2024-2025

THÈSE

pour le

DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

Qualification en Chirurgie Vasculaire

Transaxillary approach in thoracic outlet syndrome surgery

A single center report of 484 surgeries in 346 patients over 10 years

La voie transaxillaire dans la chirurgie du syndrome du défilé thoraco-brachial

Cohorte monocentrique de 484 chirurgies chez 346 patients sur 10 ans

DEVEZE Eva

Né le 04/11/1996 à ANGERS (49)

Sous la direction de Monsieur le Professeur Jean PICQUET

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Admis(e) dans l'intimité des personnes, je tairai les secrets qui me seront confiés. Reçu (e) à l'intérieur des maisons, je respecterai les secrets des foyers et ma conduite ne servira pas à corrompre les mœurs. Je ferai tout pour soulager les souffrances. Je ne prolongerai pas abusivement les agonies. Je ne provoquerai jamais la mort délibérément.

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J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité. Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses ; que je sois déshonoré (e) et méprisé(e) si j'y manque ».

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Liste des abréviations

TOS	Thoracic Outlet Syndrome
ATOS	Arterial Thoracic Outlet Syndrome
NTOS	Neurogenic Thoracic Outlet Syndrome
VTOS	Venous Thoracic Outlet Syndrome
TA	Transaxillary
SC	Supraclavicular
EAST	Elevated Arm Stress Test
SVS	Society of Vascular Surgery
TOC	Thoracic Outlet Compression
DASH	Disabilities of the Arm, Shoulder and Hand
CBSQ	Cervical Brachial Syndrome Questionnaire

Plan

Transaxillary approach in thoracic outlet syndrome surgery – a single center report of 484 surgeries in 346 patients over ten years

Transaxillary approach in TOS surgery

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Abstract

Introduction

Thoracic outlet syndrome (TOS) is a group of symptoms caused by compression of neurovascular structures serving the upper extremity. It comprises three distinct conditions depending on the affected structures: neurogenic, venous and arterial. In patient with severe disease, disability symptoms and failed physical therapy, surgical treatment is required for decompression, regardless TOS type.

The aim of our study was to report the ten-year experience of TOS surgical management with the transaxillary approach and to look for any difference of previous treatment or early results in regard of TOS types. The outcomes measures considered were minor and major complications after surgery and satisfaction at 6 week's visit.

Methods

We retrospectively collected demographic and clinical data for all patients that underwent surgery for TOS over 10 years in our center. Data were compared among patients with arterial, neurogenic, and venous TOS.

Results

Between 2012 and 2021, 346 patients underwent surgery in 484 upper limbs. The mean age was 37.9 +/- 10.6 years with 242 females (69,9%). Symptoms were reported in 535 limbs. Arterial TOS was diagnosed in 90.1% of the cases, neurogenic TOS in 36.3% and venous TOS in 24.5% of the symptomatic limbs. Patients with neurogenic TOS had longer delay before diagnosis, higher rate of physical therapy before surgery and higher rate of sick leave before surgery. The rate of cervical ribs was lower for patients with venous TOS.

Surgery was performed in 484 limbs, by the transaxillary approach in 473 (97,7%) limbs and the supraclavicular approach in 11 (2,3%) limbs.

Major early adverse events were 2 (0,5%) neurological injuries, involving C8-T1 root injury and axillary nerve injury. The rate of complications, upper limb mobility after surgery and satisfaction was similar across TOS types.

Conclusion

Clinical presentations as well as results of examinations can vary significantly in the population suffering from TOS resulting in different types of TOS and preoperative cares. However, the transaxillary approach allows first rib resection with a low rate of complications and good early results in all types of TOS. In our view, this approach should be promoted and can be performed in most patients diagnosed with TOS.

