SEVEN YEARS EXPERIENCE OF SURGICAL MANAGEMENT OF THORACIC OUTLET SYNDROME

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ABSTRACT

Objective: To evaluate the outcome of scalenotomy with cervical rib excision for Thoracic outlet syndrome (TOS).

Design: Retrospective observational descriptive study.

Place and Duration: Department of Thoracic Surgery Postgraduate Medical Institute, Govt. Lady Reading Hospital Peshawar from June 2007 to June 2014.

Material and Methods: Computerized clinical record of diagnosed cases of thoracic outlet syndrome presented in our unit for treatment was retrospectively analyzed. Nerve conduction study was done in all cases. Vascular thoracic outlet syndrome was excluded from the study. The indication of surgery in all patients was persistent neurogenic symptoms after trial of conservative physical therapy .Scalenotomy with cervical rib excision through supraclavicular approach was carried out. The outcome of the procedure was assessed according to Derkash`s classification as excellent, good, fair and poor in terms of clinical improvement in the symptoms of TOS and nerve conduction study.

Results: Out of total 72 patients 56 (77.78%) were females and16 (22.23 %) males. Age ranged from 22 years to 49 years with mean age of 33.2 years. Thirty four (47.22%) patients underwent scalenotomy with cervical rib excision and 38 (52.7%) patients had scalenotomy only. The minimum follow up was 6 month. At 6 months after surgery, according to Derkash's classification and nerve conduction study 54 (75%) have excellent, 14 (19.4%) have good, 3 (4.16%) have fair and one (1.38%) patient had Poor result. At 6 months follow up no recurrence of symptoms had occurred. Eight (11.11%) post operative complications occurred. Four patients had wound site haematoma which responded to local drainage while 3 patients had minor wound infections which were treated conservatively and one patient had pneumothorax which was managed by chest intubation. Post operative mortality was zero.

CONCLUSION: Scalenotomy with cervical rib excision is sufficient to relieve the symptoms of neurogenic TOS without excision of the first rib. Supraclavicular incision is an easy and appropriate approach for scalenotomy with cervical rib excision.

KEY WORDS: Thoracic Outlet Syndrome; Cervical Rib; Scalenotomy; Supra Clavicular Approach

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INTRODUCTION

Thoracic outlet syndrome refers to compression of the neurovascular structures in the region between the scalene muscles and the first rib, or by anatomical abnormalities such as cervical rib, fibrous bands and other variations in the scalene musculature. Its incidence is 5-10% of population.[1] The brachial plexus (82%), subclavian vein (14%), and subclavian artery (4%) are affected.[2-4] The neurologi-

cal symptoms include pain and paraesthesia which occurs in 95 % of cases while the remaining 10% have motor weakness or atrophy of the hypothener and interosseous muscles on the ulner side of the hand.[5] The vascular symptoms usually consist of hand ischemia, transient ischemic attacks, and hand edema during arm hyper abduction and arm claudication.[6] The diagnosis of TOS is usually clinical and is supported by radiography to reveal cervical rib or anomalous first rib.[6,7] Clinical neurovascular compression tests: Adson test (positive in 60% of TOS patients),Wright test (positive in 18%), McGowan-Velinsky test (positive in 38%), elevated arm stress test (EAST – positive in 68%).[7] The surgical decompression of TOS is achieved by resection of the cervical rib, if present, resection of the first rib or by scalenotomy through supraclavicular approach[8-10,19,21] or through transaxillary approach.[11] Supraclavicular approach provides an easy access to the cervical rib excision, scalenotomy or excision of any bony prominence causing TOS and for microsurgical neurovascular decompression without first rib resection.[12,13,15] The supraclavicular approach has been a successful approach for thoracic outlet decompression. It provides wide range of options than the transaxillary route. Anterior and middle scalenectomy, together with brachial plexus neurolysis can be performed with excellent exposure. The same incision can be used to perform cervical or first rib resection, although the success rate is not significantly improved by removing ribs.[8] Excision of the first rib does not remove the cause of the symptoms. Clinical improvement is due to division of scalene muscles and not because the rib excision. First rib resection is accompanied by a little higher morbidity and a slightly longer recovery time.[9,11,13]

OBJECTIVE: Objective of the present study is to evaluate the outcome of scalenotomy with cervical rib excision for Thoracic outlet syndrome.

MATERIAL AND METHODS

Computerized clinical record of diagnosed cases of thoracic outlet syndrome presented in our unit for treatment was retrospectively analyzed. Patients with all ages, both sexes and neurogenic TOS were included in this study and vascular thoracic outlet syndrome was excluded from the study. The indication of surgery in all patients was persistent symptoms after trial of conservative physical therapy. Clinical evaluation included a detailed history and physical examination. At the initial consultation, the patient's symptoms were recorded and a complete clinical examination of the neck, shoulder, and upper extremity were performed, including muscle grading according to the British Medical Council Grading System, a complete sensory evaluation was performed, including light touch, cold and hot sensation, and static two-point discrimination. Each patient underwent provocative tests such as Adson's, Wright's, and Roos test to evaluate neural and vascular compression. Pain level was measured using a visual analog scale, 0 to 10, with 0 being no pain and 10 representing maximal pain. Routine diagnostic modalities included X-rays of the cervical spine, chest, and shoulder for differential diagnosis. Nerve conduction studies were performed in all patients to estimate nerve conduction across the thoracic inlet, the ulnar and median nerves across the axilla, elbow, and wrist in order to rule out additional entrapment neuropathies.

The operative procedure consisted of supraclavicular approach in all patients and excision of cervical rib, if present with scalenotomy or division of the fibrous band.

