reports are made describing extensive techniques. All of these techniques generally permit better lateral exposure and caudal exposure is limited to T1. As summarized in Table I Standefer et al. (13) first added clavicle splitting to sternotomy. Recently a few different techniques with little modifications are described. Some authors (7,8) prefer supramanubrial approach for cervicothoracic region.

CASE REPORT

A 59 year old woman was admitted to our clinic in 1996 with an intractable pain in her shoulders, back,

and left arm for two months which had increased in the last 15 days. She also complained of numbness in both hands. Because of intractable pain the patient was not able to walk. At physical examination abduction of left arm was painful and limited. There was hypoesthesia at right C7-C8 and left C6-C7-C8 dermatomes. Hypoactivity of deep tendon reflexes at left upper extremity was also noticed. However, neurological examination had no other remarkable signs.

Routine laboratory data was in normal limits with an exception of erytrocyte sedimentation rate of 120 mm/hour. Cervical spine films were reported as normal. Cervicothoracic magnetic resonance imaging showed a soft tissue lesion in T1 vertebral body (Figure 1).

Operative Technique

Following the induction of general anesthesia a nasogastric tube was inserted to identify the oesophagus. For the left sided operation the patient was positioned supine on the operation table. A sandbag was placed between the scapulae and the head was turned away from the side of the operation. A "T" shaped incision was made with the transverse limb 1cm above and parallel to the clavicles,extending from the lateral border of one sternocleidomastoid muscle to the other. The vertical limb was in the midline extending to the middle of the sternum (Figure 2).

Figure 1. Sagittal T1-weighed MRI shows T1 vertebral body lesion. In T1 weighed slices the hypointense lesion seemed to reach the epidural space and neighbouring neural foramina bilaterally compressing the spinal cord.

The sternocleidomastoid and the strap muscles were released from the clavicle and manubrium. The manubrium and the medial half of the left clavicle were exposed subperiostally with care taken not to damage the neighbouring vascular tissues.The medial half of the left clavicle was resected.

Left two thirds of manubrium was excised preserving sternoclavicular joint, the manubrial part, left sternoclavicular joint, and the left medial half of the clavicle on the pedicle of the sternocleidomastoid muscle. The plane between the trachea and oesophagus medially and carotid sheath laterally was developed. The recurrent laryngeal nerve was not seen and the innominate vein was retracted downwards. The prevertebral muscles were exposed and stripped from the front of the vertebrae. The destructed vertebra was in the center of the exposure and it was possible to reach to the lower end of the T3.

The lesion was debrided, endplates of C7 and T2 facing the lesion were debrided and an autograft from iliac crest was placed. Afterwards the graft was fixed with a Caspar plate (Figure 3). The wound was closed after placing a vacuum drain. The osseomuscular flap was returned to its former position. The manubrium and the clavicle were reattached by wires.

In the early postoperative period the patient had no pain. She was able to move her left forearm without pain and walked in the second day. Hypoesthesia seemed to decreas in the first few days. There was not any additional neurological deficit. The screws and the wires used in the operation were not compatible with magnetic resonance therfore plain radiographs were taken (Figure 4). Histopathological examination of the biopsy material revealed tuberculosis. The patient was taken to medical treatment (isoniazid 300mg/day, rifampin 600mg/day, and ethambutol

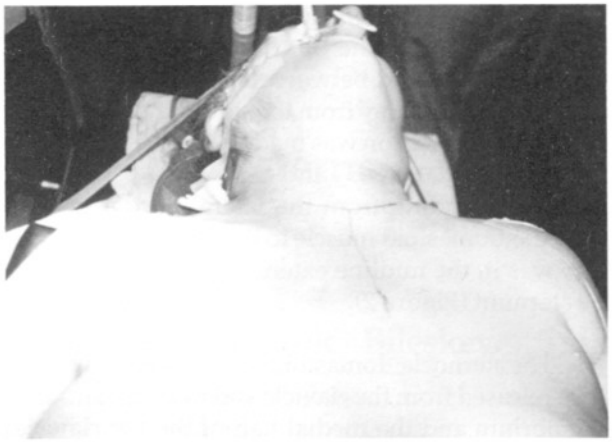

Figure 2. Skin incision.

