Extra Cervical Rib Causing Thoracic Outlet Syndrome with Left Subclavian Artery and Vein Occlusion, Presenting in 38 years Old Male: A Clinical Case Report and its Literature review.

Abstract: **Background:** Thoracic outlet syndrome is a rare condition secondary to compression of neurovascular bundle in. Being physically active led to better prognosis. Literature shows a strong link between the thoracic and the thoracic area.

Introduction: TOS can present with arm pain and swelling, arm fatigue, paresthesias, weakness, and discoloration of the hand. TOS can be classified as neurogenic, arterial, or venous based on the compressed structure(s).

Methodology: This is a case presentation of our patient presented to us and was diagnosed with TOS, and then we have written its literature review article on the presentation and management of TOS discussed in PubMed indexed articles.

Results and Conclusion: Our patient was timely diagnosed and after managing the acute complication of TOS, such as pain and thrombosis, it was treated with surgical excision of extra rib, since then the patient is asymptomatic. Muscle hypertrophy is recognized as can induce vascular or neurogenic compression outlet syndrome and certain sports. Neurogenic manifestation is most common, presenting with Pain, numbness, tingling, weakness, and vasomotor changes of upper limb. Vascular complications of thoracic outlet syndrome are uncommon including thromboembolic phenomena and swelling. Both surgical and non-surgical Treatment whereas some non-surgical Treatment appears to be effective in some patients. Despite advances, substantial controversy regarding the diagnosis remains. This is evidenced by the lack of objective findings surrounding nTOS, the most common and widely disputed form of TOS. The challenges associated with diagnosis complicate the selection of the appropriate treatment option. In some cases, e.g., acute vascular insufficiency or progressive neurologic dysfunction, surgical decompression is clearly indicated. Prompt recognition and treatment of TOS provide the greatest opportunity for optimal recovery. Unfortunately, the multitude of nonspecific symptoms and challenges in diagnosis can delay treatment and increase the risk of complications. Surgical intervention for TOS syndrome is reserved for patients who have failed conservative management. Conservative treatment including physical therapy need be trialed for at least 4–6 months prior to consideration of surgical intervention.

Key words: Thoracic outlet syndrome, extra cervical rib, pancoast tumor, rib pain, orthopedics.

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Introduction: Thoracic outlet syndrome (TOS) encompasses a variety of conditions that causes the compression of neurovascular bundle as it exits the thoracic outlet. This outlet is an anatomical region located at the base of the neck, defined by three distinct spaces between the collarbone and the first rib, which include the scalene triangle, costoclavicular space , and sub coracoid space .These spaces allow critical neurovascular structures to pass through . The structures include the brachial plexus, subclavian artery and subclavian vein. When this area is compressed, it leads to a variety of symptoms, such as upper limb pallor .Tingling sensations, weakness, muscle wasting and pain and swelling [1] .

TOS is classified based on the underlying causes of symptoms, with the main subtypes being neurogenic (ntos) , venous (vtos) and arterial (atos) and mixed (mtos) . Each of these categories can result from congenital factors, trauma, or functional changes acquired over time [2]

The diagnosis of TOS involves a detailed physical exam, focusing on the upper limbs and cervical spine and comparing the affected side to the unaffected one. Specific findings can vary depending on the type of: Thoracic outlet syndrome (TOS) encompasses a variety of conditions that causes the compression of the neurovascular bundle as it exits the thoracic outlet. This outlet is an anatomical region located at the base of the neck, defined by three distinct spaces between the collarbone and the first rib, which include the scalene triangle, costoclavicular space , and subcoracoid space .These spaces allow critical neurovascular structures to pass through . The structures include the brachial plexus, subclavian artery and subclavian vein. When this area is compressed, it leads to a variety of symptoms, such as upper limb pallor .tingling sensations, weakness, muscle wasting and pain and swelling [1]

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The diagnosis of TOS involves a detailed physical exam, focusing on the upper limbs and cervical spine and comparing the affected side to the unaffected one. Specific findings can vary depending on the type of tos .Arterial TOS might show significant differences in blood pressure between arms. While there can be swelling, discoloration and chest wall varicosities in chronic cases. Severe neurogenic TOS can cause muscle atrophy of the hand and forearm. ATOS v TOS can be diagnosed with CT scan mri and duplex by showing arterial or venous narrowing or clot. For suspected nTOS nerve conduction and electromyography studies can be conducted .Angiography is used to assess blood flow in suspected vascular TOS cases[2].

