STUDIES ON THE CERVICAL VERTEBRAE OF INDIAN MUNTJAC (*Muntiacus muntjak*)

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Abstract

The study was conducted on the cervical vertebrae of three Indian muntjac brought for post-mortem. Of the seven cervical vertebrae, the atlas and axis were atypical while the others were typical. The atlas had a rough prominent dorsal tuberosity. The convex wings of atlas presented a deep concave fossa atlantis and alar foramen but no foramen transversarium. The axis was 3.6 cm long, had a wide dens at cranial end and rectangular spinous process which was enlarged caudally. The root of transverse process presented a narrow transverse foramen while the lateral vertebral foramen was divided into two. The length of bodies of the cervical vertebrae decreased from third to seventh. The height of cranially directed spinous process increased gradually from the third to the seventh. In the third to sixth cervical vertebrae, the transverse process was divided and presented a wide transverse foramen at its root. In the sixth cervical vertebrae, the ventral part of the transverse process was broad and quadrilateral. In the seventh cervical vertebra the transverse process had no transverse foramen. The cranial and caudal articular processes were large and flat. The inter-arcuate spaces were wide. The vertebral canal was narrow at the third and fourth cervical vertebrae but widened caudally.

Key words: *Morphology, Morphometry, cervical vertebrae, Indian muntjac*

The Indian muntjac (*Muntiacus muntjak*) is commonly called as “barking deer”. The Indian muntjacs are widespread throughout Southern Asia. Gross anatomical studies on the skeletal system of different wild animals are very little. Hence a study was conducted to describe the features of cervical vertebrae in Indian muntjac.

Materials and Methods

Cervical vertebrae from three Indian muntjac were collected when the animals were brought for post-mortem examination to the Department of Pathology, College of Veterinary and Animal Sciences, Pookode. Bones were processed (Young, 1980) for studying the gross anatomical observations.

Results and Discussion

The cervical vertebrae were seven in number. The atlas and axis were atypical vertebrae while the third to seventh cervical vertebrae were typical. The bony ring like atlas

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(Fig. 1) had a broad dorsal and a narrow, thick ventral arch which showed articular facets. The dorsal surface of dorsal arch presented a rough prominent dorsal tuberosity as in ox. But this tuberosity was ill developed in sheep (Getty, 1975). The ventral surface of ventral arch carried a prominent ventral tubercle. The fovea dentis on the dorsal surface of ventral arch was continuous with the flat caudal articular surfaces. The deep concave cranial articular surfaces were separated by an interval ventrally. The wings were convex with a deep concave fossa atlantis ventrally and showed alar foramen at its root. The foramen transversarium described by Nickel *et al*. (1986) in goat was absent in the wing. This concurs with the findings of sheep and ox wherein the foramen was absent (Getty, 1975)

The axis was 3.6 cm long had a well-developed body with a prominent ventral crest. The cranial end of the body showed wide dens (Fig. 1) with deeply concave dorsal surface from side to side while the caudal end of body was deeply concave. The spinous process was rectangular as reported by Nickel *et al.* (1986) in ox. It had a height of 1.3 cm and its height and thickness increased caudally. However, Getty (1975) stated that in sheep, the spinous process is not enlarged caudally. The caudally directed transverse process projected beyond the caudal extremity and its root presented a narrow transverse foramen. The flat cranial articular surface was located ventral and lateral to the articular area of dens. Separate caudal articular processes located ventral to the spinous process and transverse processes projected caudally beyond the caudal extremity. The vertebra showed cranially a round lateral vertebral foramen, which was divided into two similar to the observations in goat recorded by Nickel *et al.* (1986).