Keywords: Thoracic outlet syndrome – transaxillary – surgery – results – neurologic – complication

INTRODUCTION

Thoracic outlet syndrome (TOS) is a group of symptoms caused by compression of neurovascular structures serving the upper extremity. There are three distinct types of TOS depending on the anatomic structures involved and the clinical syndromes that result from them. Patients can present with arterial TOS (ATOS) due to subclavian artery compression, neurogenic TOS (NTOS) due to brachial plexus compression and/or venous TOS (VTOS) due to subclavian vein compression. The etiologies of TOS have been classified as being either congenital, with cervical ribs, traumatic following whiplash injuries or motor vehicle accidents, or functionally acquired, with vigorous, repetitive upper extremity activities.[6]

In patients with severe disease, disability symptoms and failed physical therapy, surgical treatment is required for decompression, regardless of TOS type.[12] The two common surgical approaches for first rib resection include the transaxillary (TA) and supraclavicular (SC) approaches. The transaxillary approach allows less brachial plexus and phrenic nerve manipulation with easy access to the first rib, without muscle dissection. The supraclavicular approach is performed through a large exposure and allows arterial reconstruction. Because of limited data and a lack of randomized controlled studies, no approaches have demonstrated superiority over one another in terms of outcomes.

The aim of this study was to report the ten-year experience in TOS surgical management with the transaxillary approach and to look for any differences in previous treatment or early results regarding TOS types.

MATERIALS AND METHODS

Study design

We retrospectively collected demographic and clinical data for all patients that underwent surgery for TOS from January 1st 2012 to December 31th 2021 in our center. Clinical data were recorded in an anonymized Excel database to de-identify private information. The institutional review board approved this retrospective study (CNIL ar22-0014v0) and waived requirement for informed consent.

Diagnosis management

Clinical criteria for arterial TOS were paresthesias throughout the whole hand, upper limb claudication with tiredness, pallor and/or coldness, and vascular complications (such as subclavian artery aneurysm, occlusion, distal embolization or ischemia).

For neurogenic TOS, clinical criteria were paresthesias in a specific neurological territory of the hand or forearm, Raynaud's phenomenon due to sympathetic fibers irritation, and/or amyotrophy of the hand.

For venous TOS, clinical criteria were hand or upper limb edema, previous acute vein thrombosis and/or venous collateral circulation of the upper limb.

Patients underwent dynamic maneuvers: Elevated Arm Stress Test (EAST) to reproduce symptoms caused by narrowing of the scalene triangle, and abolition of the arterial pulse in case of ATOS.

Patients were then classified into groups according to the clinical findings: arterial, neurogenic, venous or mixed.

Patients underwent radiological imaging:

- A chest X-ray to detect a cervical rib, bones abnormalities or a clavicular fracture.
- Doppler ultrasonography at rest and during the EAST test. Ultrasound imaging results were classified as positive or negative for arterial compression based on the physician's assessment.
- Provocative maneuvers were performed during arteriography and phlebography, including abduction with external rotation of the arm mimicking the EAST (to detect costoclavicular compression) as well as maneuvers mimicking Adson's test (to detect pectoralis minor compression). These maneuvers were performed with the patient in a supine position. Arteriograms and phlebograms were considered positive if stenosis >75% or occlusion of the subclavian artery and/or vein was present.
- Electroneuromyography was used to assess latency and amplitude of the medial antebrachial cutaneous nerve or to detect any other abnormality compatible with this diagnostic.

Patients were then classified according to radiological findings:

Radiological arterial TOS was diagnosed if Doppler ultrasonography and/or arteriography were positive, neurogenic TOS was diagnosed if electroneuromyography was positive and venous TOS was diagnosed if phlebography was positive.

An analysis was performed on a limb-by-limb basis based on symptoms reported in the patient's history and symptoms observed during the tests. At the initial visit, each upper limb was classified as positive or negative for clinical arterial, venous and/or neurogenic TOS. After imaging, each upper limb was classified as

positive or negative for radiological arterial, venous and/or neurogenic TOS. Most of the patients with unilateral symptoms at the initial visit underwent bilateral imaging. The outcome measures considered for analysis were minor complications (such as hematoma requiring reintervention and pneumothorax requiring chest tube) and major complications (such as neurologic injury during surgery, death). Early satisfaction was assessed at the six-week visit.

Statistical analysis

Demographic data, comorbidities and details of the intervention were compared between TOS groups using Chi2 tests and t-tests. All values were expressed as count and percentage or mean +/- standard deviation. R++ software was used to perform analysis. A p-value < 0,05 was considered statistically significant.

