Case Report: Unusual Morphology of the Anterior Arch of Atlas

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Abstract: Anomalies of anterior arch of atlas vertebra are seldom reported in the literature. Presence of inferior accessory ossicle is one of the reported anomalies of the anterior arch of atlas. In the present case, we report a rare case of unusual morphology of the atlas vertebra. It was observed in one of the bones macerated locally for the teaching purpose. There were two wide accessory bony laminae extending from the middle three fourth of the superior and inferior aspect of the anterior arch proper. Each bony lamina was measured 4 cm x 0.3 mm. Further, there were small foramina along the attached border of the each bony lamina. Anterior tubercle was situated at the lower edge of the anterior arch proper. Accessory bony lamina may interfere with rotatory movements of the atlas and may lead to degenerative changes of the dense. Reporting of unusual morphology of anterior arch of atlas vertebra is clinically important during diagnostic procedures of neck pain. Sometimes this extra growth of the anterior arch may be mistaken for the pathologic mass.

Key Words: Accessory bony lamina, anterior arch, atlas, neck pain

Introduction:
Cervical vertebrae notably, the first cervical vertebra is known to present anomalies. These anomalies are frequently observed in its anterior and posterior arches. However, incidence of anomalies are more common in posterior arch than the in the anterior arch.(1) Presence of usual bony spicules, clefts, aplasia and formation of osteophytes are some of the reported anomalies of the anterior arch.(2) Abnormal morphology of the atlas is usually appreciated when it is symptomatic. Anterior arch anomalies may alter the movements of the atlanto-axial and atlanto-occipital joints. And even they may cause spondylosis and dysphasia. Reporting of unusual morphology of the anterior arch may be of clinical significance for radiologists, orthopaedicians and chiropractiters. Often, anomalies may interfere with the diagnostic procedures or they may be misinterpreted as pathological tissue.(3) In the present case, we report unusual morphology of the atlas presenting accessory bony lamina and discuss its clinical significance and morphogenesis.

Case Report:
During routine demonstration classes of osteology to the first year medical undergraduate students, we came across a rare morphology of the first cervical vertebra. Anterior arch of the atlas vertebra presented unusual accessory bony tissue on the both superior and inferior surfaces. We named this bony tissue as superior accessory lamina and inferior accessory lamina. Each accessory lamina was about 4 cm in length and 0.3 cm in thickness. Accessory lamina was situated on middle three fourth of the superior and inferior aspect of the anterior arch respectively. Each lamina presented two surfaces; anterior surface and posterior surface and two borders; attached border and free border. The free border of the accessory lamina was found to be uneven. Further, the attached border presented small pores along its attachment to the anterior arch (Figure 1, 2 and 3) proper. Anterior tubercle of the anterior arch was located at the lower edge of the anterior arch and it was quite prominent (Figure 1 and 3). No other variations were found in the posterior arch, lateral masses, articular facets and transverse processes of the atlas vertebra.
Figure 1: Anterior view of the atlas showing the superior accessory lamina (SL) and inferior accessory lamina (IL) from the superior and inferior aspect of the anterior arch of atlas respectively. Note the anterior tubercle (AT) of atlas at the lower edge of the anterior arch proper. (Fm: foramen)

Figure 2: Posterior view of the atlas showing the superior accessory lamina (SL) and inferior accessory lamina (IL) from the superior and inferior aspect of the anterior arch of atlas respectively. (PA: posterior arch, LM: lateral mass, AF: articular facet of the anterior arch, TP: transverse process)

Figure 3: Anterior view of reverse position of the atlas showing the superior accessory bony lamina (SL) and inferior accessory bony lamina (IL) from the superior and inferior aspect of the anterior arch of atlas respectively. (AT: anterior tubercle)

Discussion:
Atlas vertebra is considered as a degenerating bone in human beings when compared to that of other animals. (4) Atlas ossifies from three ossification centres; one for anterior arch and two for posterior arch. (5) However, ossification centres are frequently vary in number. (6) Anterior arch ossification centres vary from one to multiple. (7) At birth, anterior arch is completely cartilaginous. But, typically, only 20% of cases are known to have any ossification centres at birth. Ossification centres of anterior arch usually begin between the 6th and 24th months of age. (6) Anterior arch may be completely absent. Sometimes it may fuse with the anterior margin of foramen magnum completely or partially. (4) Earlier there are reports on anterior arch presenting the outgrowths. Keats has reported a case of accessory ossicle from the inferior aspect of the anterior arch. (3) It was triangular in shape and its apex was directed inferioy. Das et al. have observed two unusual bony spicules from the inferior aspect of the anterior arch measuring 0.5 cm x 0.5 cm. (2) In the present case, we noted unusual outgrowth from the both superior and inferior aspect of the anterior arch proper. Based on the existing literature, we have not come across documentation of outgrowth from superior aspect of the anterior arch. It has been suggested that existence of outgrowths from the inferior aspect of the anterior arch could be due to the abnormal development of the anterior longitudinal ligament in this area. (3) However, in the present case, such possibility is excluded as accessory bony lamina was continuous with the anterior arch proper. Thus, we hypothesize that accessory lamina observed in the present case could be due to the uncontrolled ossification of the anterior arch. Further, there were small pores along the attachment of the bony lamina. Presence of small pores may throw a light in the scope of detailed study on the ossification pattern of the anterior arch. Though Junewick et al. have studied extensively on the atlas ossification pattern, presence of accessory lamina reported in the present case has not been reported by them. (7) Presence of the accessory lamina in the anterior arch may affect the movements of atlas, axis and occipital bone. The articular facet for odontoid process is situated only in the anterior arch proper and there was no facet in the accessory lamina extending from the superior aspect. This lamina may interfere with the rotatory movements of the atlanto-axial joint. Excessive rotatory movements may cause degenerative changes in the dense of the axis. Presence of unusual outgrowth is usually revealed when they are symptomatic in the X-ray or CT scans, otherwise they may be unnoticed. (7) We opine that this is the first case of reporting the unusual morphology of the anterior arch of atlas presenting the wide accessory lamina both superiorly and inferiorly. Documentation of such rare morphology is clinically relevant for radiologist, orthopaedicians and surgeons. Prior knowledge of possible anomalies will prevent the diagnostic and operative complications. Anomalous outgrowth may be mistaken as a pathologic growth and they may deviate and delay the proper diagnosis and treatment of the patients. Knowledge of the accessory lamina is also important for chiropractitioners while dealing the neck pain by the cervical spine manipulation.

References: