Study of Cervical Ribs in Jalalabad, Afghanistan

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Abstract

Background and Purpose: cervical Ribs are congenital variants that are known to cause thoracic outlet syndrome or brachial plexopathy in up to 10% of the affected individuals. We investigated how often cervical ribs are present on cervical spine radiography to determine the incidence in humans and the percentage of reported cervical ribs.

The objectives of this study were to describe the prevalence of the cervical rib in people of the Eastern Region of Afghanistan Jalalabad, and association with gender and trying to assess any changes in the interim.

Methods: This is a cross-sectional hospital-based study that was conducted at Nangarhar University Teaching Hospital, in Radiology and Anatomy Department Jalalabad, Afghanistan in the period between January first, 2019 to August 2019. The study included a radiologic review of 800 sequential chest radiographs of adults from the Digital database looking for the presence of cervical ribs, 390(48.75%) were male and 410(51.25%) were female.

Results and conclusion: We found 20 (2.5%) persons with cervical rib among 800, 8(40%) male and 12(60%) were female, out of the 5 (25%) left rib, 10(50%) right ribs and 5 (25%) bilateral, statistically There were unilateral predominance. A female to male ratio was 1.5 to 1.

Conclusion: The prevalence of cervical ribs in our population is a little more than that reported in other populations.

Given the potential clinical implication of these anatomic variants, Neuro physician &Radiologist will be more meticulous in Diagnosis cervical ribs when reviewing cervical spine Radiography.

Keywords*:* Cervical Ribs, age, sex, Jalalabad

Introduction

Previously thought an abnormality of no medical Implication, cervical ribs are now understood by the medical community to be both a cause for disease and a possible marker of an underlying diseased genotype.

The significance of the cervical rib arose once the anatomy of the thoracic outlet was described and understood. It was then recognized that its presence in this anatomically crowded region is not without morbidity. Observations by Cooper in 1818[1] revealed that it might lead to compression of adjacent neural structures, specifically the lower trunk of the brachial plexus, or vascular structures, mainly the subclavian vessels. The full spectrum of

disorders caused by its presence continues to grow this day, with reports of new associations with diseases affecting the upper limb; anterior and possibly even posterior circulations of the brain. 1-2-4

Its presence has also been linked to subclavian nerve damage even in the asymptomatic[4]. The medical community's understanding of this anomaly's significance would be discovered in the laboratory. Genetic studies indicated that the homeobox gene plays a significant role in the development of the axial skeleton in mammals[8]. Mutations of this gene leads to a wide range of Anomalies, cervical ribs being properly common in this group. Only after an increased incidence of malignancy was associated with homeobox gene mutations in transgenic mice had scientists become able to explain why this anomaly is so rare in mammals. **5-6**

The cervical rib was subsequently observed as a marker for a diseased genotype. Skeletal surveys of humans with embryonal cancers would confirm this association in man, with cervical ribs having a noted prevalence of 17.1-33% in this population compared to a baseline of 0.05-0.7%.**7-8**

Many vertebrates especially reptiles have cervical ribs as a normal part of their anatomy rather than a pathological condition. Some sauropods had exceptionally long cervical ribs up to 4 meters long. In birds, the cervical ribs are small and completely fused to the vertebrae. In mammals the ventral parts of the transverse processes of the cervical vertebrae are the fused-on cervical ribs. **'Cervical or neck rib'** refers to an extra or supernumerary small rib or fibrous band running from the 7th cervical vertebra to the first true rib or to the sternum but usually it is present posteriorly up to a short distance. 9

Previously considered an anomaly of no clinical significance, cervical ribs are now believed by the medical community to be both a cause for disease and a possible marker of an underlying diseased genotype. The significance of the cervical rib arose once the anatomy of the thoracic inlet was described and understood. [9]

It is usually diagnosed in the middle age group persons though present since birth. The cause is that by middle age, the shoulders start drooping which causes the cervical rib to get depressed and hence compressing the nerve root of the concerned region. 15

Cervical ribs are the anomalies which lie with the lowest cervical vertebra but their relationship to the thoracic inlet syndrome (TIS) is not so constant. Perhaps no more than 10% of people who have cervical ribs develop TIS and the syndrome may well occur in the absence of ribs [9]. Diagnosis may be difficult, as a fibrous band that acts like a rib but if not calcified, it is not seen on skiagrams. There is also considerable controversy in the literature as to whether the condition actually exists. Some authors claim that it is underdiagnosed whilst others say that it is over diagnosed [10, 11].

Cervical ribs or fibrous bands are just one feature that predisposes to narrowing and compression at the outlet. Poor posture, shoulders droop and large breasts etc. can cause the thoracic inlet to narrow and compress the neurovascular structures [12].