Managing tos involves a comprehensive approach, with treatment options varying based on the specific subtype. Physical therapy is often the primary focus in conservative treatment strategies but it also involves lifestyle changes, pain management and anticoagulant therapy. Injection therapy can temporarily alleviate symptoms and is considered a positive indicator for successful surgery. Surgery is generally recommended for patients who remain symptomatic after 4-6 weeks of conservative treatment or for those with vascular forms of TOS [3]. arterial TOS might show significant

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Epidemiology:

Cervical ribs were found in 2.0% (67/3404) of the population. Of the 67 patients with cervical ribs, 27 (40.3%) had bilateral ribs. The prevalence of cervical ribs in women was twice that in men, 2.8% (39/1414) versus 1.4% (28/1990). Although African Americans accounted for 50.1% (1706/3404) and whites, 41.2% (1402/3404) of the patient population, African Americans were 70.1% (47/67) of patients with cervical ribs, whereas whites were 26.9% (18/67). Radiologists commented on 25.5% (24/94) of the cervical ribs in 25.4% (27/67) of patients.
Its incidence is 95% in neurogenic outlet syndrome and venous and arterial is 1% and 3% respectively. Venous thoracic outlet syndrome is associated with mechanical compression from repetitively overhead movements. Its range in the USA is 3-80 cases per 1000 population.
Sex and age related demographics: It's more common in women particularly with poor muscular development, poor posture, or both. Onset of symptoms typically occurs in persons aged 20-50 ears. Its uncommon in children.

Our Case presentation: A patient name Arshad 38 years old presented to old for he complaint of bluish discoloration of left hand I it worsens on exposure to cold, itching, and relieved on warmth. he has no known premorbid conditions such as no diabetes Mellitus, no hypertension, no asthma no B mom smoker's patient Was in a usual state of health 7-8 das back when he developed bluish discoloration of fingers of left hand I was sudden in onset severe in pain, sever increasing in intensity on exposure to cold with itching . Pain relieved b exposure to warmth. I was associated with pain parenthesis and itching. He experiences no triphasic color change, no oral ulcers, no alopecia, no photosensitivity no musculoskeletal weakness no dysphagia, no complain of arthritis, no complaint of epistaxis, nasal surgery, no hemoptysis, orv repeat sinuses. On cardiovascular inquiry no chest pain no shortness of breath,

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no palpitations, on CNS inquiry no seizure no headache no syncope. On respirator enquiry no cough, no fever, no gastrointestinal inquiry no diarrhea, no constipation, no hematemesis, no melena. on genitourinary inquiry no burning micturition m no hematuria, no froth urination.no past medical and surgical history . No personal or family history .no drug history .no drug or allergic history. On pulsation of the right upper limb ulnar, radial, brachial and dorsalis pedis is palpable. On left side of upper limb there is no ulnar, radial or brachial pulsation. No dorsal pedals pulsation. No posterior tibial pulsation. No carotid bruit, no renal bruit, No Aortic bruits. No Iliac bruits. On inspection of the respiratory system s1 $_{s}$s2 is audible **.**

