
Research Article

Supraclavicular Approach in Thoracic Outlet Syndrome (TOS)

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Abstract:

Introduction: Thoracic Outlet Syndrome (TOS) is clinical syndrome refers to abnormal compression of the neurovascular in the neck and axilla with signs and symptoms manifesting in the shoulders, neck, arms, hands and sometimes fingers. It may be underdiagnosed because this syndrome was poorly understood. The compression is primarily neurogenic, vascular or both. As the number of patients undergoing successful treatment increases, TOS is becoming a common diagnosis. In those patients in whom pain is refractory to conservative care, surgery should be considered. The aim of this study is to evaluate the outcome of supraclavicular approach to treat the thoracic outlet syndrome (TOS) patients in RSAL dr. Ramelan Surabaya Hospital.

Materials and methods: This study is a case series of 16 patients (10 females and 6 males) with age ranging from 19-57 years underwent neurovascular compression with supraclavicular approach. Symptoms was evaluated with medical records based on anamnesis, physical examination pre-operative, post-operative and imaging studies.

Results: Following-up of 16 patients with supraclavicular approach showed excellent results, decreasing pain and sensoric or motoric symptoms and complications like pneumothorax hemothorax, injury of artery, vein or brachial plexus have not found.

Conclusion: Supraclavicular approach relatively effective and safe to neurovascular decompression of TOS and have excellent outcome with small incision, safe and minimal complications.

Keywords: Supraclavicular, TOS, Surgery

Introduction

Thoracic outlet syndrome (TOS) is a clinical syndrome caused by neurovascular compression of the thoracic outlet result from compression of the subclavian artery, vein, and the brachial plexus nerves in some of these locations including scalene interval, infraclavicular space, tendon of the pectoralis minor muscle, or the cervical spine (cervical rib).¹

There are three types of TOS: neurogenic, venous, and arterial.² Factors leading to TOS are divided into congenital and acquired. Acquired factors including post traumatic complication or growth of tumor, whereas the cervical rib is one of the congenital factors leading to TOS.³

The incidence of TOS is 1-2% of the total population. 50% of patients complained of upper arm pain including sensory impairment. The average age of TOS patient is between 20-60 years.³ Incidence of TOS in Unites States are 3-80 cases of 1000 people. The incidence of TOS was reported three times more in women than men.⁴ Of all TOS cases, 95-98% is compression of the brachial plexus, and 2-5% is on vascular such as subclavian artery or vein.⁵ Surgical action performed with the aim of decompression. The usual decompression technique is by resection of the first rib, scalenectomy, myofascial resection, or other parts causing compression of the brachial plexus and the subclavian artery and vein.⁶

Material and Method

A review of medical records of patients with TOS performed surgically with a supraclavicular approach surgery at Dr. Ramelan Army Hospital Surabaya from January 2015 to February 2018.

Patient Evaluation

Patients were evaluated based on medical history, preoperative and postoperative neurologic examinations by reviewing medical records in detail. Adson test, Wright maneuver, Eden test, Haldstead maneuver and Roos test are applied to all patients. Preoperative clinical symptoms were assessed with visual analog score (VAS) evaluated from medical records.

Surgical Technique

This case series used the supraclavicular approach surgery.

Result

Age and Sex

The patient's age varies from 19-57 years (mean : 40 years). Of the 16 patients with TOS performed surgery with a supraclavicular approach, consist of 10 women (62%), 6 men (37.5%).

Clinical Manifestation

Shoulder and arm pain are the most frequently symptoms complained by patients with TOS, followed by paresthesias asdescribed in Table 1.

Table 1. Clinical Manifestation of the Thoracic Outlet syndrome (TOS) Patient

Clinical Manifestation	Amount	Percentage
Shoulder and arm pain	16	100%
Neck pain	8	50%
Parestesia	16	100%
Headache	7	43,75%
Motor weakness	9	56,25%
Neck vein dstention	4	62,5%
Blurred vision	1	6,25%
Faint	1	6,25%
Traumatic history	5	31,25%
History of heavy lifting	1	6,25%

Provocation Test

Of 16 patients (100%) performed surgery had positive test of Adson, Roos test, and Haldstead positive maneuver tests, 3 patients (18.75%) with positive Wright test, and 4 patients (25%) for Eden test positive as in Table 2

Table 2. The provocation test of TOS

	Amount	Percentage
Provocation Test		
Adson test	16	100%
Wright test	3	18.75%
Roos test	16	100%
Eden test	4	25.00%
Haldstead Manuver	16	100%

Of the 16 pre-operative patients, the pain assessed with VAS were 5-7 (mean 5.75), while the motoric power of the ranged in grade 3-5 (mean 4.375).

Diagnostic Test

Routine investigations consist of cervical X-ray, thoracic X-ray, Magnetic Resonance Imaging (MRI) to detect abnormalities exclude differential diagnoses. There were no abnormalities in the investigation in 16 TOS patients.