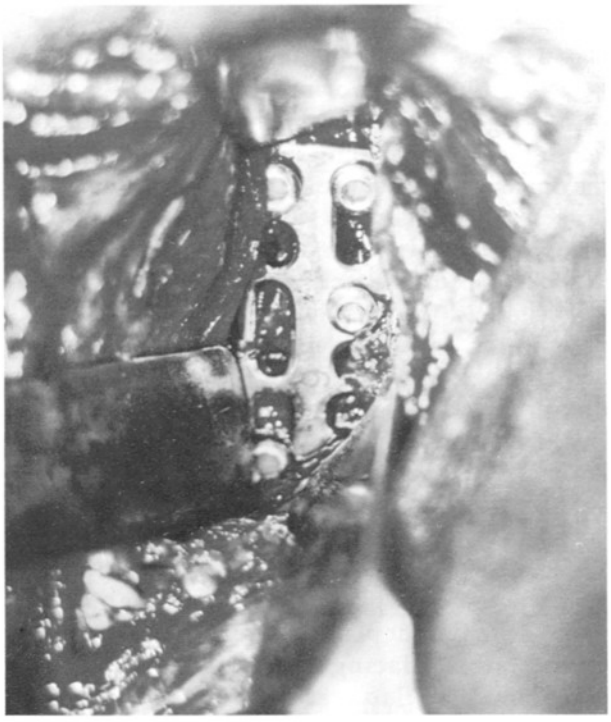

Figure 3. Operative exposure after placing the plate.

1000mg/day).

DISCUSSION

Direct access to the cervicothoracic area is generally dificult unless the patient has a long slender neck and drooping shoulders (5). The change from lordosis to kyphosis restricts the anterior approach and there are many vital structures to be controlled during the operation (1,3,14). Geiger et al. (7) claimed that with an oblique 5 cm incision parallel to the medial border of the sternocleidomastoid muscle it is possible to reach the lesions extending to T3. This

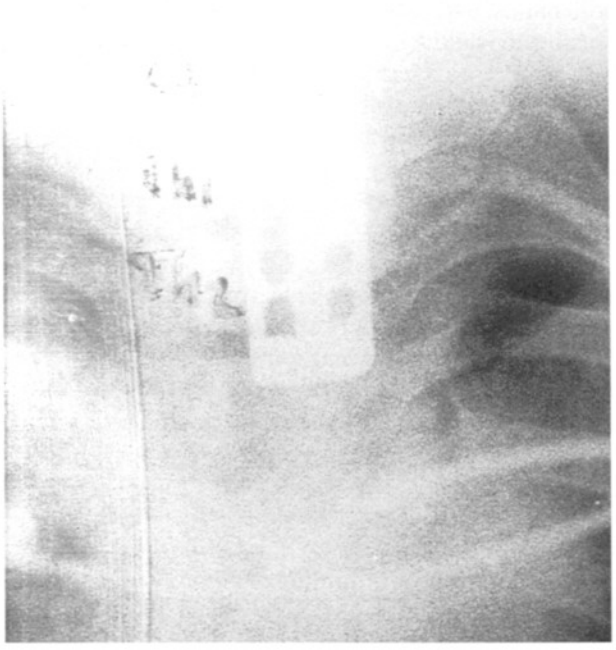

Figure 4. Postoperative plain radiograph of the patient.

approach may be used for simple discectomy and interbody fusion at C7-T1 or for biopsy (1). Otherwise for the lesions to be excised and for stabilization in the cervicothoracic region neither this approach nor the approach described by Cloward provide a good exposure (6,13). Although splitting the sternum provides some access exposure is still limited by sternocleidomastoid muscles and the clavicles. Thoracotomy may be another alternative but sternum and remaining ribs restrict the access to the lower cervical area (1). Partial resection of the clavicle and manubrium allows good access to the upper thoracic spine (3). This approach allows access not only to the axial skeleton but also to the brachial plexus and related vessels (3). An et al. agree that the techniques of resecting manubrium and clavicle are superior to their technique because the morbidity and mortality rates seem to be less (1). Nazzaro et al. (12) described another approach to this area. However this technique enables the surgeon to mobilize all paravertebral ventral tissues and the lower exposure is again limited to T3. This approach can be used for selected cases.

We found 37 cases operated with transmanubrial and transclavicular approach in the literature (2,5,10,11,14). The diagnosis of six cases were tuberculous abscess (5). So the case presented

Table I. Approaches to the cervicothoracic junction.