The length of cylindrical bodies of the cervical vertebrae decreased from third to seventh as reported by Dyce *et al.* (1996) in domestic animals (Table). The cranial and caudal extremities of the bodies of these vertebrae were strongly convex and concave respectively. In the third to fifth cervical vertebrae, the bodies showed a prominent ventral crest with a thickened caudal tubercle. But in the sixth and the seventh cervical vertebrae, the ventral crest was indistinct. These features corroborate with the observation of Getty (1975) in cattle and differ from the features in sheep wherein the ventral crests were rudimentary. The strong, wide vertebral arch of third to seventh cervical vertebrae carried a cranially directed spinous process (Fig. 2). The height of spinous process increased gradually from the third to the seventh cervical vertebrae as recorded in goat and sheep (Nickel *et al.*, 1986). However, in sheep the spinous process of the seventh was vertical and in cattle the vertical spine of seventh had about the double height of sixth (Getty, 1975). In the third to sixth cervical vertebrae, the well-developed transverse processes presented two parts: a short, stout caudally projected dorsal part and a plate-like cranially projected ventral part. These vertebrae also carried a wide transverse foramen at the root. In the sixth cervical vertebrae the ventral part of the transverse process formed a broad, quadrilateral ventrally directed lamina, the *lamina ventralis*.

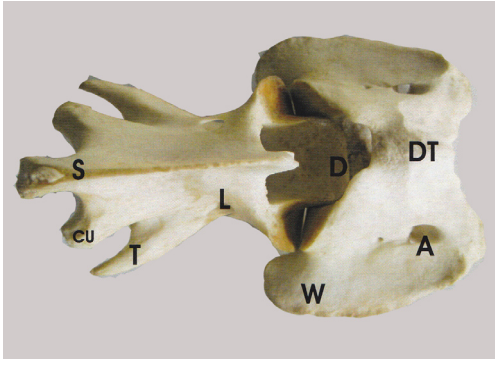

Fig. 1. Dorsal view of atlas and axis of Indian muntjac. DT- Dorsal tuberosity of atlas, A- Alar foramen, W- Wing, D- Dens of axis, L- lateral vertebral foramen, T- Transverse process, S- Spine, CU- Caudal articular process

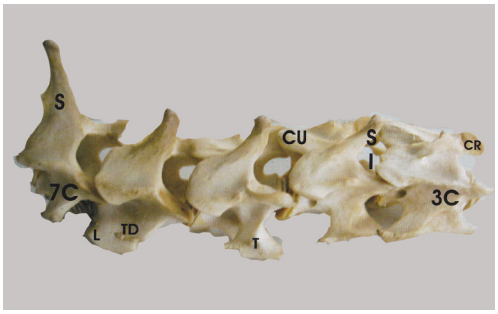

Fig. 2. Third to seventh cervical vertebrae of Indian muntjac. 3C- Third cervical vertebra, 7C- Seventh cervical vertebra, S- Spine, CU- Caudal articular process, CR- Cranial articular process, T- Transverse process, TD- Dorsal part of transverse process, L- Lamina ventralis , I- Interarcuate space

Nevertheless, in the seventh cervical vertebra, the transverse process was single, short and thick with no transverse foramen. The cranial and caudal articular processes were large and flat with horizontal articular facets positioned at the same level of the arch as recorded by Dyce *et al.* (1996) in domestic animals that allowed free lateral movements of neck. The cranial and caudal articular facets of the same side were connected by a plate of bone. The inter-arcuate spaces were wide; the cranial and caudal vertebral notches were deep. The vertebral canal was narrow at the third and fourth cervical vertebrae but widened in the caudal series (Table). The seventh cervical vertebra showed caudodorsally a facet for the first rib.

Table: Average morphometrical parameters of third to seventh cervical vertebrae in Indian muntjac

Parameters (cm)	Third to seventh cervical vertebrae				
	III	IV	V	VI	VII
Length of vertebral body	3.2	3.0	2.9	2.7	2.4
Breadth of vertebral body	1.5	1.5	1.4	1.4	1.5
Vertebral canal width	1.4	1.4	1.5	1.6	1.7
Vertebral canal height	1.1	1.1	1.2	1.3	1.3
Height of spinous process	0.6	1.3	1.7	2.1	3.0

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