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Osteometry of Lumbar Vertebrae of Asiatic Lion (*Panthera leo*)

Sweta Pandya, Alka Suman, Vanila Shukla and D.M. Bhayani

Department of Veterinary Anatomy and Histology,

College of Veterinary Science and AH, AAU, Anand-388001, Gujarat, India

Corresponding Author: drsweta26@gmail.com

Abstract

The anatomy of lumbar vertebrae of Asiatic lion was studied. There were seven lumbar vertebrae. The length of the body increased from the first to the sixth vertebrae, whereas the width increased up to the last vertebra. The ventral ridge was absent in first and last vertebrae. The dorsal spinous processes were short and flattened laterally and were cranially inclined, except L7 which was vertical. The transverse processes of each lumbar vertebra were directed obliquely forward and downward. The length of accessory processes decreased from L1 to L6 and it was absent in L7.

Key Words: Lion, Lumbar, Vertebrae, Spine, Process, Biometry.

Introduction

Cats are very flexible and can rotate half of their spine 180 degree. They are capable of jumping five times of their own height. A relatively long flexible spine of cats contribute considerably to increasing stride length and provides an additional source of forward propulsion during galloping, vertical clinging and leaping, and bounding behaviours. Asiatic lions are the most familiar amongst the large cats. The backbone of lion is very flexible. This is what allows it to have such a wide range of motion. The morphology of lumbar vertebrae has been used as an indicator of locomotory behaviour in living mammals. The present study was carried out on lumbar vertebrae of Asiatic lion, with the hypothesis that it will help in establishing basic data bank on gross anatomy of vertebrae and will also assist surgical intervention and will fulfill the need for authentic references in proceedings in the courts of law.

Material and Methods

The study was undertaken on skeletons of Asiatic lions, at the department of Anatomy, Veterinary College, Anand. The lumbar vertebrae of 2 adult lions were used for the study. The following parameters were measured in all seven lumbar vertebrae of lions, with the help of digital vernier calipers / non-elastic thread/scale.

1. Length, width and height of body of lumbar vertebrae.
2. Height and width of vertebral foramen
3. Distance between cranial and caudal articular processes

4. Height of dorsal spinous processes

5. Length of transverse process

6. Inter transverse space

7. Length of accessory processes

Results and Discussion

There were seven vertebrae as in carnivores. All seven vertebrae were typical which presented body, arch and processes (Fig. 1, 2). Body was dorso-ventrally flattened. The body of the L5 was longest with 4.4 cm length, while that of L1 was shortest with 2.9 cm length.

Table 1: Measurements of different dimensions of lumbar vertebrae of Asiatic lion

Sr. No.	Parameters (cm)	Lumbar vertebrae						
		L1	L2	L3	L4	L5	L6	L7
1	Length of body	2.9	3.1	4	3.9	4.4	4.2	3.5
2	Width of body	3.6	3.6	3.7	3.9	3.9	4.1	4.4
3	Height of body	2.7	2.8	2.8	2.7	2.7	2.9	2.7
4	Height of vertebral foramen	1.4	1.4	1.5	1.6	1.9	2.2	1.6
5	Width of vertebral foramen	1.9	2.0	2.2	2.2	2.9	2.8	2.9
6	Distance between cranial and caudal articular processes	2.5	2.7	2.8	2.7	2.6	2.4	1.7
7	Height of dorsal spinous process	2.4	2.6	2.8	3.2	3.2	3.4	3.4
8	Length of transverse process	2.0	2.2	4.5	6.3	7.3	7.5	8.1
9	Length of mammillary process	2.8	2.6	1.8	0.7	0.5	0.3	-

Similar findings were reported by Tiwari *et al*. (2012) in tiger, where the body of lumbar vertebrae increased from first (4.00 cm) to sixth (5.20 cm) while the length of L7 (4.12 cm) was similar to L1. Rajani *et al*. (2011) also reported that the length of the vertebral body increased from the first to sixth in leopard. In the present study, the width of the body slowly increased from L1 (3.6 cm) to L7 (4.4 cm). The transverse diameter of the vertebral bodies increased from the first to the last lumbar vertebrae as reported by Taluja *et al*. (2000) in tiger, Rajani *et al*. (2011) in leopard, Belu *et al*. (2013) in jaguar and Georgescu *et al*. (2015) in Bengal tiger. The height of the body was found between the ranges of 2.7 to 2.9 cm. The ventral median ridge was absent in L1 and L7, but present in L2 to L6. The ridge was very sharp in L3 and L4. The present findings were similar with Rajani *et al*. (2011) in leopard, but were dissimilar with Belu *et al*. (2013) in jaguar and

Fig-1,Showing umbar vertebra of Asiatic lion.

t-tuberous end of dorsal spinous process, **dp**-dorsal spinous process,**tp**-transverse process,**ma**-mammilo articularprocess,**B**-body,**vf**-vertebral foramena,**ac**-acessory process,**ca** -caudal articul process,

Georgescu *et al*. (2015) in Bengal tiger, where they mentioned the absence of ventral ridge in all vertebrae.

Fig-2 showing all 7 lumbar vertebrae of asiatic lion

The minimum height and width of vertebral foramina were in L1 (1.4 and 1.9 cm), while the maximum height and width were in L6 (2.2 cm) and in L5 (2.9 cm), respectively. The height and width of the vertebral foramina slowly increased. The caliber of the vertebral canal increased from the first to the last lumbar vertebrae as in carnivores (Getty, 1975) to accommodate the lumbar swelling of the spinal cord. The caudal notches were deeper in all lumbar vertebrae, while cranial notches were almost absent.