RESULTS

1. Demographic characteristics

Between 2012 and 2021, 346 patients underwent surgery on 484 upper limbs. The mean age was 37.9 +/- 10.6 years with 242 females (69.9%). Two hundred and two patients were manual workers (58.3%). Laterality was recorded for 270 patients and 236 (87.4%) were right-handed. Medical history of shoulder surgery was reported in 39 (11.2%) patients, spine surgery in 28 (8%) patients (at cervical level in 19 (67.8%) patients), release of the ulnar nerve at the elbow in 24 (6.9%) and carpal tunnel release in 55 (15.8%) patients (among whom 22 (40%) had bilateral surgery).

The delay between first symptoms apparition and first vascular surgeon visit was less than 1 year in 87 (25.1%) patients, 1 to 2 years in 50 (14.4%) patients and more than 2 years in 199 (57.5%) patients. Sick leave due to TOS was reported in 129 (37.2%) patients.

Symptoms were reported in 535 limbs. At initial presentation, 190 (55.3%) patients had bilateral symptoms. For the others, 75 (21.9%) had right upper limb symptoms and 78 (22.8%) had left upper limb symptoms.

Among patients with initial bilateral symptoms, 106 (55.8%) had bilateral surgeries. Among those with initial unilateral symptoms, 32 (21.1%) had bilateral surgeries because they secondarily became symptomatic on the second side.

2. TOS diagnosis

Arterial TOS symptoms were reported in 484 (90.1%) limbs. Symptoms were arm tiredness in 410 (84.7%) limbs, forearm tiredness in 419 (86.5%) limbs, paresthesias throughout the hand in 248 (51.2%) limbs and 10 (2.0%) acute limbs ischemia. Among them, neck pain in 218 (45.0%) and shoulder pain in 382 (78.9%).

Venous TOS symptoms were reported in 130 limbs (24.5%). Symptoms were swelling in 130 limbs and collateral circulation in 13 (9.8%) limbs.

Neurogenic TOS symptoms were reported in 193 limbs (36.3%). Symptoms were arm pain in 175 (89.7%) limbs, forearm pain in 176 (90.2%), paresthesias in a specific neurologic territory in 162 (83%) and amyotrophic thenar territory in 3 (1.5%) limbs. Among them neck pain was reported in 100 (51.2%), shoulder pain in 155 (79.4%).

Isolated arterial TOS was diagnosed in 262 limbs (48.9%) isolated neurogenic TOS in 22 (4.1%), isolated venous TOS in 21 (3.9%), mixed arterial and neurologic in 121 limbs (22.6%), mixed arterial and venous TOS in 59 limbs (11%), mixed neurologic and venous TOS in 8 limbs (1.4%), mixed arterial, neurologic and venous TOS in 42 limbs (7.9%). (Figure 1)

Among the 484 limbs with clinical arterial TOS, 457 (94.4%) had a radiologic ATOS diagnosis. Among the 193 limbs with clinical neurogenic TOS, 107 (55.4%) had a radiologic NTOS diagnosis. Among the 130 limbs with venous clinical TOS, 100 (76.9%) had a radiologic VTOS diagnosis.

Chest radiology demonstrated 41 cervical ribs in 24 patients (6.9%) and 9 bones malformation (1.8%). According to the SVS classification, cervical ribs were 12 (29.2%) type 1, 12 (29.2%) type 2, 14 (34.1%) type 3 and 3 (7.3%) type 4.

3. Surgery

Surgery was performed in 484 limbs, by transaxillary approach in 473 (97.7%) limbs and supraclavicular approach in 11 (2.3%) limbs.

Supraclavicular approach was performed because of 5 (17.2%) cervical ribs, 6 (54.5%) redo surgery and 3 (27.2%) arterial bypasses.

Transaxillary approach allowed first rib removal in 466 cases (98.5%), associated with pectoralis minor section in 201 cases (43%). Pectoralis minor section alone was performed in 7 cases (1.4%). Twenty-four (82.7%) cervical ribs were removed, and 1 redo surgery was performed through TA approach.

Major early adverse events were 2 (0.5%) neurological injuries, involving one C8-T1 root injury and one axillary nerve injury. Minor adverse events were pleural hematoma requiring 13 (2.7%) evacuation, 22 (14.2%) pneumothoraxes requiring 21 chest tube, and 57 (37%) medial brachial nerve palsy.