	Techniques	Primary tumor	Metastatic Tumor	Trauma	Tuberculous Abscess	Disc Herniation	Others	Total
Standefer et al. (1982) (13)	Splitting sternum and resecting ½ medial clavicle as free graft	1	-	-	-	-	-	1
Sunderasan et al. (1984) (14)	Resecting part of manubrium and 1/3 medial part of clavicle as free grafts	3	3	-	-	-	1	7
Lesoin et al. (1986) (11)	Resecting central part of manubrium and 1/3 medial parts of both clavicles on bileteral vascular pedicles "transsternal biclavicular approach"	6	-	2	-	-	-	8
Charles and Goverder (1989) (5)	Resecting manubrium and ½ medial clavicle as free grafts	1	3	-	6	-	-	10
Birch et al. (1990) (3)	Resecting manubrium and ½ medial clavicles both on vascular pedicle	5	2	-	-	1	-	8
Kurz et al. (1992) (10)	Resecting ½ manubrium and 1/3 medial clavicle as free grafts	-	4	-	-	-	-	4
Anderson et al. (1993) (2)	Upper midline sternotomy	-	-	-	-	-	3	3
An et al. (1994) (1)	Sternotomy	1	4	1	-	-	-	6
Nazzaro et al . (1994) (12)	Sternotomy with thoracotomy "trap door exposure"	-	5	-	-	-	-	5
TOTAL		17	21	3	6	1	4	52

in this article seems to be the seventh case of tuberculous abscess operated with transmanubrial and transclavicular approach. It is generally agreed that the technique using manubrium and clavicle resection has lower morbidity and mortality rates than other techniques (1,3,5,10,11,14). There seem to be another benefit of this technique. It allows the supporting muscles of respiration, i.e. sternocleidomastoid muscle to remain firmly attached to the clavicle preventing potential impairment of function and therefore pulmonary compromise in patients with respiratory problems. Generally left sided approach is preferred because the left laryngeal nerve has a more constant course (14), and the right laryngeal nerve crosses the operative field and is more vulnerable to traction damage (3,5,11).

Standard approaches to the cervical and thoracic spine can not provide a good exposure. Transmanubrial and transclavicular approaches have lower complications rates, supply sufficient exposure and that is why they are ideal.

Correspondence: Dr. Ahmet Çolak
GATA Haydarpaşa Eğitim Hastanesi
Nöroşirürji Servisi,
Kadıköy, 81327,İstanbul, Turkey
Phone: (216) 346 26 00
Fax : (216) 348 78 80

REFERENCES

1. An H S, Vaccaro A, Cotler J M, Lin S: Spinal disorders at the cervicothoracic junction. Spine 19:2557-2564,1994
2. Anderson T M, Mansour K A, Miller J L:Thoracic approaches to anterior spinal operations :Anterior thoracic approach. Ann Thorac Surg 55:1440-1446,1993
3. Birch R, Bonney G, Marshall R W: Surgical approach to the cervicothoracic spine. J Bone Joint Surg Br 72:904-907,1990
4. Cauchoix J, Binet J P: Anterior surgical approaches to the spine. Ann R Coll Surg Engl 21:234-243,1957
5. Charles R, Govender S: Anterior approach to the thoracic vertebrae. J Bone Joint Surg 71:81-84,1989
6. Cloward R B: The anterior approach for removal of ruptured cervical disc. J Neurosurg 15:602-617,1968
7. Geiger M, Roth P A, Wu J K: The anterior cervical approach to the cervicothoracic junction. Neurosurgery 37:704-710,1995
8. Fielding J W, Stillwell W T: Anterior cervical approach to the upper thoracic spine. Spine 1:158-161,1976
9. Hodgson A R, Stock F E, Fang H S Y: Anterior spinal fusion. The operative approach and pathological findings in 412 patients with Pott's disease of the spine. Br J Surg 48:172-178,1960
10. Kurz L T, Pursel S E, Herkowitz H N: Modified anterior approach to the cervicothoracic junction. Spine 16:S542-S547,1991
11. Lesoin F, Thomas C E, Autricque A, Villette L, Jomin M: A transsternal biclavicular approach to the upper thoracic spine. Surg Neurol 26:253-256,1986
12. Nazzaro J M, Arbit E, Burt M: "Trap door" exposure of the cervicothoracic junction. J Neurosurg 80:338-341,1994
13. Standefer M, Hardy R W, Marks K, Cosgrove D M: Chondromyxoid fibroma of the cervical spine. A case report with a reviewof the literature and description of an operative approach to the lower anterior cervical spine. Neurosurgery 11:288-292,1982
14. Sundaresan N, Shah J, Foley K M, Rosen G: Anterior surgical approach to the upper thoracic vertebrae. J Neurosurg 61:686-690,1984