Trauma at inlet, fracture of clavicle, excessive callus, hematoma or pseudo aneurysm, sleep disorder, estrogen or thyroid deficiency, inflammatory disease including rheumatoid arthritis, fibromyalgia, kyphosis and scoliosis, thrombosis, embolism and nerve entrapment in other places can cause this syndrome too. It is necessary to exclude thrombosis, embolism and nerve entrapment in other places. This includes Pancoast's syndrome, where lung cancer infiltrates the brachial plexus. Paget-Schrötter syndrome is thrombosis of the subclavian vein following heavy exercise of the upper limb [13].

X-ray, MRI and CT can distinguish cervical rib or fibrous band, elevated first ribs due to tight anterior or middle scalene muscles, displaced fractures of clavicle, non-union and excessive callus, cervical spine degenerative, malignant lesion in the chest, degenerative spurs, herniated discs or other causes. Doppler and plethysmography studies can show impediment of blood flow. Occlusion can occur in normal subjects but is unusual and is not related to age [14].

Objectives or aim of this study is to provide baseline prevalence for future studies to use when attempting to associate these anomalies with patient complaints or with effects possibly explained by their presence. We also aim to raise awareness of the Afghan medical community regarding this often unnoticed anomaly with possibly significant morbidity.

Study Area and Study Site

The study was conducted at Nangarhar University Teaching Hospital in Radiology and Anatomy Department. These hospitals are the principal hospitals at the area, which are located in Jalalabad center of Nangarhar. Nangarhar is an eastern province of Afghanistan. Nangarhar province is the second overcrowded province with three millions of estimated population that has border with Pakistan. The climate of the center Jalalabad is tropical and temperature varies from 20 to 44℃ at different seasons of the year.

Figure-1: Study area, Nangarhar Province
Source: http//:www.google.com/Nangarhar map

Figure-2: Study Site Source: www.google.com/maps

Methods and Materials

We reviewed six hundred consecutive case of chest x rays of adult patients (age above 20 years) at Nangarhar University Teaching Hospital, taken during the 8-month period between january and August 2019. The Biomedical research committee approved this cross-sectional, hospital-based study. The reviewed x-rays had to meet our inclusion criteria; we only accepted those with clear, complete, and unobstructed visualization of the seventh cervical and first thoracic vertebrae. Our radiographic database is digital, this allows us to zoom in on regions of interest and manipulate contrast and brightness settings to best delineate its anatomy.

Inclusion Criteria

- Residence of Eastern Region of Afghanistan.
- Age above 20 years
- The cervical rib must articulate with the seventh cervical vertebra and project either caudally or laterally, as opposed to the first rib that projects superiorly.
- The cervical rib must not articulate with the manubrium sterni, but may do so with the first rib. This serves to differentiate it from the rudimentary first rib.
- To be classified as a rib it must be discrete from the transverse process of C.7.

Exclusion Criteria

- Technical inadequacy (no inclusion of complete seventh vertebral body, rotation, or inadequate exposure).
- Repeat radiographs of the same patient.
- Radiographs gaining prior to 20 years of age

Chest X-ray samples Collection and processing

The reviewed x-rays had to meet our eligibility criteria; we only accepted those with clear, complete, and unobstructed visualization of the seventh cervical and first thoracic vertebrae.

Our radiographic database is digital, this allows us to zoom in on regions of interest and manipulate contrast and brightness settings to best delineate its anatomy.

Statistical Analysis

After the completion of Data collection process all those taken chest x-rays are arranged according to dates they were obtained and cleaned from errors before being entered in data base. Data were entered in Nangarhar Medical Faculty, Anatomy and Radiology Department. Statistical analysis was performed using SPSS Version 20 (IBM, USA). Database was prepared according to collected data and questionnaires. Non Parametric Chi-Square test was used for categorical organizing of the data and variables. Tables and charts were used for better description of the data.

Results

Among our study population of 800 patients, 390(48.75%) were male and 410(51.25%) were female. The study was reported normal in 780 patients (382 males and 398 females). Cervical ribs were found in 20 patients, constituting a percentage of 2.5% of our study population (**Table 1**). 5(25%) were left ribs, 10(50%) were right ribs (Figure-2) and 5 (25%) were bilateral (Figure-1) . The female to male ratio was 1.5:1.

Table 1 - Frequency distribution of cervical rib in 800 studied patients.

sex	Cervical ribs	Male /female ratio	Right rib	Left rib	Bilateral
Male(n=390)	8(40%)	1:1.5	10(50%)	5(25%)	5(25%)
Female(n=410)	12(60%)				

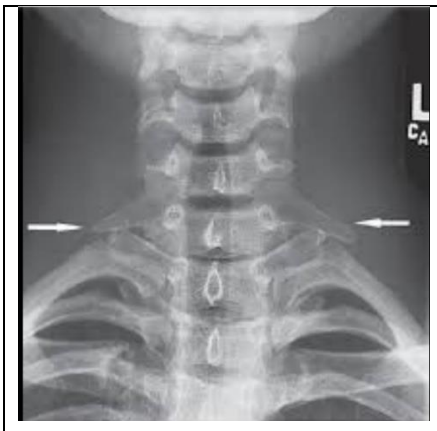

Figure 1 - Chest radiograph demonstrating bilateral cervical ribs.