4. Outcomes at 6 weeks

At 6 weeks after surgery, outcomes were considered satisfactory for 71.5% of the patients. The remaining patients were either midly symptomatic (44%), had symptoms persistence from the first side (27%), had others pain not related to TOS (14%) or were lost to follow (14%).

5. Influence of TOS type

Among the 484 upper limbs in 346 patients who underwent surgery, NTOS was diagnosed in 180 limbs (37.1%), ATOS in 434 limbs (89.6%) and VTOS in 128 (26.4%) limbs. Characteristics were similar in regard with male/female ratio and age at diagnosis. The delay since first symptoms apparition and diagnosis was more than 2 years in 83 patients (65.3%) with NTOS, which was significantly

longer than other patients (p=0.032). The rate of sick leave before diagnosis was significantly higher in NTOS patients with 53 patients (41.7%) reporting at least one sick leave before diagnosis (p=0.008). Physical therapy before surgery was performed in 103 NTOS patients (81.1%), which was higher than VTOS and ATOS patients (p=0.012). The rate of cervical ribs was lower in VTOS patients with 2 (2%) cervical ribs (p=0.046).

Surgery on the first side was performed through transaxillary approach in 120 (94.5%) NTOS upper limbs, 299 (96.7%) ATOS upper limbs and 93 (95.8%) VTOS upper limbs, without significant differences. The rate of first rib resection and pectoral minor section was similar between groups. The mean in-hospital length of stay was 4 +/- 1 day in each group.

Minor complications after surgery were similar between groups, excepted a lower rate of pneumothorax requiring chest tube in NTOS patients (1 NTOS patient (0.7%)). The rate of major complications was similar between groups.

Surgery results were similar between groups in term of mobility at 6 weeks, patient's satisfaction, need for physical therapy after surgery and late adverse events. (Table 1) Surgical results were similar for patients who underwent contralateral surgery (Table 2).

DISCUSSION

In this study we demonstrated the safety of the transaxillary approach for TOS in a large cohort of patients over 10 years. We reported two nervous injuries, including one C8-T1 root injury and one axillary nerve injury, representing 0.5% of the total population. The rate of neurological injuries with the TA approach varies from 0% to 2% across studies with long thoracic nerve injury resulting in scapula alata or plexus neuralgia reported.[1,16,4] In a recent meta-analysis, the reported rate of permanent brachial plexus injury was 0.1%.[18] Most of the symptoms disappeared within a short period. The rate of pleural opened or pneumothorax was 14%, which is consistent with our findings, with 22 (14.2%) cases of pneumothorax.

The importance of complete first rib resection has been demonstrated in a randomized prospective trial comparing supraclavicular neuroplasty of the brachial plexus alone versus transaxillary first rib resection in terms of postoperative result and pain after surgery.[15] Concerning the approach, there is no demonstrated superiority of the TA approach over the SC approach. In Aboul Hosn et al trial comparing TA and SC to perform first rib resection, there were no significant differences in average operative time, and length of hospital stay, or minor complications, perioperative and 30-day mortality.[1] On follow-up, 49% of patients had complete resolution of symptoms, 46% had partial improvement and 5% had no improvement, without significant differences based on the type of procedure. In a recent meta-analysis, the pooled success rate and complete relief rate were 0.76 (95% CI 0.65-0.85) and 0.53 (95% CI 0.38-0.68) respectively for TA, and 0.77 (95% CI 0.68-0.85) and 0.57 (95% CI 0.41-0.72) for the SC approach in NTOS surgery. The probability of a complete relief rate

of 50% or greater was 67% for TA and 71% for SC respectively.[18] Another recent meta-analysis showed similar results in terms of neurological injury (5% in TA vs 3% in SC), vascular injury (0.1% in TA vs 0.3% in SC) and death (0.04% in TA vs 0.07% in SC).[17]

