

THE SURGICAL TREATMENT OF THORACIC OUTLET SYNDROMES (T.O.S.)

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TITLE :

Surgical Decompression of Thoracic Outlet Syndromes (T.O.S.).

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OBJECTIVES :

Thoracic outlet syndromes (T.O.S.) are uncommon and difficult to manage. The objective of this article was to review the author's experience with regard to its management.

METHODS :

All patients presenting with T.O.S. who were seen by the author over 6 years period were studied. There were 21 cases of T.O.S. The mean age of the group was 37.0 years (range 17-65 years). Majority were females (76.2%). The causative anomalies were : 17 cervical rib (80.9%), 3 fibrous bands (14.3%), one hypoplastic first rib. Angiography was done selectively.

RESULTS :

Twelve patients presented with neurological manifestations (57.2%), 3 (14.3%) with arterial, 2 (9.5%) venous and 4 (19.0%) with more than one structure compressed. Fifteen cases were managed conservatively while 6 (23.8%) patients underwent a surgical decompression procedure via a supraclavicular route solely. There was no mortality and no significant morbidity rates. All patients (except one) in the surgical group did well in the follow-up period.

CONCLUSIONS :

Surgical decompression of T.O.S. cases is recommended in all patients with severe neurological symptoms and/or evidence of vascular compression. Simple excision of the cervical rib and/or a constricting fibrous band via a supraclavicular incision is sufficient in most of the cases.

INTRODUCTION

Thoracic Outlet Syndrome (T.O.S.) are a group of disorders that produce symptoms affecting the neck, shoulder and upper extremity by compression or mechanical irritation of the brachial plexus, subclavian artery or subclavian veins as these structures pass through the thoracic outlet⁽¹⁾. The thoracic outlet syndrome has been known in the past as cervical ribs syndrome⁽²⁾, scalenus anticus syndrome, Naffziger's syndrome⁽³⁾ first thoracic rib. In syndrome⁽⁴⁾, costoclavicular syndrome⁽⁵⁾ and hyperabduction syndrome⁽⁶⁾. In 1956⁽¹⁾ it was recommended that all of these clinical entities should be grouped together as the thoracic outlet syndrome. Its plural (T.O. Syndromes) is a probably a better term because it denotes more than one group or subdivision. For decades, the thoracic outlet syndrome (T.O.S.) have been surrounded by confusion, misconception and controversy with regard to aetiology, diagnosis and methods of treatment. In this article, the author's experience in dealing with six cases of (T.O.S.) which were managed surgically will be discussed. Upto the best of our knowledge, this is the first report from Saudi Arabia.

PATIENTS AND METHODS

Over six years time (starting September 1989 to 1995), a total of 21 cases of T.O.S. were seen and treated by the author. All of them except one were Saudi nationals. Of the 21 patients, 12 cases were detected during a screening programme for cervical rib detection while the other 9 (42.8%) were referred from other specialities. There were 16 women (76.2%) and 5 men (23.8%). Their mean age was 37.0 years and ranged between 17-65 years. Most of the cases occurred in the late thirties. In the 21 cases of T.O.S. 17 cases were due to cervical ribs (80.9%), 3 cases with fibrous band (14.3%) and only one case due to a hypoplastic first rib (4.8%). All of the cases were reviewed and assessed by the author and were divided into 4 main categories according to their clinical manifestations, Table 1:

1. Neurological : patients had pain, paraesthesia and/or muscle weakness in the affected limb.
2. Arterial : patients complained of either pain, colour or temperature, and/or established ischaemic changes such as digital gangrene.
3. Venous : patients presented with swollen congested limb which may restrict movement.
4. Combined : when neurovascular symptoms were present. This was encountered in 19.0% of the series.

All the patients had a plain x-ray of the thoracic outlet to identify cervical ribs. All were interpreted by a consultant

radiologist. Arteriograms when performed in selected cases (n=3) where peripheral vascular diseases were expected. Nerve conduction studies e.g. electromyography (E.M.G.) were done in most of the cases to exclude distal entrapment or neuropathy. All patients with mild to moderate symptoms of (T.O.S.) were referred to physiotherapy department for an active physical therapy programme aiming to strengthen the cervical and shoulder girdle muscles. Conservative management usually continues for as long as it benefits the patient and helps him/her to tolerate symptoms. Nevertheless, surgical decompression was indicated in 6 patients (28.6%). Our indication for surgical relief were : intolerable pain that failed to respond to conservative management, threatened loss of limb function and/or job, unacceptable changes in patient's life pattern and most cases with a significant element of vascular insufficiency.

All of our reported six cases were performed solely through a supraclavicular approach, Table 2. All patients were followed up for a duration between 3 and 48 months. Their symptoms were reassessed and classified into three groups : complete cure, improved and little or no benefit.

