

## Anterior Trans Cervicothoracic Approach for Complete Resection of Cervicothoracic Mediastinal Neurogenic Tumors

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### ABSTRACT

**Introduction:** Neurogenic mediastinal tumors comprise a wide range of benign and malignant diseases. A group of these tumors, located at thoracic apex, sometimes spread to cervical spaces causing numerous surgical difficulties. In thoracotomy approaches, due to proximity of the tumors to major blood vessels, complete removal of these tumors from cervical spaces is impossible or may cause intraoperative severe bleeding or other dangerous incidents. Because of the adjacent major vessels that are not visible. The aim of this study is to report cases of surgical treatment of such tumors using Anterior Trans Cervicothoracic Approach (ATCA).

**Materials and Methods:** All patients with neurogenic tumors and cervicomediastinal (CM) spread who underwent surgery with ATCA technique during 2005-2011 were included in our study. Then they were evaluated in terms of age, sex, clinical symptoms, radiological and pathological findings, technical success rate of the surgery, surgical complications and first-year relapse rate after the surgery.

**Results:** Our study included 10 patients from whom 9 were female and 1 was male (M/F= 1/9) and the mean age was 27 years. The most common symptoms were pain and feeling of a lump. All patients were operated by this technique successfully. The most common pathological finding was neurofibroma (in 5 patients) and surgical complications occurred in 2 patients (20%) (Wound infection in 1 patient and brachial plexus injury in another patient). There was no mortality. Disease relapse was reported in 1 patient ganglioneuroblastoma who underwent surgical resection for the second time.

**Conclusion:** Considering the successful removal of the tumors and favorable exposure of major vessels in cervicomediastinal spaces, this technique is recommended to resect mediastinal tumors with spread to cervical spaces. However, a more definite conclusion requires further studies.

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### Introduction

Mediastinal tumors include a wide range of benign and malignant tumors. Depending on their anatomical position, they are divided in

anterior, middle and posterior mediastinal tumors. These three mediastinal spaces make one space at the apex of the chest and are connected

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to cervical spaces. Sometimes a group of tumors located at the apex of the chest spread to cervical spaces causing numerous surgical difficulties (1).

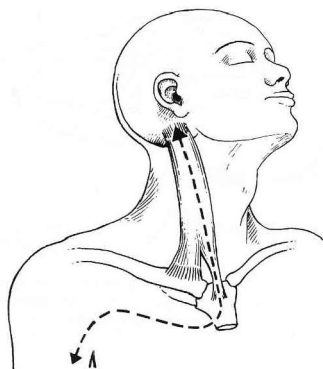
In thoracotomy approaches, due to proximity of the tumors to major blood vessels, complete removal of these tumors from cervical spaces is impossible or may cause intraoperative severe bleeding or other dangerous incidents for adjacent major vessels that are not visible (2).

The aim of this study is to evaluate the role of Anterior Transthoracic Approach in total removal of the tumors in one step and without changing patient's position.

#### *Surgical technique*

The patient is placed at supine position with the neck hyperextended and rotated to the opposite site. A bolster is placed behind patient's shoulders to allow surgeon for better view the surgical site. Then the skin of mastoid or xiphoid is prepared using betadine.

Initially cervical spaces are dissected totally by an oblique incision on the neck starting from lateral border of Sternocleidomastoid muscle (SCM) then the incision is continued partially to the sternum. To provide better exposure, scapula head is resected on the site of the lesion. Partial sternotomy and mediastinal space dissection is done and, whenever required, for the complete removal of the tumor the procedure is completed with an anterior thoracotomy incision at the fourth space. Figure 1 shows the incision image in patients.