The transverse processes were very well developed which sprang out from the lateral aspect of the body. The processes were dorso-ventrally flattened and directed obliquely downward and forward. The length of transverse processes was minimum in L1 (2.00 cm) and maximum in L7 (8.1 cm). The length and curvature of transverse process increased from L1 to L7. McClure *et al*. (1973) mentioned that in cat the length of processes increased cranio-caudally, but Miller *et al*. (1964) reported that in dog the longest transverse processes were in mid lumbar region. The processes of L4 to L7 were more concave and pointed cranially. The inter transverse space was different amongst all lumbar vertebrae. These findings concurred with Rajani *et al*. (2011), Belu *et al*. (2013) and Georgescu *et al*. (2015). They reported that the tranverse processes were angled cranio-ventro-laterally and the length of the transverse processes increased up to the sixth lumbar vertebra in leopard, the length increased from the first lumbar vertebra (1.5 cm) to the last (5.0 cm) in jaguar and from L1 (1.9 cm) to L7 (6.1 cm) in Bengal tiger, respectively. The inter transverse space was different amongst all lumbar vertebrae.

The dorsal spinous processes were short, flattened laterally and tuberous at free end. The size of the tuberosity of free end was gradually decreased from L1 to L7. The height of dorsal spinous processes slowly increased from L1 (2.4 cm) to L5 (3.7 cm), but in last vertebrae the height slowly decreased. The spinous processes were cranially inclined, except L6 and L7 which were vertical. These findings were in agreement with Rajani *et al*. (2011), Tiwari *et al*. (2012), Belu *et al*. (2013) and Georgescu *et al*. (2015) in different wild felines. Tiwari *et al*. (2012) in tiger mentioned the height of spinous processes as 3.22 cm in first, 4.32 cm in sixth and 4.22 cm in last lumbar vertebrae.

The articular processes were very well developed. The cranial articular processes were more developed than caudal articular processes. The distance between cranial and caudal articular processes was maximum in L3 (2.8 cm) while minimum in L7 (1.7 cm). Similar findings were reported by Tiwari *et al*. (2012) in tiger. The cranial articular processes on lateral aspect carried the fused ridge like mammillary processes, called mammilo-articular processes on all lumbar vertebrae. These findings were in accordance with Miller *et al*. (1964) in dog, Belu *et al*. (2013) in jaguar and Georgescu *et al*. (2015) in tiger.

The accessory processes were directed caudally. The maximum length was 2.8 cm in L1 while minimum was 0.3 cm in L6. The length decreased from L1 to L6 and was absent in L7. This observation was similar to McClure *et al*. (1973), Belu *et al*. (2013) and Georgescu *et al.* (2015). The latter authors reported the maximum length in L1 (3.4 cm) and minimum in L6 (1.6 cm) of

Bengal tiger. In last vertebra the processes were absent. These findings were dissimilar to Miller *et al*. (1964) who reported in dog the well-developed processes in first three or four lumbar vertebrae and absent in fifth and sixth and with Rajani *et al*. (2011) in leopard, where the processes of first five lumbar vertebrae were very large, but those of the succeeding vertebrae were smaller and that of the fifth vertebrae had a pointed projection.

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Conflict of Interest: All authors declare no conflict of interest.

References:

Belu, C., Prdoi, G., Gergescu, B., Dumitrescu, I., Ancaseicaru , Petronela Rosu, Anca Opera and Visoiu, C. (2013). The morphology of the vertebral column in jaguar (*Panther aonca*), *Lucrari Stiintifice Medicina Veterinara*, XLVI(1): 18-22.

Georgescu, B., Predoi, G., Belu, C., Dumitrescu, I., Petronela Rosu, Stefania Mariana Raita, Letitia Purdoiu, Onamagarita, Ghimpeteanuflorica and Barbuceanu (2015). The morphology of the vertebral column in Bengal tiger (*Panthera tigris tigris*) - case study. *Lucrari Stiintifice Medicinia Veterinara*, XLVII (1): 54-66.

Getty, R. (1975). *Sisson and Grossman's The Anatomy of The Domestic Animals*. Vol. II, 5th ed. W.B. Saunders Company, Philadelphia.

Mc Clure, R.C., Dallman, M.J. and Garrett, P.G. (1973). *Cat Anatomy: an Atlas, Text and Dissection Guide*. Lea and Febiger, Philadelphia. pp: 18-19.

Miller, M.E., Christensen, G.C. and Evans, H.E. (1964). Anatomy of the dog. *In "The Skeletal System"*. W.B. Sounders Company, Philadelphia. pp. 56-57.

Rajani, C.V., Maya, S., Sreeranjini, A.R. and Raj, Indu V. (2011). Morphological studies on the lumbar vertebrae in Leopards (*Panthera pardus*). *Tamilnadu J. Vety & Anim. Sci*., 7(6): 258-261.

Taluja, J.S., Malik, M.R. and Parmar, M.L. (2000). Osteometry of Lumbar Vertebrae in Tiger, In: Proc. XV convention of Indian Association of veterinary Anatomists and National Symposium, Madras Veterinary College, Chennai, India, December, 23-25.

Tiwari, Y., Taluja, J.S., Vaish, R., Pandey, A. and Shrivastav, A.B. (2012). Biometry of Lumbar vertebrae in tiger (*Panthera tigris*). *World Research J. of Wildlife Res.,* 1(1): 5-8.

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