Results were assessed according to Derkash's classification published by Wood[10] as “excellent” result: no pain, easy return to preoperative professional and leisure daily activities; “good” result: intermittent pain well tolerated, possible return to preoperative professional and leisure daily activities; “fair” result: intermittent pain with bad tolerance, difficult return to preoperative professional and leisure daily activities; and “poor” result: symptoms not improved or aggravated.

RESULTS

Out of total 72 patients 56 (77.78%) were females and16 (22.23 %) males. Age ranged from 22 years to 49 years with mean age of 33.2 years. 36 (50%) patients had right side involved while 28 (38.88%) patients had left side involvement while 8 (11.11%) had bilateral involvement. Duration of symptoms ranged from 2 years to 15 years with mean duration of symptoms of 4.2 years (Table 1). Fifty three (73.61 %) patients had predominantly neurological symptoms, 7 (9.72%) had purely vascular while 12(16.66 %) patients had combination of these (Table 2). Thirty Four (47.22%) patients had cervical rib excision while in 38(52.7 %) patients scalenotomy was performed. That patient with bilateral disease, the contra lateral side was operated 3 to 5 months after the first operation in 2 patients. Eight (11.11%) post operative complications occurred. Four had haematoma in the wound which responded to local drainage while 3 patients had minor wound infections which were treated conservatively one patient had post operative pneumothoax treated by chest tube drainage. There was no mortality. After 6 months follow up none of the patients found to have recurrence of symptoms. At 6 months after surgery, according to Derkash's classifi-

Table 1: Patient's Demographics

Variable		Percentage
Sex	Male	16 (22.22%)
	Female	56 (77.77%)
Side	Left	36 (50%)
	Right	28 (38.88%)
	Bilateral	08 (11.11%)

(All cases, n=72).
Age range: 21–55 Years, Mean Age 36.9±11.5
Mean Duration of symptoms:4.2 year

cation and nerve conduction study 54 (75%) had excellent, 14 (19.4%) good, 3 (4.16%) fair and one (1.38%) patient had Poor result.

DISCUSSION

Thoracic outlet syndrome (TOS) results from compression of the neurovascular structures of the upper extremity at the thoracic outlet. Previously, the name was designated according to the etiologies of compression, such as scalenus anterior, costoclavicular, hyperabduction, cervical rib, or first rib syndromes.

Adson[13] was the first to approach the thoracic outlet area from the front and to emphasize the contribution of the scalenus anticus tendon to the syndrome. There is no single satisfactory diagnostic tool for TOS and like wise does not have a gold standard surgical approach.[12] Different approaches have been utilized by different authors achieving variable results.[11-13,16] In our series, all the patients had scalenotomy or cervical

Table 2: Level of Brachial Plexus Compression in patients who had Surgical Treatment.

Level	Percentage
C5, C6, C7	4 (5.55 %)
C7, C8, T1	12 (16.66 %)
C8, T1	48 (66.66 %)
C5–T1	8 (11.11 %)

Table 3: Results of Surgery According to Derkash's Classification (n: 72)

Derkash's Classification Results	No. of Patients	Percentage
Excellent results (no pain, easy return to preoperative professional and leisure daily activities)	54	(75 %)
Good results (intermittent pain well tolerated, possible return to preoperative professional and leisure daily activities)	14	(19.4 %)
Fair result (intermittent pain with bad tolerance, difficult return to preoperative professional and leisure daily activities)	3	(4.16 %)
Poor ("poor" result: symptoms not improved or aggravated)	1	(1.38 %)

rib excision without excision of the first rib through supraclavicular incision. It is an easy approach providing sufficient excess and exposure of brachial plexus, subclavian vessels, scalene muscles, the first rib and cervical rib.[17,22] Our results are consistent with other studies[18,19,21] with the advantage of eliminating complications of first rib excision.

In a study by Efstathopoulos et al.,[23] 42 patients were operated for TOS utilizing supraclavicular approach reported results as excellent 16%, good in 12% cases and poor results in 6% cases. In another study by Osman Abd Ellah Mohamed[24] the overall functional result as a function of the severity of the pain and the satisfaction of the patient showed 32% of excellent results, 44% of good results, 7% of fair results and 17% of poor results while in our study which include 72 patients and at 6 months after surgery, 54 (75%) have excellent, 14(19.4%) have good, 3 (4.1%) have fair and one (1.38%) patient had Poor result.

In our series, no major complications occurred. Three wound infections were managed conservatively and 4 haematoma formation were drained successfully and one case of pneumothorax treated with chest tube insertion. We did not receive any recurrent case of TOS in our study as it is reported in other studies with long follow up. Efstathopoulos et al, showed one case of pneumothorax and a temporary dysfunction of the phrenic and XI cranial (accessory) nerve while Altobeli et al[25] operated upon 185 patients with neurogenic TOS by the same operative protocol. The complication rate was 4% and consisted of 7 pneumothoraxes, 3 subclavian vein injuries, 1 nerve injury, 1 internal mammary artery injury, and 1 suture granuloma. Our study achieved good to excellent results in majority of the cases, with very few complications and the advantage of eliminating complications of first rib excision. In addition supraclavicular approach is an easy, safe approach to access structures, performing anterior and middle scalenectomy, together with brachial plexus neurolysis with excellent exposure.

CONCLUSION

Scalenotomy with cervical rib excision is sufficient to relieve the symptoms of neurogenic TOS without excision of the first rib. Supraclavicular incision is an easy and appropriate approach for scalenotomy with cervical rib excision.

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