Table 1: Baseline investigations: Complete blood profile

Name of investigation	**Results at admission**	**Results at discharge**	**Normal Range**	**Unit**
Hemoglobin	14	14	M=14-18 F= 11.7-15.7	mg/dl
W.B.C	6320	6320	15.6	$x10^3$/dl
Neutrophils	50%	50%	40-70%	$x10^3$/dL
Lymphocytes	21%	21%	20-25%	$x10^3$/dL
Monocytes	4%	4%	2-10%	$x10^3$/dL
Eosinophil	1%	1%	1-2%	$x10^3$/dL
Platelets Count	249	249	150-400	$x10^6$/L
Sodium	140	140	136-149	mmol/L
Potassium	4	4	3.8-5.2	mmol/L
Chloride	100	`100	98-107	mmol/L
Random Blood Sugar	100	105	80-140	mg/dl
Blood Urea	20	20	10-50	mg/dl
Alkaline Phosphatase	55	55	40-129	mg/dl
Serum Calcium (Total)	10	10	8.8-12.0	mg/dl
Total Bilirubin	.3	.3	0.1-1	mg/dl
Creatinine kinase	20	20	10-120	micrograms per liter (mcg/L)
ANF	Negative	Negative	negative	
ESR	10	10	0 to 15 mm/hr in men. 0 to 20 mm/hr in women	mm/hr
Ferritin	200	200	Male: 30 to 400 nanograms per milliliter (ng/mL) Female: 13 to 150 ng/mL	ng/mL
CRP	0.5	0.5	0.3 to 1.0	mg/dL

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LDH	160	160	140 to 280	U/L
Anti CCP	10	10	less than 20 Units	
Urine R/E	Normal	Normal	looking for any nitrates and WBC, RBC and PH most of the time or amt sediments	
Serum procalcitonin	Less than 0.1	Less **than 0.1**	less than 0.1	ng/mL

ALL INVESTIGATIONS:

X RAY:

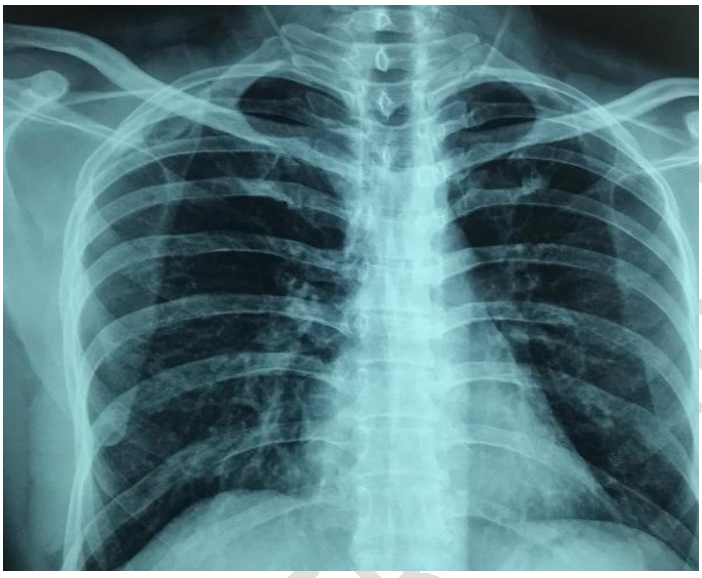

Figure 1: X ray showing extra cervical rib on left side:

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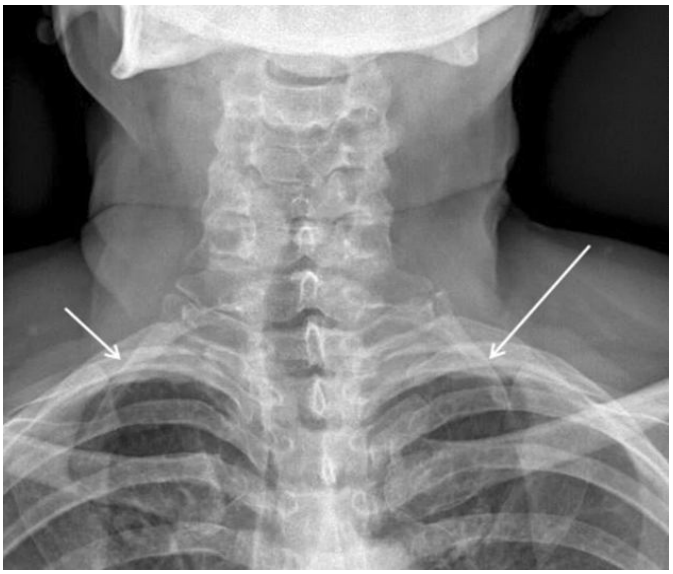

Figure 2: Display the C7 vertebra prominently; ensuring it is the origin point of the extra cervical rib, there are bilateral extra cervical rib present seen in the X ray imaging.

CT angiography of left upper limb:

Aortic arch, right brachiocephalic trunk, right common carotid artery and left common carotid artery are normal contrast opacified. A filling defect is noted in the proximal left subclavian artery resulting in near complete occlusion. This segment lies 1cm distal to its origin from the aortic arch. The involved partly occluded segment has length of 2.5cm.mild to moderate compression of left subclavian artery is observed between first rib and scalenus anterior suggest thoracic outlet syndrome. There is no evidence of cervical rib. The left vertebral artery is patent. Res of subclavian artery and axillary artery are patent. No Ct evident. Visualizing lung apices appear normal.

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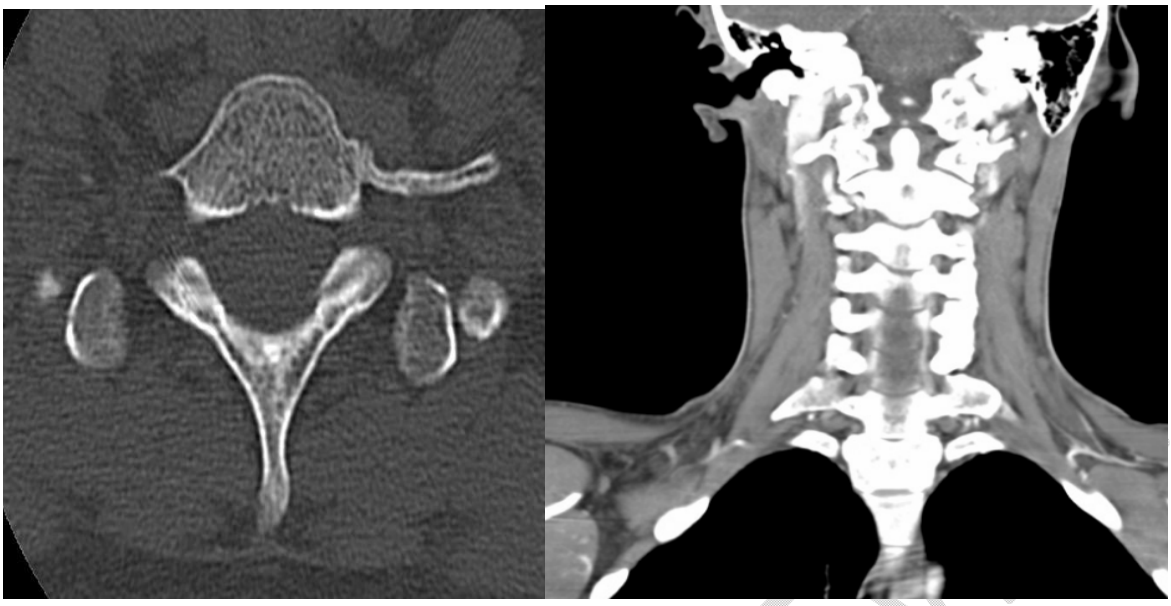

Figure 3: Aortic arch, right brachiocephalic trunk, right common carotid artery and left common carotid artery are normal contrast opacified. A filling defect is noted in the proximal left subclavian artery resulting in near complete occlusion.

Findings of CT Scan:

1- Findings are suggestive of short segment partial thrombosis of left subclavian artery, rest of upper limb arteries is patent.

2-mild to moderate compression of left subclavian artery is observed between scalenus anterior and first rib suggestive of thoracic outlet syndrome

ECHO: normal findings

Doppler Ultrasound both leg: limb examination was performed using Doppler ultrasound imaging with special and colored. No detection flow in the left radial artery. Low velocity patch monophasic flow in left radial artery flow is noted in o left brachial are a hide image of scan IAL left upper.

Right upper extremity triplex imaging was performed with a high frequency linear array transducer. Triplex examination included imaging in the transverse, sagittal planes with both grayscale and color Doppler. Pulsed wave spectral Doppler data was also acquired for radial and ulnar arteries. Triphasic flow was noted in the right axillary, right brachial, right ulnar and right radial artery. V max of arteries of right upper limb is as follow:

- Right axillary artery -83.9cm/s

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- Right brachial - 60.9cm/s
- Right ulnar – 29.8cm/s
- Right radial – 26.3cm/s

Conclusion: adequate flow in the arteries of right upper limb

DOPPLER U/S CAROTID:

Conclusion: Normal bilateral carotid ultrasound, highly suboptimal stud as origin of left subclavian artery is narrowed and on is location. However visualized proximal left subclavian artery is narrowed on and on spectral analysis showing biphasic flow and distally the left subclavian artery is normal showing triphasic flow. Findings are suggestive of partial stenosis of left subclavian artery a is origin.

