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Short Communication

Study on Absence of Costal Element of Foramina Transversarium of Atlas

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ABSTRACT

Introduction: Atlas is first cervical vertebra ring shaped, differs from other vertebrae by not having body and spine. Foramina transversarium is the one of the identifying feature of cervical vertebrae, bounded by true transverse process and costal elements.
Materials and methods: 40 adult dried of unknown sex age were studied for absence of costal element, collected from Department of Anatomy ESIC Medical College Gulbarga.
Results and observation: 4 atlases showed absence of costal elements (3 on right side and one on left). Incidence was more on right side.
Conclusion: Such variations must be noted by surgeons and radiologist.

Keywords: Atlas vertebrae, atlas bridges, costal element, foramina transversarium, vertebral artery.

INTRODUCTION

First cervical vertebra atlas, supports the globe of the head. The name atlas is derived from a deity of Greek mythology called Atlas. It is ring shaped having two arch is anterior and posterior. Atlas differs from other vertebra, by absence of body and spine, contains weight bearing lateral mass with articular facets. Posterior arch forms $3/5^{th}$ of circumference of atlantal ring, having groove called as sulcus arteriae vertebralis which transmits vertebral artery and first cervical nerve. [1] Transverse processes of cervical vertebrae contain foramina transversarium, important identifying feature of cervical vertebrae. The foramen transversarium is the result of the special formation of the cervical transverse processes. It is formed by a vestigial costal element fused to the body and the original true transverse process of the vertebra; the vertebral vessels and nervous plexus are caught between these bony parts. [2] Posterior part of which is called as true transverse process and anterior part called as costo-transverse bar which represents cervical costal element of atlas. But in typical vertebrae anterior root, anterior tubercle, costo-transverse bar and posterior tubercle together called as cervical costal element. [1] Absence of costal element is a rare condition, may expose the vertebral artery anteriorly. Relation of vertebral artery with cervical vertebrae and its variation is important for any cervical spine surgery. It is very important to know about this variation during surgeries at atlanto-occipital joints. Our study provides detailed

information about this variation and it will be useful for surgeons and radiologists.

MATERIALS AND METHODS

40 dried atlases of unknown sex used for the study from department of Anatomy and from students of ESIC medical college Gulbarga. Each atlas was observed for absence of costal element and any variations were photographed.

RESULTS

Out of 40 atlas vertebrae, 4 atlases showed unilateral absence of costal element. 3 on right side [fig 1] and 1 on left side [fig 2]. Bilateral absence costal elements were not observed. Incidence calculated was10%.

Figure 1 : showing absence of costal element unilaterally on right side

Figure 2 : showing absence of costal element on left side unilaterally

DISCUSSION

Atlas vertebra shows greatest variability among the cervical vertebrae. Many authors have described about variations of atlas but little literature is available about absence of costal element. In our study out of 40 atlases, 4 showed absence of costal element (3 on right and 1 on left atlas). Incidence of absence of costal element more on right side .Table 1 shows comparison of incidence of absence of costal element in different population and our study.

Variations of foramina transversarium may be developmental or anatomical other factors may be tensions and stresses imposed on the vessels running through the FT and by the relatively free movements of the cervical spine (flexion, extension, and rotation). [2] In one of the study out of 120 atlases 8 incomplete foramina transversarium were noticed (6 on right and 2 bilateral). [3] In another study out of 50 atlases 3 unilateral (right) and 2 bilateral absence of costal element was noticed. Right sided absence of costal element was more frequent. [4] Rekha BS et al., studied 153 atlas among these 6 (3on right and 2 on left, 1 bilateral) atlas with absence of costal element was noticed. [5] In one of the study 8 (6 on right and 2 bilateral) incomplete foramina transversarium was noticed out of 102 atlas vertebra. [6]

Hadley (1958) and Hyyppa (1974) reported that tortuosity of the vertebral artery may cause bone erosion and may be a factor determining the size of the foramina. [7,8] Stress and posture in the erect human can be the factor responsible for shaping bony architecture of the neck region. [2] It is therefore possible that the incomplete transverse foramina may be due to erosion by the vertebral artery due to presence of atlas bridges. [6] It can be assumed that variations in the presence and course of the vessels will be manifested in changes of the FT. Conversely, variations of the FT can be

useful for estimating changes or variations of the vessels and accompanying nerve structures. [2] The occurrence of incomplete transverse foramina in atlas should be noted by radiologist, as these can be confused with other anomalies. [3]

Table 1: Shows absence of costal element in different population

Author	sample	right	Left	Bilateral	Population
Karau et al., (2010) [3]	102	6	-	2	Kenyans
Chauhan et al., (2013) [4]	50	3	-	2	India
S Rekha B et al., (2014) [5]	153	3	2	1	India
Karau et al., (2013) [6]	120	6	-	2	Kenyans
Present study(2015)	40	3	1	-	India

CONCLUSIONS

In this study out of 40 atlases, 4 showed absence of costal element, 3 on right side and 1 on left side. Knowledge of such variations may be useful for surgeons during cervical surgeries and for radiologist in interpreting the X rays.

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