The most difficult aspect of the TA approach is to perform surgery in a deep field, especially for the posterior part of the first rib. Moreover, the learning curve is steeper due to the small incision and limited visibility for the surgical assistant. This aspect may lead some surgeons to prefer the supraclavicular approach, especially in cases of a cervical rib. In our study, we reported the resection of 24 cervical ribs through the transaxillary approach. Gelabert et al reported a cohort of 56 patients who underwent 70 resections of first and cervical ribs through the TA approach.[11] One patient was noted to have a transient mild elevation of the hemidiaphragm after surgery, and two patients required longer hospital stays for pain management. Postoperative pain and DASH scores were reduced for all patients. As described in this study, the most common reason for recurrent symptoms is inadequate resection of the posterior portion of the first rib. We have also adopted a "cartilage to cartilage" approach to first rib resection, disarticulating the rib from the transverse process and transecting it at the costochondral junction.

Most of the studies report arterial TOS as the least common subtype of TOS, ranging from 1% to 19% in the literature.[9] According to the SVS reporting standards, diagnostic criteria for ATOS are limited to subclavian artery aneurysm, occlusion, distal embolization or ischemia. In our study ATOS criteria included tiredness, pallor and coldness at effort and paresthesias throughout the whole hand. We strongly defend the idea that paresthesias throughout the whole

hand is due to the ischemia of the hand consecutive to the arterial dynamic occlusion. There is no way that the whole branches of the brachial plexus can be compressed simultaneously and provoke such paresthesias. This is why we distinguished paresthesias in a specific neurological territory and paresthesias affecting the entire hand. Moreover, the neurological anatomy of the hand is so complex that these symptoms cannot be invented by patients. NTOS was diagnosed in our study when paresthesias were present in a specific neurological territory of the hand or forearm, mostly in the ulnar territory. These neurogenic symptoms typically result from C8-T1 nerve roots compression at the scalene triangle and/or costoclavicular space.

Patients with TOS are often misdiagnosed and subjected to unnecessary operations and therapies. In our study, the delay between first symptoms apparition and first surgical visit was more than two years in 199 (57, 5%) patients leading to a high rate of sick leave. It was higher for patients with NTOS. Rockind et al described a group of NTOS patients with pronounced motor deficits for whom the delay ranged from 1 to 15 years before diagnosis and surgical treatment.[14] One hypothesis is the broader range of symptoms in NTOS and its differential diagnosis with carpal syndrome, which is much more widely recognized in the medical community than TOS. Indeed, we reported a high rate of previous carpal tunnel release and ulnar nerve release at the elbow which could have contributed to a longer delay before the diagnosis of TOS. In Chang et al prospective study, 27% of NTOS patients had previous surgeries including the cervical spine, shoulder or elbow.[7] Dubuisson et al described a series of seven patients with Gilliatt-Sumner hand, arm pain, and paresthesias. Three patients were treated with C5/C6 discectomy with disc prosthesis, ulnar

neurolysis at the elbow, carpal tunnel release, and intravenous immunoglobulin before being diagnosed with NTOS. In these patients, the delay before first symptoms apparition and NTOS diagnosis was six months to five years.[10] It has been demonstrated that NTOS patients have lower Physical Component Score and DASH score before surgery than VTOS patients, but similar results after surgery in terms of physical and mental improvement, and full-time work or activity return after surgery.[7] Our study is consistent with these results: NTOS patients had longer delay before diagnosis and higher rate of physical therapy before surgery. Despite these differences, no significant differences were found between the groups in terms of complications and surgical outcomes.

Most of the patients with asymptomatic limbs have arterial or venous costo-clavicular compression at dynamic imaging. In a cross-sectional observational study using ultrasound spectral Doppler waveform analysis of the subclavian artery, one-third of healthy subjects demonstrated significant changes in at least one dynamic position when compared to rest.[5] Nord et al demonstrated a rate of false-positive test of 9% to 56% in healthy subjects depending on the provocative maneuvers performed.[13] Demondion et al demonstrated that healthy subjects had substantial arterial stenosis >50% at 130° abduction on Doppler imaging.[8]

These findings highlight the importance of distinguishing thoracic outlet compression and thoracic outlet syndrome. Recently, Abraham et al proposed that these cases of positional compression without symptoms should not be named TOS but "Thoracic outlet compressions" (TOCs) to avoid confusion between the two conditions.[2] The diagnosis of thoracic outlet syndrome is based on a set of clinical and paraclinical findings.

