

**FUSION OF SECOND WITH THIRD CERVICAL VERTEBRA AND ITS
EMBRYOLOGICAL BASIS**

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ABSTRACT

The spine is a complex and vital structure. Its function includes not only structural support of the body as a whole but it also serves as a conduit for safe passage of the neural elements while allowing proper interaction with the brain. Skeletal abnormalities of the cervical region or in the craniocervical region are of interest to the anatomists, orthopedicians, neurosurgeons, and orthodontists. These abnormalities may result in severe neck pain, decreased neck mobility, muscular weakness of both upper limbs with sensory deficits. In our we present a bony fusion between axis and third cervical vertebra at various parts.

KEYWORDS: Cervical Vertebra, Fusion, Axis Vertebra

INTRODUCTION

The cervical vertebrae are seven in number. C3 –c6 are typical, whereas C1 [atlas], C2 [axis] and C7 [cervical prominence] are atypical. C2 vertebra bears a odontoid process or dens which projects cranially from the superior surface of the body. The axis acts as an axle for rotation of axis and head around the dens.¹

The characteristics of the normal typical cervical vertebra [3 to 6] are as follows -----

They have a smaller body, broader lateral dimension, triangular large vertebral foramen which exceeds the size of the body, longer and narrower lamina, foramina transversaria in the transverse process and short bifid spine. Congenital anomalies of the cervical or craniovertebral region are common. Among these, the important ones are fused cervical vertebra [FCV]. Congenital fusion of the axis with the third cervical vertebra limits the movements between these bones and because of this the third vertebra was given the name as vertebrae critica by Cave [1937].² This fusion may be associated with neurological signs and symptoms. In our case report we are presenting the details of one such abnormal fusion between C2 and C3.

OBSERVATIONS

During a routine medicolegal case examination, we came across fused cervical vertebra, there was a bony fusion between axis and third cervical vertebra at various parts.

-On the anterior aspect C2 and C3 showed a bony bar at the junction of body and transverse process bilaterally.(Fig.1)

-There was fusion between body of C2 and C3 posteriorly. (Fig.2)

The spines of C2 and C3 were also fused.



Fig.1: Second and Third cervical vertebra fusion (Anterior view) Arrow indicates the site of fusion



Fig.2: Second and Third cervical vertebra fusion(Posterior view) Arrow indicates the site of fusion

DISCUSSION

In vertebrate animals, a flexible column extending from neck to tail, made up of series of bones, the VERTEBRA, carry out the function of protecting the spinal cord chiefly. In humans additional function is to transmit body weight in walking and standing

Cervical vertebrae of the spine consists of seven bony rings that reside in the neck between the base of the skull and thoracic vertebrae in the trunk which carry the function of supporting the head, protecting the spinal cord and providing mobility to the head and neck region.

Tiwari et al[2002]³ studied a case of congenitally abnormal cervical vertebra and he observed that -

- a fusion of vertebral laminae of two subsequent cervical vertebrae on left side.-
- Failure of development of pedicle; costal element and anterior tubercle of transverse process of lower cervical vertebrae on left side.
- Absence of foramina transversaria and intervertebral canal on left side.
- Failure of fusion of lamina with that of the opposite side in both vertebrae.

Wazir S and Mahajan(2011)⁴ A studied case of fusion of axis with third cervical vertebra.

The observed variation in the present study most of the time is one of the components of Klippel-Feil syndrome. K F syndrome is characterized by short neck, lower hair line at the back of neck, restricted mobility of the upper spine mainly associated with abnormalities of other organ systems such as scoliosis, spina bifida, heart abnormalities and short stature.

KFS can be classified as Type 1, 2, 3. In Type 1, The patient presents with numerous fused cervical vertebrae and possibly upper thoracic vertebrae with synostosis. Type 2 includes fusion of one or two vertebrae and other abnormalities of the cervical spine. Type 3 includes fusion of cervical vertebrae with concomitant fusion of thoracic or lumbar vertebrae.

Most affected people have one or two of the characteristic features in the present study there is isolated cervical spine fusion hence observed variation in the present study comes under type 2 of KFS.⁵

Somites are formed from paraxial mesoderm that lie on each side of neural tube. The somites are divided into three parts: ventromedial sclerotome; intermediate myotome; lateral dermatome. The vertebral column is formed from the sclerotome of the somites. Normal segmentation of the sclerotomes is important for the development of normal vertebral column. But in certain cases due to decreased blood supply during third to eighth week i.e. embryonic period results in abnormal segmentation and formation of congenitally fused vertebrae or block vertebrae. The sclerotome appears as paired condensations of mesenchymal cells around the notochord. Each sclerotome consists of loosely arranged cells cranially and densely packed cells caudally. Some densely packed cells move cranially opposite the center of myotome where they form intervertebral disc. The remaining densely

packed cells fuse with the loosely arranged cells of the immediately caudal sclerotomes to form the mesenchymal Centrum, the primordial of the body of vertebra.⁶

The incidence of CFCV of C2-C3 is around 0.4% to 0.7%.

In FCV the fusion may be either congenital or acquired .Acquired FCV is generally associated with diseases like tuberculosis, other infections juvenile rheumatoid arthritis and trauma. Due to fused cervical vertebra may be narrowing of the vertebral canal leading to compression of spinal cord along with nerves emerging from it. Due to this patient may present with radiculopathy myelopathy or quadriplegia. Such type of variation can cause difficulties while performing procedures such as endo-trachial intubation and cysternal puncture.⁴

CONCLUSION

Development of spine occurs through a complex series of events. A detailed cascade of events must occur to result in the proper formation of the neural elements of the spine. Alteration in any steps can result in one or more congenital abnormalities of the spine. Clinicians should be aware of such type of variations as well as have an understanding of normal embryology process of development of vertebral column. Recognition of such variation indicates the need of thorough physical examination to identify possible associated anomalies in other system as well.

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