



ORIGINAL RESEARCH PAPER

Anatomy

A RADIOLOGICAL STUDY ON PREVALENCE OF CERVICAL RIB

KEY WORDS: Cervical Rib, Radiographs, Ajmer, Prevalence.

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ABSTRACT

Introduction: Cervical rib is the extra rib arising from the seventh cervical vertebra. The prevalence of cervical rib depends on the population. Cervical ribs are usually asymptomatic but may cause compression of subclavian artery and brachial plexus. **Aim:** Study the prevalence of cervical rib with associated gender, age group and laterality (body sides). **Material And Method:** 8000 plain chest radiographs were studied from the month of November 2021 to November 2022, in which 71 chest radiographs were found with cervical ribs. The particulars of the patients were recorded and data were tabulated and analysed. **Results:** Prevalence of the cervical rib was found to be 0.88% and female more numbered than male.

INTRODUCTION

The cervical rib is described as an anomalous, supernumerary, extra, or additional rib which arises from the seventh cervical vertebra. However, according to Tubbs et al., a cervical rib could also originate from the sixth or the fifth cervical vertebrae^{1,7}. In our practice, we have even found that, in very rare instances, it can also originate from the fourth cervical vertebra. Cervical rib is also known as "Eve's rib". Although cervical ribs are known to commonly occur in reptiles, they are rare in humans. On the other hand, cervical rib in comparison to very rare skeletal variations like double suprascapular foramen are common anomaly².

Radiograph images indicate that the prevalence of cervical rib is below 1% in the general population; however, studies have found its occurrence to vary significantly from 0.58% to 6.2% depending on the population. Surveys indicate that cervical rib commonly occur bilaterally and are more frequent in women.

However, it is also reported that cervical rib is typically unilateral, most commonly occurring on the right side, and if the cervical ribs are bilateral, they are often asymmetrical. In approximately 50% of the patients with a complete cervical rib, clinical manifestations begin spontaneously³. The presence of cervical ribs may be associated with diminished or absent radial pulse (especially when the arm is abducted), reduced sensation, or a painful and weakened hand. Patients may also complain of tingling and numbness of the ulnar aspect of the forearm and hand. Cervical rib may mimic palpable mass in the supraclavicular fossa or may present as pulsation due to displacement of the subclavian artery⁴.

Ribs are flat, thin, curved bones that help to protect the vital organs like heart and lungs. A typical human rib cage or thoracic cage consists of twelve pairs of ribs the sternum and the 12 thoracic vertebrae. A cervical rib (Eve's rib or neck rib) is an extra rib that forms above the first rib. It is described as an abnormality or extra rib that's present from birth, which arises from one of the cervical vertebrae usually the seventh rarely the sixth, and very rarely the fifth or fourth. However cervical rib varies widely in size and shape, it may be unilateral or bilateral or may be a fully-formed bony rib or just a thin strand of tissue fibers. The presence of cervical rib was

first observed by Galen in the second century, during dissections of human cadavers⁵.

However, the first observations of the clinical manifestations of neurovascular compression caused by cervical rib was made by Cooper. On physical examination, cervical rib may appear as fixed hard lumps, which even are mistaken for a metastatic tumors. Although cervical rib may be present since birth they are usually diagnosed in middle age group persons because by middle age the shoulders start drooping which causes the cervical rib to get depressed and hence compressing the nerve root of the concerned region⁴.

Such congenital abnormalities of cervical ribs compress the lower trunk of brachial plexus and may lead to Klumpke's paralysis. The paralysis affects the intrinsic muscles of hands flexors of digits producing claw hand and anesthesia along the ulnar aspect of forearm, hand and little finger. Hence, knowledge of congenital abnormality of cervical rib as well as the location of compression is useful in determining the pathology and appropriate treatment for compressive neuropathies⁶.

Embryonic Development of Cervical Ribs

The skeletal system arises from the paraxial mesoderm. The cells of the mesoderm give rise to somites on either side of the neural tube. Sometimes, they divide into a ventral part, the sclerotome, and a dorsal part, the dermatome. At the end of the fourth week of embryogenesis, the cells of the sclerotome convert into mesenchymal cells and then into ribs⁷. *Hox* genes are responsible for patterning of the axial skeleton, and mutations within them probably are implicated in the development of cervical ribs. It has been hypothesized that abnormality in the expression of *Hox* genes could influence oncogenesis. Germ cell tumors, astrocytoma, and acute lymphoblastic leukemia were diagnosed in children with higher rate of such cervical anomalies as cervical ribs. A greater difference occurs in the frequency of cervical anomalies (transverse apophysomegaly and cervical ribs): 8.6% versus 6.1%, respectively (p = 0.047)⁸.

AIMS AND OBJECTIVES

To evaluate the prevalence of cervical ribs with
A) Gender

- B) Age
- C) Unilateral/ Bilateral

MATERIAL AND METHOD

This study was a prospective cross sectional study conducted in the Department of Radiology at Jawahar Lal Nehru Medical college Ajmer Rajasthan during period from November 2021 to November 2022. The chest and cervical spine radiographs were taken for the purposes of study. Patients of 15 years and above were included in the study. A total of 8000 radiographs were taken for the study.

Radiographs with obvious pathology obscuring the bony shadows were excluded from the study. Patient's information including age, sex, presence or absence of cervical rib, side of occurrence and presence or absence of symptoms were recorded.

The reviewed x-rays have to meet our inclusion criteria only those with clear, complete, and unobstructed visualization of the seventh cervical and first thoracic vertebrae were accepted. Our radiographic database is digital, thus allowing us to zoom in on regions of interest and manipulate contrast and brightness settings to best delineate its anatomy.

Inclusion Criteria

- Residence of central Rajasthan.
- Age above 15 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 sternum 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 C7.

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 15 years of age



Fig.1 Showing bilateral cervical rib



Fig.2 Showing unilateral cervical rib

RESULT AND OBSERVATION

This section contains the description of data collected from 8000 cases, who attended the Department of Radiology Jawahar Lal Nehru Medical College Ajmer Rajasthan. The cases were selected on the basis of the random sampling method. The data collected from these patients were subjected to statistical analysis. The observation made and the results of this analysis are presented in the form of tables, diagrams and charts.

A total of eight thousand chest and cervical spine radiographs of patients were taken for various purposes and analyzed by SPSS software. Patients above 15 years were involved in the study.

Table 1 - According To Age Distribution Of Participants

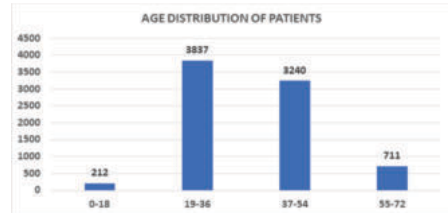
AGE	NUMBER	PERCENTAGE
0-18	212	2.7%
19-36	3837	47.9%
37-54	3240	40.5%
55-72	711	8.9%
TOTAL	8000	100%

Table 2- According To Presence Of Cervical Ribs

PRESENCE	NUMBER	PERCENTAGE
PRESENT	71	0.88%
ABSENT	7929	99.12%
TOTAL	8000	100%

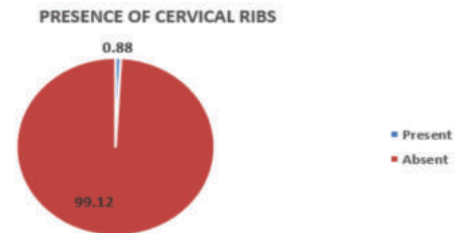
Table 3- Comparison With Types

Sex	Bilateral	Unilateral(left)	Unilateral(ri ght)	Compl ete	Incompl ete
Male	9	9	13	11	20
Female	16	19	5	14	26



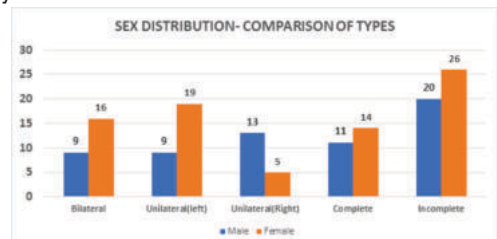
Interpretation :-

47.9% of the patients belong to the age group of 19-36 years and 2.6% of the patients belonged to the age group of 0-18 years.