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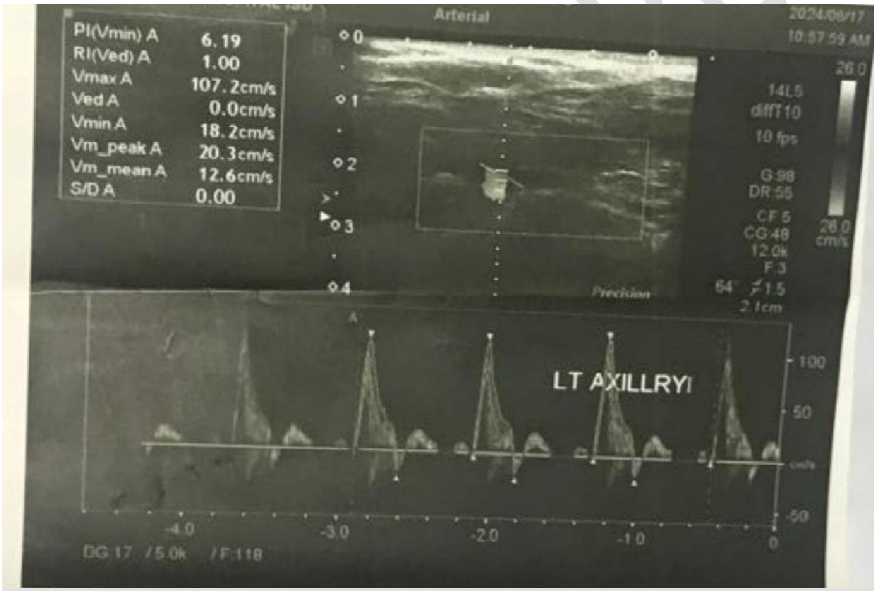

Figure 4; proximal left Axillary artery is narrowed o and on spectral analysis showing biphasic flow and distally he left subclavian artery is normal showing triphasic flow.

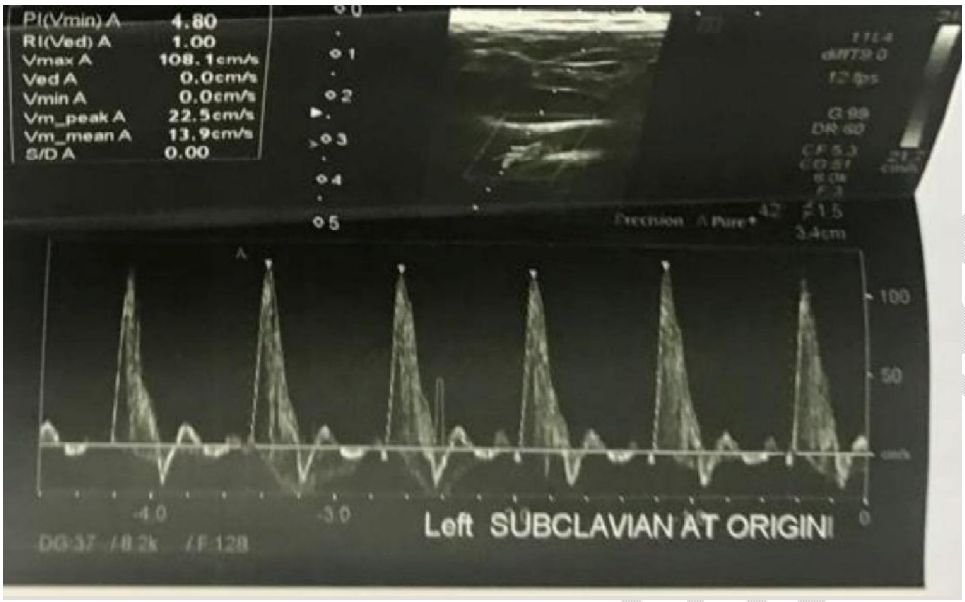

Figure 5: Findings are suggestive of partial stenosis of left subclavian artery at its origin.