Surgery

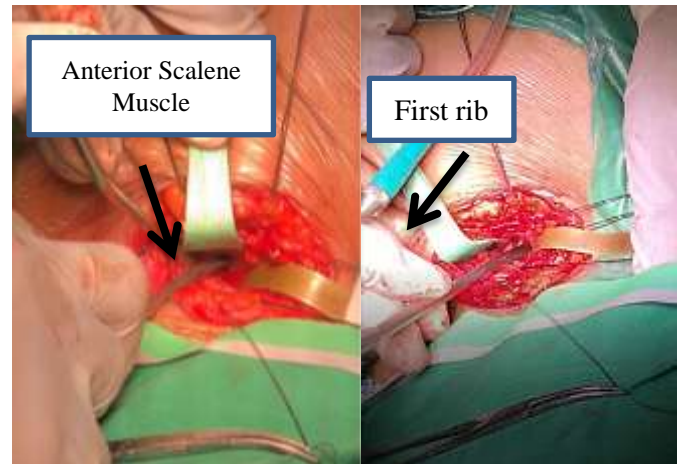
Of all 16 patient,3 patients (18.75%) had surgery with scalenectomy and 13 patients (81,25%) performed scalenectomy and costectomy (picture 1).

Post Operative

Assessment of post-operative outcomes is evaluated within 2 months until 1 year. The VAS post-operative were 0-4 (mean 1.06), while the motoric power of the patients ranged in 4-5 (mean 4.8).

In this cases series, the recurrence rate occurred in 2 patients

(66.7%) underwent scalenectomy only. Recurrence rates occur for 1 year after surgery due to connective tissue formed. One patient (7.7%) underwent scalenectomy and costectomy had recure in 2 months after surgery because of the formed of connective tissue as in Table 3.



Picture1. Incision of Anterior Scalene Muscle and resection first rib at its insertion

Table 3. Recurrence Rate after Surgery

Supraclavicular approach	Recurrence Rate	Non-recurrence Rate
Scalenectomy	2 (66.7%)	1 (33.3%)
Scalenectomy and costectomy	1 (7.7%)	12 (92.3%)

Re-operative scartectomy has been done in the connective tissue (scar) post-operative.

Complication

The most common complication of underwent supraclavicular approach surgery is a scar seen on the skin that interferes with the cosmetic look. Of the 16 patients, 15 patients (93.75%) have visible scars, and 1 patient (6.25%) with invisible scar due to a semicolar incision. Semicolar incision solved the cosmetic problem. However, this incision causes the difficulty of exposing the first rib.

Discussion

The subclavian artery, vein and brachial plexus pass through three narrow anatomic in the axillary region.^{7,9} The causes of thoracic outlet syndrome (TOS) due to bone or soft tissue abnormalities. Cervical ribs are rare with a 0.17-0.76% incidence in rudimentary first-class populations. The soft-tissue factors are the cause of TOS including congenital anomalies such as fibrous muscular band anomalies around the brachial plexus, etc.⁸

Management conservatively contributes to improve the symptom like NSAID often used to reduce pain and inflammation. From Leffert's study, if the main symptoms are pain and paresthesias, it is recommended to be given local heating, analgesic, muscle relaxant, and scheduled programs for shoulder strengthening of 2x muscles a day.¹¹

Surgery should be considered if symptoms persist with conservative treatment. One disadvantage of transaxillary

intervention is the difficulty of exposing the fibromuscular band and the difficulty of performing arterial reconstruction and the recurrence occurred 20%.⁷ Supraclavicular interventions provide exposure to good anatomical structures and first rib resection or arterial reconstruction. Maxey et al. reported that supraclavicular intervention was safer than the other intervention.^{7,9}

Recurrence is caused by fibrosis after surgery causes the nervous structure and blood vessels to be re-compressed.⁸

Conclusion

Surgery is performed on patients with vascular components and persistent symptoms with conservative treatment. Supraclavicular approach in TOS showed significant improvement to solve symptoms. Scalene muscle incision and the first rib resection, give better outcome with a reduced recurrence rate compared with only a scalen muscle incision only. The scars disturbing post-surgical cosmetic appearance can be solved by doing a semicircular incision, but has difficulty in exposing the first rib.

References

- [1] Robey H, et al. 2009 Bilateral Functional Thoracic Outlet Syndrome in a Collegiate Football Player. North American journal of sport physical therapy.
- [2] Freischlag F, Orion K. 2014 Understanding Thoracic outlet syndrome . Hindawi Publishing Corporation Scientifica. <http://dx.doi.org/10.1155/2014/248163>
- [3] Wojcik G, Sokolowska B, et al. 2015 Epidemiology and Pathogenesis of Thoracic outlet syndrome . Current Issues in Pharmacy and Medical Science
- [4] Rosenbaum D. 2017 Thoracic outlet syndrome .Medscape . Downloaded : <https://emedicine.medscape.com/article/96412-overview>
- [5] Walker C, et al. 2010 Thoracic outlet syndrome . American Physical Therapy Association downloaded : [https://www.physio-pedia.com/Thoracic Outlet Syndrome](https://www.physio-pedia.com/Thoracic_Outlet_Syndrome)
- [6] Reilly L, Stoney J. 1988 Supraclavicular approach for Thoracic Outlet Decompression. Journal of Vascular Surgery
- [7] Dalbayrak S, et al. 2014 Supraclavicular Surgical Approach for Thoracic outlet syndrome. Turkish Neurosurgery.
- [8] Walker C, Hernandez X, Slininger C, et al. 2011 Thoracic outlet syndrome . Texas State University. Downloaded: http://www.physio-pedia.com/Thoracic_Outlet_Syndrome
- [9] Novak C. 2008 Thoracic outlet syndrome . WSCC Clinics.Western States Chiropractic College
- [10] Mackinon SE, Novak CB. 2001 Thoracic outlet syndrome . Washington University School of Medicine. Downloaded: <http://nerve.wustl.edu/TOS.pdf>
- [11] Ropper AH, Brown RH, et al. 2005 Victor Adams Principles of Neurology 8th edition. Mc Graw Hill Education.