Interpretation

0.88% of the patients had presence of cervical ribs in the study.



Interpretation

This graph showing comparison of cervical ribs in male and female

DISCUSSION

Cervical rib is a congenital defect during bone formation. It develops from the costal process of the primitive vertebral arches. In the fetus, the costal element which is separate initially, later regresses, and fuses with the transverse process to form the anterolateral boundary of the foramen transversarium. If the costal process of the seventh cervical rib continues to develop, it may result in a cervical rib, which is separate from the vertebra. It can lead to neurovascular compression which can give rise to thoracic outlet syndrome¹. The present study emphasizes on the presence of anomalous cervical ribs by analyzing digital chest and cervical spine radio graphs of 8000 patients, in which different age group patients were involved. Shows age distribution of the cases in which 47.9% of the patients belong to the age group of 19-36 years and 2.6% of the patients belonged to the age group of 0-18 years. shows age distribution of patients with the presence of cervical ribs. In the present study we found that 47.8% of the patients belonged to 19-36 years and 4.3% belonged to 0-18 years of age who had the presence of cervical ribs. Cervical rib identification is an incidental finding, hence in the present study no co-relation exists between the age and the presence of cervical ribs. But sometimes these creates severe health problems so that it is necessary to carryout surgery. Hence age has been considered in the present study.

In the present study, we found that the prevalence of the cervical ribs was 0.88% in total of 8000 patients. These results are in accordance with the other studies. Lalchan et al⁴, also conducted a similar study on the Nepalese population in the western development region and noted cervical ribs in 39 out of 3600 cases with the prevalence of 1.1%. Rani et al⁵, observed various anomalies of costal element at the thoracic outlet syndrome radiologically and also found that the cervical ribs were present in 1.45% of the cases.

CONCLUSION

In our present study the prevalence of cervical ribs was 0.88% which is low. We found a female prevalence of cervical ribs and cervical rib was more commonly present unilaterally on left side. Out of this complete cervical rib was 25 and incomplete is 46 the complete cervical ribs have some neurovascular complications, hence during the examination it is necessary to examine the cervical ribs and the symptoms associated with it and its clinical correlation. In the present study most of radiograph were taken during covid time and were patients with presenting complain of upper respiratory tract infection, neck pain and shoulder pain.

Summary

Keeping this in mind we planned a study with aim to assess the prevalence of cervical rib. This is a prospective cross sectional study conducted in the Department of Radiology Jawahar Lal Nehru Medical College, Ajmer Rajasthan during November 2021 to November 2022. The chest and cervical spine radiographs were taken for the purpose of study. Patients of 15 years and above were included in the study. A total number of 8000 radiographs were taken. Radiographs with obvious pathology obscuring the bony shadows were excluded. Patient's information including age, sex, presence or absence of cervical rib, side of occurrence and presence or absence of symptoms was recorded. The reviewed x-rays have to meet our inclusion criteria; we were only accepting those with clear, complete, and unobstructed visualization of the seventh cervical and first thoracic vertebrae. Our radiographic database is digital, thus allowing us to zoom in on regions of interest and manipulate contrast and brightness settings to best delineate its anatomy. Few inclusion and exclusion criteria were followed throughout the study.

In our study 47.9% of the patients were of the age group of 19-36 years and 59.6% of the patients were males and 40.4% were females. Most common presenting complaint was upper respiratory tract infection, chest pain, neck pain, shoulder

pain. In the present study 0.88% of the patients had presence of cervical rib. 66.1% of the patients had unilateral cervical rib with more common on left side, and 64.8% of the patients had incomplete cervical rib and females were most commonly affected. Thus in the present study, we found that the prevalence of the cervical ribs was 0.88% in total of 8000 patients. These results are in accordance with the other studies. When laterally compared most of the cases showed left side which is also in accordance with the previous studies. Thus to conclude Cervical rib is a common anatomic variant discovered during a routine radiological procedure in our study.

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Conflict of Interest:None

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