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Treatment

Table 2: Treatment received. Inj. injection; Syp. Inf. infusion, ; Tab. tablet ; IV, intravenous; PO, per oral; TSF, teaspoon; OD, once daily; TDS, thrice daily; BD, twice daily.

Serial No.	Name of a drug	Route of administration	Dosage	Duration
1.	Gtn Ointment	topical	As required	8 HOURL
2.	Capsule Gabica	Oral	75mg	HS
3.	**T**able**t T**ramal plus	Oral		BD
4.	tablet Msdipine	Oral	30mg	BD
5.	tablet benpros**t**	Oral	20mg	OD
6.	Injection Heparin	IV	6000IU	BD
7.	table**t**Loprin	Oral	75mg	OD
8.	tablet Risek	Oral	20mg	BD
9.	tablet Folic acid	Oral	5mg	OD
10.	tablet Xept	Oral	10mg	OD
HOME BASED REAMEN:				
1.	GnOintmant	Opical	As required	8 HOURL
2.	Capsule Gabica	Oral	75mg	HS
3	**T**able**t t**ramaul plus	Oral		BD
4	tablet Msdipine	Oral	30mg	BD
5.	tablet benpros**t**	Oral	20mg	OD
6.	Injection Heparin	IV	6000IU	BD
7.	table**t**Loprin	Oral	75mg	OD
8.	tablet Risek	Oral	20mg	BD

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9.	tablet Folic acid	Oral	5mg	OD
10.	tablet Xept	Oral	10mg	OD

Literature review:

Search strategy: To identify articles for inclusion in the meta-analysis, searches

Were performed to September 2017 in the following databases; PubMed, EMBASE, Science Direct, and Other articles, published in Pakistan as well.

ETIOLOGY: some researchers suggest a vertebral column grows faster **t**han upper extremity **t**hus leading to more suscep**t**ible **t**o neurovascular compression, with further scapular descent. Delay symptoms may last several weeks or acute trauma.

Treatment**:** thoracic outlet syndrome has persistent pain**,** muscle atrophy, or progressive deficit.

Prognosis: symptoms in 90% of patients are resolved with conservative therapy; postsurgical success rates over 1 ear vary from 43-78%.A total cure is not achievable with surgery.

Complication; Ischemic changes include gangrene; pulmonary embolism is reported in 0-28.5% of patients. Venous gangrene and upper extreme can lead to phlegm Asia. Nerve injury e.g. brachial plexus neurapraxia is most common complication of post-surgical. Bleeding can even occurred 3.

DIAGNOSIS	
● **Brachial plexus compression**	
● **Carpal tunnel syndrome**	
● **Cubital tunnel syndrome**	

PHYSICAL EXAMINATION: physical examination includes evaluation of cervical spine, shoulder, and upper extremity. Attention should be given to evaluation of head, neck and shoulder, Thoracic kyphosis should be keep in mind, pain overall pos**ture** re should be assessed. Comparing the upper limb of each other, regarding skin, color, Temperature, hair dis**tri**bu**t**ion, muscle atrophy and nail change. Gil muscle sumner hand finds atrophy of abductor pollicis brevis and o lesser degree hypothenar and o lesser extension in**t**erosseous**.** A BP difference of

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20 MMHG between two extremities is a significant finding of Vascular TOS . Upper limbs and chest may be congested and edematous with prominent superficial veins in venous Tos and hence appear to be paler. Distal skin changes, ulceration, and signs of micro embolic events can even occur. Palpation of the supraclavicular region may reveal some masses and tenderness. Vascular examination emphasizes **t**he quality **of radial** pulse wi**th different positions of arms.**

1-Wright test: is described as decrease in radial pulse with the arm in hyper abduction and external rotation, with head turned in opposite direction**.**

2-ADSON TEST:is described as bringing the arm in extension, asking the patient to take a deep breath, and turning towards the affected side**.**

3-ROOS TEST: is more reliable test for tOS it's and elevated arm stress test. In this maneuver the patient places both arms in a 90 abducted position with elbows flexed to 90. Hands are hen opened and closed for 3 minutes. Normal people have minor fatigue while tOS patients have dramatic symptoms and discomfort. Some are even unable to do th*is* test due to pain.

