

GROSS ANATOMY OF THE HEART OF THE INDIAN ONE HORNED RHINOCEROS (*RHINOCEROS UNICORNIS*)

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Abstract: The hearts of a full-term fetus and an adult Indian one horned rhinoceros were studied. Although the gross anatomical features of the rhino heart generally resembled those of the hearts of the elephant, Asiatic buffalo, goat, and other domestic animals, there were differences in the biometrics.

INTRODUCTION

The Indian one horned rhinoceros is native to Assam and now is found primarily in the world-famous wildlife sanctuaries of Kaziranga and Manas. Scientific information on this unique species is minimal. This report records the gross anatomic characteristics of the heart, with emphasis on measurements.

MATERIALS AND METHODS

The hearts of two Indian one horned rhinoceroses (one full-term fetus and an adult) were obtained from the State Zoo-cum-Botanical Garden, Gauhati. The hearts were measured and gross anatomical features were noted. Topographical observations were not possible due to prior postmortem examination.

RESULTS AND DISCUSSION

The general gross anatomy of the hearts was similar to descriptions of the hearts of the elephant,⁵ Asiatic buffalo,^{1,4} goat,³ and other domestic animals.² Therefore, in the following description, only the differences are explained.

The heart presented two surfaces, a broad base and narrow apex; the incisura apicis cordis was marked only in the apex of the adult heart and not in the fetal heart (Fig. 1). An incisura apicis cordis was reported to be present in the heart of the pig² and fetal Indian elephant.⁵ In addition to right

and left longitudinal grooves on the surfaces of the rhinoceros heart, there were one or two shorter grooves that did not reach half of the ventricular length.

Biometric features from this study are presented in Table 1 and comparative figures in Table 2. Most of the measurements of the fetal rhinoceros heart corresponded with those of the fetal Indian elephant; however, the foramen ovale in the heart of the



Figure 1. Incisura apicis cordis in the adult rhinoceros heart.

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Table 1. Measurements of the heart of rhinoceros.

Sl. no.	Parameter	Measurement			
		Fetus		Adult	
1.	Weight (kg)	0.250		9.5	
2.	Length (base to apex) (cm)	11.3		32.2	
		Right atrium		Left atrium	
		Fetus	Adult	Fetus	Adult
3.	Longitudinal length (cm)	5.8	22	5	24
4.	Width at widest part (cm)	3.6	8.4	2.5	10.2
5.	Wall thickness at smooth part (cm)	0.5	1.9	0.4	2
6.	Diameter of cranial vena cava (cm)	3.6	10.6	—	—
7.	Diameter of caudal vena cava (cm)	2.7	6.2	—	—
8.	Thickness of prominent musculae pectinatae (cm)	0.7	1.3	—	—
9.	Diameter of pulmonary vein (at root) (cm)				
	Small	—	—	0.3	1.8
	Medium	—	—	0.8	3.8
	Large	—	—	2.0	6.5
10.	Diameter of foramen ovale				
	a) Transverse	1.7	Absent	—	—
	b) Vertical	2.4		—	—
11.	Diameter of pulmonary trunk at root (cm)	1.9*	3.8*	—	—
		Right longitudinal groove		Left longitudinal groove	
		Fetus	Adult	Fetus	Adult
12.	Length (cm)	5.5	20.5	9.0	41.0
		(straight, and 1.9 cm away from the point of apex)	(does not reach apex)	(curved and 2.3 cm away from apex)	
		Fetus		Adult	
13.	Ventricular valve				
	Cusp of right ventricle (attached to free margin) (cm)	2.0		5.2	(1.3 cm at shortest part)
	Cusp of left ventricle (attached to free margin) (cm)	1.9		4.2	(1.1 cm at shortest part)
	Cusp of pulmonary valve (cm)	1.1		3.2	
	Cusp of aortic valve (cm)	1.1		3.2	
14.	Ventricular wall thickness				
	Right	1.0		4.0	
	Left	1.6		5.5	