The lack of standardization in outcomes is a major limitation of this study. The SVS reporting standards emphasize the need for assessment instruments like the Quick-DASH, CBSQ, and the TOS disability scale.[12] The reported outcomes in our study are subjective, based on patient satisfaction. We previously evaluated the quality of life after surgical treatment of TOS in our center in a prospective observational study, including patients treated surgically for TOS in 2018.[3] The improvement of the DASH score and the MCS-SF-12 was statistically significant at 3, 6, and 12 months, and the improvement in PCS-SF-12 was significant at 6 and 12 months after first rib resection via the transaxillary approach.

CONCLUSION

Clinical presentations as well as results of examinations can vary significantly in the population suffering from TOS resulting in different types of TOS and preoperative cares. However, the transaxillary approach allows first rib resection with a low rate of complications and good early results in all types of TOS. In our view, this approach should be promoted and can be performed in most patients diagnosed with TOS.

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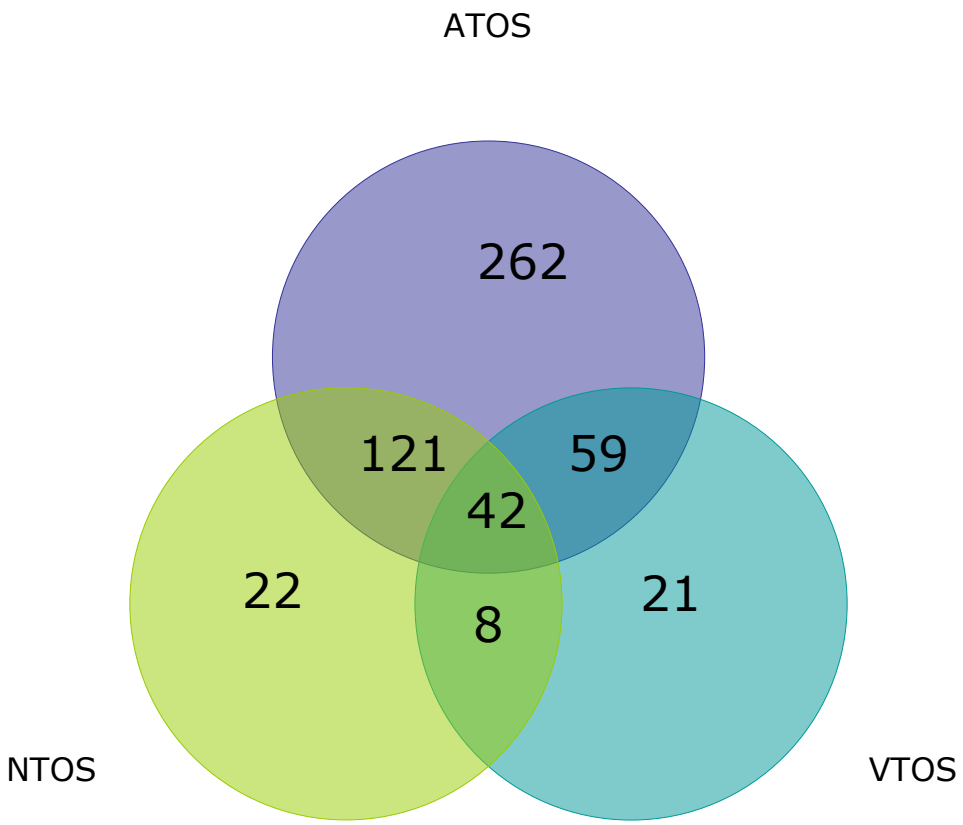
FIGURES

Figure 1 - clinical TOS repartition at initial visit among the 535 symptomatic limbs



TABLEAUX

Table 1 - preoperative characteristics and surgical results according to TOS type (first side)