Clinicians have done many trials showing that compression of subclavian arteries can lead to reduced blood supply and compression can further cause ischemia. Though treatment is possible through man exercise but it's not effective in our case. In our case vasodilators and anticoagulants are given so that blood flow can be increased. Supraclavicular region is most for Tos. Tos is associated with compression of blood vessels and nerves leading to various symptoms. Ongoing researches are done to further improve and manage the toS.[6]

Associations

Turner syndrome

Cleidocranial dysplasia

Aarskog syndrome

Trisomy 8 syndrome

incontinentiapigmenti

Fifteen thoracic vertebrae, each with a pair of ribs: isolated case report 5

With all evaluation, we have come to know that exercise therapy has a good effect on patients; exercise is beneficial in reducing pain even. Resistive exercise has proven to reduce VAS level significantly. Few conclusions have shown more effective results with the medication even.in shorter period more effective treatment can be possible. Half of the patients were almost

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cured. Physical activity has shown more improvement .follow up of more 6 ears is seen mostly cases.[5]

Discussion:

The prevalence of CR is underreported because they are found incidentally on radiography or only if associated with symptoms. The presence of CR can result in thoracic outlet syndrome (TOS) and symptoms such as ipsilateral limb pain, weakness, numbness, or cold intolerance.TOS develops from neural and/or vascular compression of the structures traversing the interscalene triangle, which is bordered by the anterior scalene muscle anteriorly, middle scalene muscle posteriorly, and superior border of the first rib inferiorly.

A significant development within the vascular surgery community focused on treatment of TOS was the development and adoption of standardized diagnostic criteria. These include the SVSand CORE-TOS criteria, which also have been adopted in modified form by this workgroup. Similarly, the neurosurgical community, through the section of peripheral nerve surgery of the European Association of Neurosurgical Societies recently adopted consensus statements focused on anatomy, diagnosis and classification of TOS.A follow-up publication provided consensus recommendations for management of NTOS.Within the orthopedic and plastic hand surgery community, however, there remains a significant variation in clinical practice ranging in all aspects from tools used for diagnosis of NTOS to indications and techniques for surgical management of NTOS.

Regarding specific surgical details, the majority of the workgroup used an anterior supraclavicular approach for exposure of the supraclavicular brachial plexus, with an infraclavicular approach and adjunctive procedures for select patients. An anterior supraclavicular approach is also the preferred surgical approach by the neurosurgical consensus group. The trans axillary approach remains uncommonly used by hand surgeons in general, though two members of the workgroup used this as the first line approach to the supraclavicular brachial plexus. This may reflect region-specific surgical preferences.

Conclusion:

The upper extremity pain and numbness typical of the condition have been subcategorized into distinct disorders based on the structures involved. A history of trauma or repetitive motions combined with supportive physical exam findings suggests the correct diagnosis. Other diagnostic modalities such as MRI, ultrasound, and nerve conduction studies can further support the diagnosis, and ongoing developments in this sphere are currently underway. Patients develop TOS secondary to congenital abnormalities such as cervical ribs or fibrous

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bands originating from a cervical rib leading to an objectively verifiable form of TOS. The treatment is surgery. By 8 weeks postoperatively, patients can begin resistance strength training. Surgical treatment complications include injury to the subclavian vessels potentially leading to exsanguination and death, brachial plexus injury, hemothorax, and pneumothorax. Despite advances, substantial controversy regarding the diagnosis remains. This is evidenced by the lack of objective findings surrounding nTOS, the most common and widely disputed form of TOS. The challenges associated with diagnosis complicate the selection of the appropriate treatment option. In some cases, e.g., acute vascular insufficiency or progressive neurologic dysfunction, surgical decompression is clearly indicated. Prompt recognition and treatment of TOS provide the greatest opportunity for optimal recovery. Unfortunately, the multitude of nonspecific symptoms and challenges in diagnosis can delay treatment and increase the risk of complications.

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