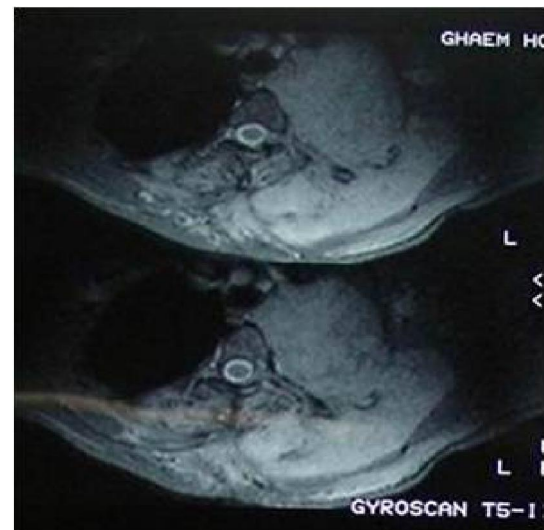
**Figure 1.** Incisional view of Anterior Trans Cervicothoracic Approach.

## **Materials and Methods**

In a case series study, all patients with mediastinal neurogenic tumor and cervical spread who underwent surgery with ATCA were evaluated in terms of age, sex, clinical symptoms, radiological and pathological findings, technical success rate of the surgery, surgical complications and first-year relapse rate after the



**Figure 2.** Shows an X-ray image of a Mediastinal neurogenic tumor.



**Figure 3.** Shows the MRI image of the Mediastinal neurogenic tumor.

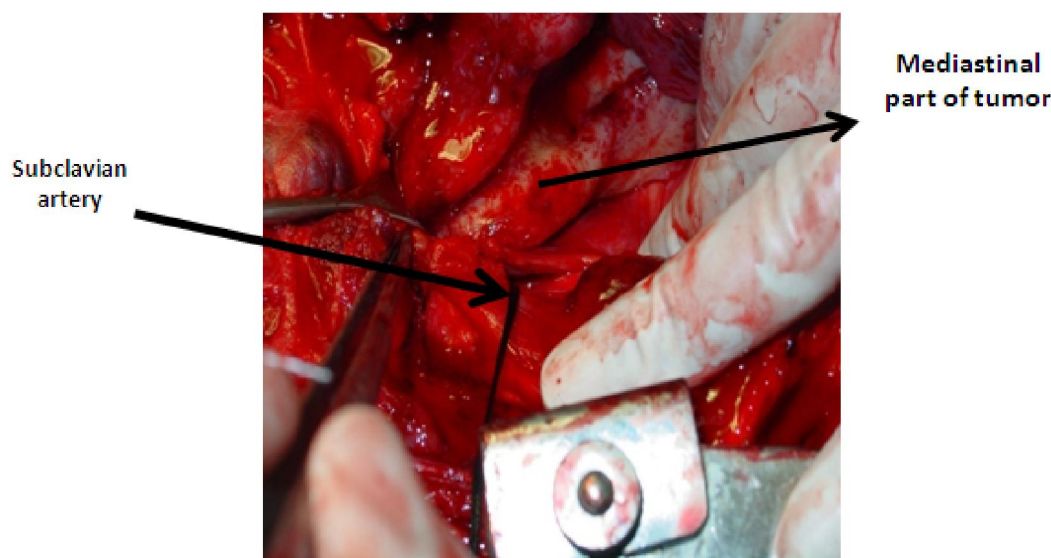
surgery. The results were analysed by SPSS software ver. 11.5.

## **Results**

Our study included 10 patients from whom 9 were female and 1 was male (M/F= 1/9) and the mean age was 27 years old. The most common symptoms were pain and feeling of a lump at the base of the neck and upper extremities. All patients underwent CXR, CT-scan and MRI prior to the surgeries.

Figure 2 shows an X-ray image of a neurogenic tumor with spread to cervical space in a 20 year old female and Figure 3 shows the MRI image of the same lesion.

All patients were operated on with the same



**Figure 4.** Shows an intraoperative image of a patient with Mediastinal neurogenic tumor.

surgical technique and the success rate was 100%.

Figure 4 shows an intraoperative image of a patient and Figure 5 indicates macroscopic image of patients after the surgery. All operations were assisted by a neurosurgeon. Pathology findings revealed neurofibroma in 5 patients, ganglioneuroblastoma in 3 and schwannoma in 2 patients. Surgical complications were reported in 2 patients including wound infection in 1 patient and brachial plexus injury in another patient who was treated with postoperative physiotherapy. There was no perioperative mortality. During the one-year post-op follow up one case of relapse was reported in a patient with ganglioneuroblastoma and the patient was again operated.