	NTOS	ATOS	VTOS	p-value
First side				
N arm (%) / N patients	127 (36,7%) / 346	309 (89,3%) / 346	97 (28%) / 346	
Female sex, N (%)	84 (66,6%)	217 (70,6%)	68 (70,8%)	NS
Delay since first symptoms apparition > 2years, y (%)	**83 (65,3%) ***	182 (58,9%)	49 (50,5%)	***0,032**
Sick leave before diagnosis, N (%)	**53 (41,7%) ***	123 (39,8%) *	34 (35%)	***0,008**
Physical therapy before surgery, N (%)	**103 (81,1%) ***	235 (76%)	62 (63,9%)	***0,012**
Cervical rib, N (%)	8 (6,3%)	21 (6,8%)	**2 (2%) ***	***0,046**
Transaxillary approach, N (%)	120 (94,5%)	299 (96,7%)	93 (95,8%)	NS
First rib resection, N (%)	124 (97,6%)	303 (98%)	95 (97,9%)	
Pectoral minor section, N (%)	54 (42,5%)	134 (43%)	44 (45,3%)	
Length of stay, days (%)	4,1 +/- 1,1	4,1 +/- 1,1	4 +/- 0,8	NS
Minor complications				
Pneumothorax with chest tube, N (%)	**1 (0,7%) ***	11 (3,5%)	3 (3%)	** 0,036**
Hematoma , N (%)	14 (11%)	26 (8,4%)	9 (9,2%)	
Medial brachial nerve palsy, N (%)	17 (13,4%)	42 (13,5%)	11 (11,3%)	
Major complications				
Neurological disease, N (%)	1 (0,7%)	2 (0,6%)	0	NS
Mobility at 6 weeks				
None, N (%)	3 (2,3%)	7 (2,3%)	4 (4,1%)	NS
Partial, N (%)	41 (32,2%)	102 (33,2%)	31 (32,2%)	
Total	83 (65,3%)	198 (64,7%)	61 (63,5%)	
Patient's satisfaction, N (%)	91 (71,6%)	221 (71,5%)	67 (69%)	NS
Physical therapy after surgery, N (%)	90 (70,8%)	219 (70,8%)	65 (67%)	NS
Late adverse events, N (%)	41 (32,2%)	97 (31,3%)	31 (31,9%)	NS

Table 2 – Surgical results according to TOS type (second side)

	NTOS	ATOS	VTOS	
Second side				
N arm (%) / N patients	53 (38,4%) / 138	125 (90,5%) / 138	31 (22,4%) / 138	
First rib resection	45 (84,9%)	106 (84,8%)	27 (87,1%)	NS
Pectoral minor section	20 (37,7%)	52 (41,6%)	14 (45,1%)	
Length of stay	4 +/- 0,83	4 +/- 0,9	3,9 +/- 1	NS
Minor complications				
Pneumothorax with chest tube	4 (7,5%)	8 (6,4%)	1 (3,2%)	NS
Hematoma	8 (15%)	12 (9,6%)	1 (3,2%)	
Brachial nerve palsy	3 (5,6%)	7 (5,6%)	3 (9,6%)	
Major complications				
Neurological disease	0	0	0	NS
Mobility at 6 weeks				
None	0	0	0	NS
Partial	17 (35,4%)	42 (37,8%)	8 (30,7%)	
Total	31 (64,5%)	69 (62,1%)	18 (69,2%)	
Patient's satisfaction	37 (69,8%)	87 (69,6%)	21 (67,7%)	NS
Physical therapy after surgery	33 (62,2%)	68 (54,4%)	15 (48,3%)	NS
Late adverse events	10 (18,8%)	25 (20%)	5 (16,1%)	NS

