A Rare Anatomical Variation of the Cervical Vertebrae Characterized by the Abnormal Fusion between C4 and C5

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ABSTRACT

Aim: The seven cervical vertebrae are characterized by their small size and by the presence of a foramen in each transverse process. From C2 to S1 articulate by secondary cartilaginous joints between their bodies, synovial joints between their articular processes, and fibrous joints between their laminae, transverse and spinous processes. In the cervical region, from C3 to C7, there are also laterally placed articulations between the uncinate processes of the inferior vertebral body and the bevelled lateral border of the superior body at each level.

Material and methods: During the osteology demonstration of cervical vertebrae for the medical students of department of anatomy, faculty of medicine, Mashhad, Iran, an unusual fusion between C4 and C5 vertebrae was founded.

Results: In the anterior view, fusion between right and left articular mass of C4 and C5 cervical vertebrae were observed. In the posterior view fusion between articular mass observed only on left side. Other features of vertebrae were normally.

Conclusion: Noticing the possibility of existence of these variations in the cervical vertebrae can be valuable and help surgeons to reduce the potential of mistakes and side effects in surgery.

INTRODUCTION

The seven cervical vertebrae are characterized by their small size and by the presence of a foramen in each transverse process. A typical cervical vertebra has the following features: the vertebral body is short in height and square shaped when viewed from above and has a concave superior surface and a convex inferior surface, each transverse process is trough-shaped and perforated by a round foramen transversarium, the spinous process is short and bifid, the vertebral foramen is triangular in shape (1). (Figure 1)

The intervertebral discs are the chief bonds between the adjacent surfaces of vertebral bodies from C2 to the sacrum (2). The two major types of joints between vertebrae are: symphyses between vertebral bodies and synovial joints between articular processes (1). A typical vertebra has a total of six joints with adjacent vertebrae: four synovial joints (two above and two below) and two symphyses (one above and one below). Each symphysis includes an intervertebral disc. Although the movement between any two vertebrae is limited, the summation of movement among all vertebrae results in a large range of movement by the vertebral column. Movements by the vertebral column include flexion, extension, lateral flexion, rotation, and circumduction. Movements by vertebrae in a specific region (cervical, thoracic, and lumbar) are determined by the shape and orientation of joint surfaces on the articular processes and on the vertebral bodies (3) (Figure 2).

For many years abnormalities of cervical region were of interest mainly to anatomists and surgeons (4). Congenital anomalies are common in the vertebral column (4). In condition of fusion of the cervical vertebrae (FCV), two vertebrae appear not only structurally as one but also function as one (5). In this article we report rare variations in cervical vertebrae.
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MATERIAL AND METHODS

During the osteology demonstration of cervical vertebrae for the medical students of department of anatomy, faculty of medicine, Mashhad, Iran, an unusual fusion between C4 and C5 vertebrae was founded.

RESULTS

In the anterior view, fusion between right and left articular mass of C4 and C5 cervical vertebrae were observed (Figure 3). In the posterior view fusion between articular mass observed only on left side (Figure 3, B). Other feature of vertebrae such as, bifid spinous process, foramen transversarium and joints between inferior and superior articular process of C4 and C5 were normally. Figure 3, 4 and 5 represent additional information from our finding.
Figure 4: (C) inferior view of fused C4 and C5 cervical Vertebrae, (D) superior view of fused C4 and C5 cervical Vertebrae.

Figure 5: (E) and (F) lateral View of fused C4 and C5 cervical Vertebrae

DISCUSSION

Fusion of cervical vertebrae (FCV) may be congenital (CFCV) or acquired (AFCV) (6). This abnormality may be asymptomatic, however, it may also appear with appearance of serious clinical features such as myelopathy or may be associated with syndromes such as klippel-feil, limitation of the neck movement, muscular weakness, atrophy and neurological sensory loss (7). AFCV is generally associated with diseases like tuberculosis, infections, juvenile rheumatoid and trauma (6, 7). Although radiologic appearance of FCV has a characteristic feature, it is precise diagnosis is complex, particularly, among young case (Graaf) (6). It is because ossification of the vertebral body is not complete till adolescence and cartilage which has not ossified, may appear like a normal disc area (Gray and et al) (8)

EMBRYOLOGICAL CORRELATION

CFCV is one of primary malformations of chorda dorsalis, supposed to be due to defects which take place during the development of the occipital and cervical somites (9). Cause of this anomaly is often a combination of environment and genetics which occurs during the 3rd week post conception (Bethany and Mette) (10). Sacrum is an example for block vertebrae (11). Block vertebrae results from embryological failure of normal spinal subdivision due to lessening in local blood supply during the third to eighth week of fetal growth (6). The presence of block vertebra results in greater biomechanical stress in connecting segments leading to premature deteriorating changes at connecting motion segments [12]. Embryological vascular disorders like subclavian artery supply disruption sequence have been hypothesized to result in klippel-feil syndrome [13].
CONCLUSION

Early diagnosis of these anomalies will be helpful in documenting the change due to an injury, aging, or progression of a degenerative process and also motivates the patients to change their lifestyle to lead a normal life. The knowledge on the variations of joints between cervical vertebrae, specially, between only two vertebrae is important for neural surgeons and noticing the possibility of existence of these variations in the cervical vertebrae can be valuable and help surgeons to reduce the potential of mistakes and side effects in surgery. Appropriate counseling on the organization of known risk factors, including therapeutic decisions that can precipitate complication should be encouraged (like avoiding undue trauma, extension and rotational maneuvers which may place the spinal cord at risk).

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CONFLICT OF INTEREST

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REFERENCES