**Figure 5.** Indicates macroscopic image of patients after the surgery.

## Discussion

The first use of this technique was reported in 1963 by Steenburg.R.W *et al* in a patient with severe damage to subclavian arteries. They used this technique successfully to control bleeding and to repair damaged vessels (3). This technique

was later used to eliminate bronchogenic tumors with thoracic inlet involvements and it was believed that the ability to repair subclavian vessels following total resection of tumors is an important advantage of this technique (4). Inspired by this approach in eliminating bronchogenic tumors, this technique gradually became common to remove non-bronchogenic tumors of the thoracic inlet (5). Inaccessibility to thoracic apical great vessels (Aorta and Subclavian arteries) is a major problem that surgeons face in removing mediastinal tumors with spread to cervical space and is often associated with potential surgical risks such as intraoperative vessel injuries. In addition to that, posterolateral thoracotomy dissection of the cervical part of the tumor is performed blindly and may lead to serious problems. Therefore, this technique has been recommended to remove cervicomediastinal tumors and many surgeons have reported its benefits. Using this technique, Vanakesa has achieved success in removing cervicomediastinal tumors (5). Praniokoff.T *et al* reported using this method in resection of massive mediastinal neuroblastomas with spread to cervical space. They've considered the better view of great vessels as an important advantage of this technique (6). Korst.R.J *et al* have described results of the resection of mediastinal tumors with cervical space spread and noted that they used this technique in one phase, without changing patient's position and completely safe (7). Blanco.E *et al* also reported a successful removal of a massive cervicomediastinal angioleiomyoma with this technique and mentioned that blind dissection with posterolateral thoracotomy approach could be associated with serious threats (8). Kanzakim *et*



*al* also removed a cervicomedial dumbbell shaped schwannoma with this technique, they mentioned that the two cervical and mediastinal parts of these tumors are often connected and due to their severe adhesion to adjacent elements (specially major vessels), blind surgical interventions are associated with lethal incidents but with this method tumors can be removed totally and in one step (9). Watanabest *et al* also reported using Figure-L unilateral mini-sternotomy technique to remove similar tumors (10). On the other hand, other techniques have been suggested to eliminate similar lesions, for instance Akashi *et al* have presented a method in which intrathoracic part and mediastinal apex are released by means of VATS and then the tumor is fully removed with a supraclavicular incision (11). Another technique to remove cervicomedial tumors is presented by Verbeke.S.J *et al* in which Transmanubrial Osteomuscular Sparing Approach is used to remove these tumors completely. They pointed out that with this technique subclavian vessels and brachial plexus are better viewed (12). Uchiyama *et al* have reported using infra-sternal mediastinoscopic surgery to remove anterior and superior mediastinal tumors. In fact, they benefited thorascopic technique in order to dissect the mediastinal part and after releasing the tumor from mediastinal elements it was fully removed with a cervical dissection(13). Marcell Migliore *et al* also reported using video-mediastinoscopy in patients with medullary carcinomas in which, bleeding complication rate is lower in comparison to other techniques and can be used to control bleeding and repair damaged vessels (14). Federica De *et al* used this technique in pediatric cervicothoracic tumors with spread to cervical spaces (neuroblastoma, ganglioneuroblastoma, schwann cell tumors) and reported that the technique is safe with good bleeding control (15).

At 2007, Langner E *et al* conducted a study on patients with mediastinal lymphangioma and noted that in patients with cervical cystic hygroma, mediastinal spread of cyst is evaluated and surgical resection of the tumor by cervical incision is useful (16).

## Conclusion

Considering the fact that this technique enables surgeons to successfully remove cervicomedial tumors, this method is recommended. However, due to lack of similar experience in our country further studies should be conducted to present probable advantages and disadvantages of this technique.

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## Conflict of interests

The authors have no conflict of interests.

## References

1. Vanakesa T, Goldstraw P. Antero-superior approaches in the practice of thoracic surgery. *Ann Thorac Surg* 1993;15: 611-8.
2. Kamal A, Mansour A. Extended Resection of Bronchial carcinoma in the superior pulmonary sulcus. In: Schield TW, editor. *General Thoracic Surgery*. 6th ed. Philadelphia: lippincott Williams & wilkins; 2005. P. 547-8.
3. Steenburg Rw, Ravitch Mm. Cervico-Thoracic approach for subclavian vessel injury from compound fracture of the clavicle consideration of subclavian-axillary exposure. *Ann Surg* 1963; 157: 839-46.
4. Darteville PG, Chapelier AR, Macchiarini P, Lenot B, Cerrina J, Ladurie FL, et al. Anterior transcervical-thoracic approach for radical resection of lung tumors invading the thoracic inlet. *Thoracic Cardiovasc Surg* 1993;105:1025-34.
5. Macchiarini P, Darteville P, Chapelier A, Lenot B, Cerrina J, Ladurie FL, et al. Technique for resecting primary and metastatic non bronchogenic tumors of the thoracic outlet. *Ann Thoracic Surg* 1993; 55:611-8.
6. Pranikoff T, Hirschl RB, Schnauffer L. Approach to Cervicothoracic neuroblastomas via anterior trans cervicothoracic approach. *Pediatr Surg* 1995; 40: 546-8.
7. Korst RJ, Burt ME. Cervicothoracic Tumors: Results of resection by the anterior trans cervicothoracic approach. *Thorac Cardiovasc Surg* 1998; 115: 286-95.
8. Coscarón Blanco E, Gómez González JL, Blanco Pérez P, Cañizo Alvarez A, Benito González F, Flores Corral T. Cervico thoracic angiomyolipoma: an unusual tumor located at a site difficult to reach for surgery. *Acta Otorrinolaringol Esp* 2004; 55: 148-51.
9. Kanzaki M, Ohtsuka T, Obara T, Yamamoto H, Onuki T. Surgical treated dumbbell schwannoma arising in the brachial plexus with intrathoracic extension, *JPN J Thoracic Cardiovasc surg* 2003; 51:62-94.

10. Watanabe SI, Shimokawa S, Sakasegawa KI, Nakamura Y, Kariatsumari K, Oyama H. The figure-L unilateral mini-sternomy for anterior mediastinal tumor. *Thoracic Cardiovasc Surg* 2004; 52: 54-6.
11. Akashi A, Ohashi S, Yoden Y, Kanno H, Tei K, Sasaoka H, et al. Thoracoscopic surgery combined with a supraclavicular approach for removing superior mediastinal tumor. *Surg Endosc* 1997; 11: 74-6.
12. Verbeke SJ, Knaepen PJ, Slooff WB, Van Es HW, Schramel FM, van den Bosch JM. Transmanubrial osteomuscular sparing approach for sulcus superior tumors. *Acta Chir Belg* 2003;103:577-81.
13. Uchiyama A, Shimizu S, Murai H, Ohshima A, Konomi H, Ogura Y, et al. Inferasternal Mediastinal masse. *Surg Endosc* 2004;18:43-6.
14. Migliore M, Costanzo M, Cannizzaro MA. Cervico-mediastinal goiter: is telescopic exploration of the mediastinum (video mediastinoscopy) useful? *Interact Cardiovasc Thorac Surg* 2010;10:439-40.
15. De Corti F, Avanzini S, Cecchetto G, Buffa P, Guida E, Zanon GF, et al. The surgical approach for cervicothoracic masses in children. *J Pediatr Surg*. 2012 47:1662-8.
16. Langner E, Del Negro A, Akashi HK, Araújo PP, Tincani AJ, Martins AS. Schwannomas in the head and neck: retrospective analysis of 21 patients and review of the literature. *Sao Paulo Med J*. 2007 5;125:220-2.