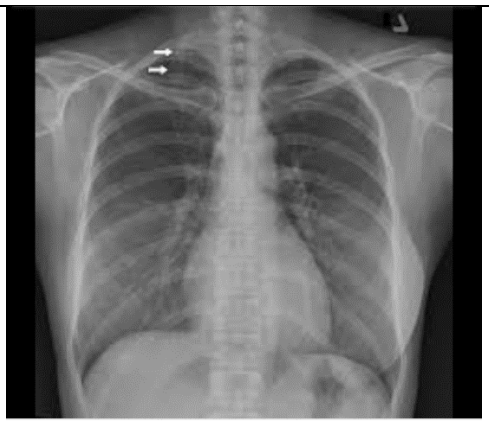

Figure 2 - Chest radiograph demonstrating right side unilateral (double arrow) cervical ribs.

Discussion

It is believed that anatomical variation cervical ribs or fibrous bands can cause narrowing of the supra costoclavicular space and render the adjacent nerves more susceptible to external trauma. In brachial plexus pathology in infants, cervical ribs may aggravate the mechanism of injury in two ways, firstly by stretching the nerves around the cervical rib and secondly by concentrating pressure on the nerve roots when the shoulder region is forced against the cervical spine.

The highest prevalence of cervical ribs reported was 3.2% in a series of 1000 radiographs reviewed in a Saudi population. And 3% in a series of 6630 radiographs reviewed in a Turkish population [16] Erken et la [17.] Another study conducted in an isolated Italian community showed the presence of cervical ribs in 2.5% of individuals, [18]

But the largest radiographic surveys available, conducted in largely Caucasian populations, produced figures in the range of 0.05-0.54%.[19-21]

On literature review, we found a study by King Abdul-Aziz University Hospital, Jeddah, Saudi Arabia, that described the prevalence of elongated transverse processes and cervical ribs in the Saudi population. It was a prospective study conducted in Jeddah, Saudi Arabia more than 9 years ago. Of 1000 chest radiographs of patients attending the outpatient clinics, cervical ribs were found in 34 (3.4%), 41% were bilateral, and 66.6% in females.22

Another conducted study showed a prevalence of 1.89%, with the third study in an isolated Italian community and reported a prevalence of 4.98%.[18]

In our study we found form 800 patients 390 male and 410 were female among them 2.5% have had cervical ribs , (60%) female and (40%) were female ,which from out of them 50% right ribs ,25% left ribs and 25% are bilateral ribs.

Limitations of our study are mainly related to the setting. We conducted the study in a tertiary level hospital, although consecutive chest radiographs were utilized in an effort to avoid selecting for patients with a higher chance of having cervical ribs, for example, relying on studies performed for patients attending rheumatology, neurosurgery, or orthopedic clinics. This does not protect against the possible confounder of our patient population having a possibly increased chance of underlying malignancy, as we are one of the few accessible institutions that offer a comprehensive oncologic service in our region. This is, however, unavoidable and a larger radiologic survey at a primary care institution is warranted to better dilute this factor. It would be interesting to ascertain the prevalence of neurovascular symptoms and malignancy among those with and without the vertebral anomaly. It would also be very interesting to know whether characteristics of the elongated process, such as angle of projection or length, may be correlated to the probability of developing clinical symptoms or neurophysiologic changes.

Strengths of our study include it being the first such study to report on this anomaly, we also followed the definitions proposed by Brewin [23], and this allows the direct comparison between populations and mitigates the amount of confusion in the literature.

A valid question to ask is whether these incomplete variants are as clinically significant as their more developed counterparts. Anatomic studies have shown that fibrous bands may extend from their tips towards the first rib; these bands are radiolucent and therefore can be present even with an apparently ‘benign’ looking elongated transverse process on x-ray. Several reports have linked these bands to clinical neurovascular compression [10, 24]. These effects may be clinically silent, as a recent post mortem study reported histopathologic evidence of nerve damage in both patients with incidentally discovered cervical ribs although their records bring no mention of related symptoms.

This implies that interpretation of neurophysiologic studies may be confused by their presence, giving false positives that may misguide the treating physician [25].

Conclusion

In conclusion, it appears that the first time Eastern region population has a higher prevalence of cervical rib (2.5%), than other mostly other countries population reported in the literature. Our study reiterates the necessity for the practicing physicians to consider this high prevalence in evaluating patients with neurological symptoms of the upper extremities. It also points to a possible target for research in the gene's role in our population's malignancies.

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