TABLE DES MATIERES

DEVEZE Eva

La voie transaxillaire dans la chirurgie du syndrome du défilé thoraco-brachial

RÉSUMÉ

Introduction
Le syndrome du défilé thoraco brachial (SDTB) est un ensemble de symptômes provoqués par la compression dynamique des structures vasculo-nerveuses du membre supérieur. Il existe trois types de SDTB selon les structures impliquées : neurologique, veineux et artériel. Chez les patients présentant des symptômes invalidants et après échec de traitement médical par kinésithérapie, un traitement chirurgical est recommandé pour exérèse de la première côte, peu importe le type de défilé présenté.
L'objectif de l'étude est de rapporter l'expérience chirurgicale sur les dix dernières années des patients opérés d'un syndrome du défilé thoraco-brachial par voie transaxillaire et de mettre en évidence des différences de traitement et de résultats de la chirurgie selon le type de SDTB. Les critères de jugement considérés étaient le taux de complications mineures et majeures et la satisfaction à 6 semaines postopératoire.
Matériel et méthode
Les données démographiques et cliniques ont été collectées rétrospectivement sur dossier médical pour tous les patients opérés d'un SDTB sur 10 ans dans notre centre. Les données ont été comparés entre les patients présentant un SDTB artériel, neurologique et veineux.
Résultats
Entre 2012 et 2021, 346 patients ont été opérés sur 484 membres supérieurs. L'âge moyen était de 37,9 +/- 10 ans avec 242 femmes (69,9%). Parmi 535 membres symptomatiques, 90,1% présentait un SDTB artériel, 36,3% neurologique et 24,5% veineux. Un délai plus long entre le début des symptômes et le diagnostic, un taux plus élevé de kinésithérapie et d'arrêt de travail préopératoire a été retrouvé chez les patients présentant un SDTB neurologique. Le taux de côte cervicale était plus bas chez les patients présentant un SDTB veineux. Une voie transaxillaire a été réalisé pour 473 (97,7%) des membres opérés et supraclaviculaire pour 11 (2,3%) des membres opérés. Les complications majeures retrouvées étaient 2 (0,5%) lésions neurologiques, 1 lésion C8-T1 et 1 lésion du nerf axillaire. Le taux de complications, la mobilité du membre après chirurgie et la satisfaction post-opératoire était similaires entre les groupes.
Conclusion
La présentation clinique varie significativement parmi les patients souffrant d'un SDTB, entraînant des différences de prise en charge. Cependant, la voie transaxillaire permet l'exérèse de la première côte avec un faible taux de complications et de bons résultats précoces peu importe le type de SDTB. De notre point de vue, cette approche permet le traitement chirurgical de la majorité des patients souffrant d'un SDTB et ne doit pas être oubliée.

Mots-clés : Syndrome du défilé thoraco-brachial – transaxillaire – chirurgie – résultats – neurologique – complication

Transaxillary approach in thoracic outlet syndrome surgery

ABSTRACT

Introduction
Thoracic outlet syndrome (TOS) is a group of symptoms caused by compression of neurovascular structures serving the upper extremity. It comprises three distinct conditions depending on the affected structures: neurogenic, venous and arterial. In patient with severe disease, disability symptoms and failed physical therapy, surgical treatment is required for decompression, regardless TOS types.
The aim of our study was to report the ten-year experience of TOS surgical management with the transaxillary approach and to look for any difference of previous treatment or early results in regard of TOS types. The outcomes measures considered were minor and major complication after surgery and satisfaction at 6 week's visits.
Methods
We retrospectively collected demographic and clinical data for all patients that underwent surgery for TOS over 10 years in our center. Data were compared among patients with arterial, neurogenic, and venous TOS.
Results
Between 2012 and 2021, 346 patients underwent surgery in 484 upper limbs. The mean age was 37.9 +/- 10.6 years with 242 females (69,9%). Symptoms were reported in 535 limbs. Arterial TOS was diagnosed in 90.1% of the cases, neurogenic TOS in 36.3% and venous TOS in 24.5% of the symptomatic limbs. Patients with neurogenic TOS had longer delay before diagnosis, higher rate of physical therapy before surgery and higher rate of sick leave before surgery. The rate of cervical ribs was lower for patients with venous TOS.
Surgery was performed in 484 limbs, by the transaxillary approach in 473 (97,7%) limbs and the supraclavicular approach in 11 (2,3%) limbs.
Major early adverse events were 2 (0,5%) neurological injuries, involving C8-T1 root injury and axillary nerve injury. The rate of complications, upper limb mobility after surgery and satisfaction was similar across TOS types.
Conclusion
Clinical presentations as well as results of examinations can vary significantly in the population suffering from TOS resulting in different types of TOS and preoperative cares. However, the transaxillary approach allows first rib resection with a low rate of complications and good early results in all types of TOS. In our view, this approach should be promoted and can be performed in most patients diagnosed with TOS.

Keywords: Thoracic outlet syndrome – transaxillary – surgery – results – neurologic – complication

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