OPERATION MANAGEMENT AND RESULTS

In the operated group (n=6) Table 2, there was no mortality. Various procedures were carried out via solely a single incision supraclavicular approach. Scalenotomy was done in all patients to expose and decompress the neurovascular structures. Scalenectomy was performed in 2 cases. A cervical rib was successfully excised in 3 patients. In the other 3 cases a fibrous constricting band was identified and divided. In one case, first rib was additionally excised. Cervical sympathectomy was essential in case (No. 5) as the patient presented with gangrene of finger tips. In the whole group no vascular reconstructive procedure was needed. Seven patients did improve or cured after surgical decompression, however, only one patient (Case No. 1) experienced little benefit from our procedure. As shown in Table 2 all patients with vascular symptoms claimed some improvement. There were no major postoperative complications such as neurovascular injuries or haemopneumothorax. However, only (Case No. 2) had evidence of asymptomatic transient phrenic nerve palsy which did not require any treatment.

DISCUSSION

Thoracic outlet syndromes (T.O.S.) comprise a number of aetiological factors of which cervical rib is one of the first to be described. Roos identified ten different types of anomalies including various types of cervical ribs⁽⁸⁾. Similar to other authors^(9,10), cervical ribs predominated in our series as it accounted for 17 cases (80.9%). Nevertheless, in the operated group only 3 patients had evidence of cervical rib Table 2. Most of these occurred in women and presented with neurogenic manifestations. This compared favourably with similar studies in literature^(9,10). The incidence of T.O.S. is difficult to determine, however, in a recent study we found a higher prevalence rate in our population compared to similar studies in the literature⁽¹¹⁾. The presence of a cervical rib in a symptomatic patient justifies its removal to decompress the thoracic outlet particularly if there is evidence of vascular complications. Such serious complications are uncommon and have been estimated to involve the subclavian vein in about 1.5% of patient and the subclavian artery in 0.5%^(10,12). Four of our operated case (n=6) had evidence of vascular compression.

Since the clinical tests for diagnosing T.O.S. are not very reliable⁽¹³⁾, the indication for operation, particularly in the absence of cervical rib, is mainly based on a carefully assessed symptomatology. This policy was adopted in the last three patients in which a constricting fibrous band was identified during exploration of the thoracic outlet with the intention of decompression. This approach is justified based on the low rates

of morbidity associated with this procedure. On the other hand side, delay in diagnosing the arterial complications of T.O.S. may lead to subsequent delay in instituting appropriate treatment and may have devastating consequences including tissue loss of the vital upper limbs. This has happened in Case No. 5 of our patients.

The choice of the surgical decompression procedure was the subject of debate in the literature^(8,9,10,14,15). After a period of enthusiasm for a transaxillary approach popularized by Roos^(7,8) and Machleder⁽¹⁶⁾, most surgeons are back to the standard supraclavicular approach which gives adequate exposure and decompression of all of the various possible anomalies⁽¹⁰⁾. In our experience, the supraclavicular approach was the optimum approach and was associated with scalenectomy whenever possible. This was followed by dividing any constricting fibrous band. Should the decompressing lesion prove to be a cervical rib, a complete excision of the rib with its periosteum was performed. Additional further procedures were tailored to the patient needs. In this short series, we did not need to perform any reconstructive procedure nor there was a clavicle excision. However, one patient had first rib excision. Similar to Desai and Robbs⁽¹⁰⁾, we think that the routine removal of the first rib advocated by Thompson and Webster may not be essential in most cases. Cervical sympathectomy was carried out as an additional procedure in a patient with established manifestations of advanced upper limb ischaemic changes.

In summary, diagnosis of T.O.S. is difficult and based largely on careful history and physical examination. Surgical exploration aiming for decompressing the thoracic outlet is justified in most cases with evidence of vascular compression and/or severely symptomatic neurologic syndrome. The choice of surgical procedure depends on the attending surgeon's preference, the nature of the developmental anomalies and the type of the compressed structures. Similar to others, a simple excision of the cervical rib via the supraclavicular route together with vascular reconstruction, when needed, is usually adequate. Currently, the English literature is lacking a prospective study for selecting the optimum procedure

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Table 1 : Frequency of various clinical manifestations in the
21 (T.O.S.) cases :

Presentation	Number	Percentage
Neurogenic	12	(57.2 %)
Arterial	3	(14.3 %)
Venous	2	(9.5 %)
Combined	4	(19.0 %)

Table 2 : Clinical characteristics of the six operated (T.O.S.) cases

Case No.	Age/Sex	Anomaly	Manifestation	Procedure	F/U
1	28 / M	C. Rib, incomplete	Neurogenic	Excision	Little benefit
2	30 / M	C. Rib, complete	Neurogenic + Venous	Excision	Improved
3	40 / F	C. Rib, complete	Neurogenic + Venous	Excision	Improved
4	43 / F	Band	Arterial, hand ischaemia	Excision + Splenectomy	Improved
5	35 / M	Band	Arterial, hand ischaemia	Excision + scaleneotomy + c. sympathectomy	Cured
6	17 / F	Band	Neurogenic	First rib excision	Cured

c : cervical

Legends

Figure 1 : A selective left subclavian arteriogram showing a stenosed compressed left subclavian artery (Case No. 5).