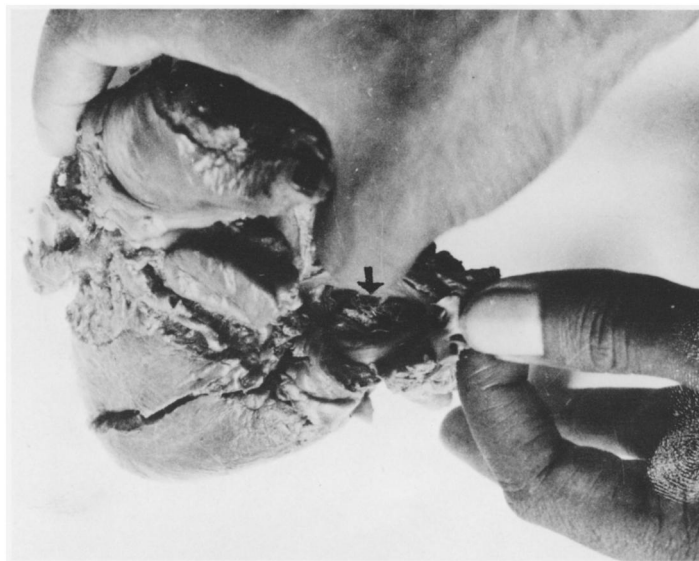
Table 1. Continued

Sl. no.	Parameter	Measurement	
		Fetus	Adult
15.	Thickness of Pulmonary artery	0.1	0.8
	Aorta	1.3	2.2
	Pulmonary vein	0.4	0.5
16.	Septal thickness	1.0	7.0

* From right ventricle.

Table 2. Comparative measurements of the heart.

Sl. no.	Species	Sagittal diameter of base (cm)	Greater width of base (cm)	Circumference at coronary groove (cm)	Distance between pulmonary artery and apex (cm)	Distance between termination of caudal vena cava and apex (cm)
1.	Rhino (present study)					
	Fetus	11.3	8.1	20	11.5	10
	Adult	32.2	27	68	34	26
2.	Buffalo ⁴	16.40	14.35	38.75	17.95	14.45
	Buffalo ¹	17–20	13–15	55–60	22–23	19–20
3.	Ox ²	—	12	38	17	—
4.	Horse ⁶	25	18–20	65–70	25	18–20
5.	Goat ⁴	8.52	4.94	13.83	8.15	6.48

**Figure 2.** Presence of foramen ovale (arrow) in the fetal rhinoceros heart.

fetal elephant had a transverse diameter of 1.0 cm and vertical diameter of 1.5 cm, while the size of foramen ovale in the heart of the rhinoceros fetus was larger (Fig. 2). The thickness of the ventricular septum in the fetal Indian elephant (2.5 cm) was higher than in the fetal rhinoceros. The aortic valve consisted of three cusps, with the anterior sinus having a prominent nodule. There were right and left coronary arteries similar to those of domestic animals.² The elephant is different in that one of the coronary arteries is subdivided into two major branches.⁵

The course of coronary arteries in the rhinoceros heart differed from that in domestic animals. The left coronary artery (0.6 cm at the root) originated from the left posterior sinus, and had a descending branch at the left longitudinal groove and smaller branches, one of which anastomosed with a branch of the right coronary artery. The right cor-

onary artery (0.8 cm at the root) originated from the anterior sinus and continued in the coronary groove with additional branching.

REFERENCES

1. Dhingra, L. D. and Sharma, D. N.: Topographic anatomy of the heart of adult female Murrah buffalo (*Bubalus bubalis*). Indian Journal of Animal Science 48(10): 729-736, 1978.
2. Ghoshal, W. G.: Heart and arteries. Cited in: Getty, R.: Sisson and Grossman's anatomy of domestic animals. Philadelphia: W. B. Saunders Co., 1975.
3. Malik, M. R., Shrivastava, A. M. and Thakur, M. S.: A note on the biometry of caprine heart. Indian Journal of Animal Science 48(9): 686-687, 1978.
4. Malik, M. R., Tewari, G. P., Singh, A. P. and Kapoor, P. N.: Biometry of the heart of the buffalo (*Bubalus bubalis*). Indian Journal of Animal Science 42: 1004-1006, 1972.
5. Mariappa, D.: The anatomy of the fetal Indian elephant. Indian Veterinary Journal 35: 191-208, 251-267, 1958.
6. Sisson, S. and Grossman, J. D.: The anatomy of the domestic animals. Philadelphia: W. B. Saunders Co., 1953.