

THE EPIPHARYNGEAL BURSA OF AN INDIAN RHINOCEROS

by

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Une description anatomique est présentée de la bourse pharyngienne (bursa epipharyngea) chez un troisième spécimen adulte de *Rhinoceros unicornis*, avec une attention spéciale pour les vaisseaux et (pour la première fois) les canaux lymphatiques de la bourse. Les faits morphologiques indiquent nettement sa fonction amygdalienne.

INTRODUCTION

The anatomy of the epipharyngeal bursa in the Rhinocerotidae has been described (Cave, 1974) from the gross and microscopical examination of that structure in two specimens of the Indian rhinoceros (*Rhinoceros unicornis*), four specimens of the African black rhinoceros (*Diceros bicornis*), two specimens of the African white rhinoceros (*Ceratotherium simum*) and one specimen of the Sumatran rhinoceros (*Didermoceros sumatrensis*). In all the specimens studied the bursae parietes were characterised by the presence of lymphoid tissue in such abundance as to indicate unmistakably the tonsillar nature of the bursa. This lymphoid tissue occupied the bursal mucosa and submucosa both in diffuse form (concentrated around the gland-ducts and blood-vessels) and as lymphoid secondary nodules disposed principally around the gland-duct ostia. Consequently the bursa mucosa displayed a variable pattern of mammilliform, duct-pierced elevations grouped in irregular rows or in patches, their degree of development being probably correlated with the age and state of health of the individual animal. Of necessity, all the bursae studied were from animals living in captivity.

Since the rhinoceros epipharyngeal bursa but rarely becomes available for examination and since account needs to be taken of individual variation in the composition of any total morphological picture it is deemed not inappropriate to submit the present observations upon epipharyngeal bursa anatomy in a third Indian rhinoceros specimen, the more particularly because this additional specimen provided fuller and more precise information concerning the bloodvessels and lymphatics associated with the bursal lymphoid tissue.

REPORT ON SPECIMEN

A 15-years old male Indian rhinoceros, born and kept in the menagerie of the Zoological Society of London was made available for anatomical examination by courtesy of the Council of that Society and the cooperation of their veterinarian, Mr. David Jones, M.R.C.V.S. During routine post mortem examination the pharynx, larynx and adnexa were carefully excised in continuity and were formalin-preserved (May, 1975) until later dissection. No gross evidence of pathological change was observable in the cervical organs or in the associated lymph nodes.

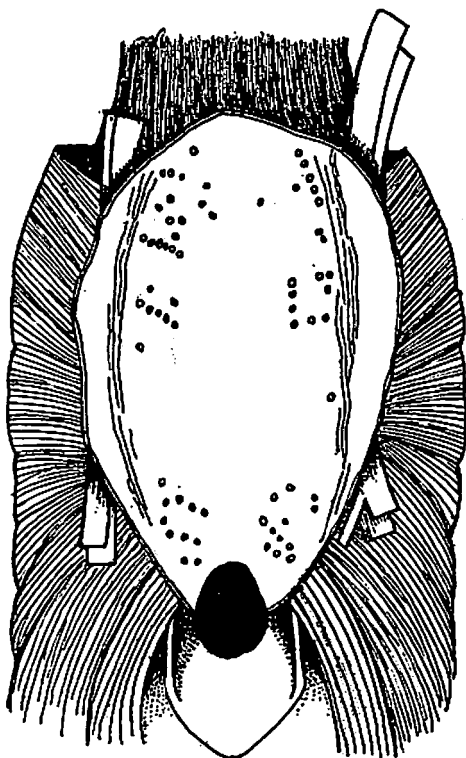


Fig. 1. — Indian rhinoceros (*Rhinoceros unicornis*). 15 years old male (1975). Dorsal aspect of pharynx showing opened epipharyngeal bursa overlying carotid sheath and displaying mammilliform lymphoid elevations in its floor mucosa.

The exceptionally well-developed epipharyngeal bursa, a thin-walled globulo-pyriform sac, was 112 mm long, 110 mm wide (maximally) and 20 mm deep : it extended over the dorsum of the pharynx and initial 25 mm or so of the oesophagus. Bilaterally its mucosal floor was longitudinally plicated where it overlay the carotid sheath before reflexion

dorsally into continuity with the bursa roof. Elsewhere the floor mucosa was unwrinkled and displayed an obtrusive spiderwork of multiple fine veins : anteriorly and posteriorly it presented a limited number of small, rather inconspicuous, duct-pierced mammilliform lymphoid elevations (Fig. 1). The bursa was attached to the subjacent pharynx roof by a fat-free layer or bed of fibro-areolar tissue within which the bursal bloodvessels and lymphatics ramified. These were unusually well preserved and readily amenable to dissection.

The bursa was directly supplied by a slender specific artery (a. epipharyngea) arising from the dorsal aspect of the common carotid artery : on the bursa wall this vessel divided into anterior, middle and posterior branches, each of which terminated in a leash of fine ramifying twigs. From the conspicuous network of fine, anastomosing mucosal veins arose ultimately three terminal veins of relatively large size. Of these, one (vena comes of the bursal artery) joined the jugular vein directly, a second (more anteriorly situated) vein entered a large pharyngeal tributary of the jugular, and a third (the shortest vein) pierced the median raphé of the pharynx and was untraceable further.

From the lymphoid tissue of the epipharyngeal mucosa and submucosa arose very numerous fine lymphatic vessels which by progressive union formed dissectable afferents, some of which averaged 1 mm in width. At least four such afferents were readily traceable into a single, discrete lymph node (postcarotid node) situated high on the pharyngeal wall : three of these afferents pursued a direct ventral course into the node, the fourth gained the node after running alongside an unrelated large lymphatic vessel travelling down the pharyngeal wall from the palatofaucial region. No bursal afferent lymphatics were traceable to any other node than this postcarotid node, which appeared to be the sole receptacle for all the bursa lymph. The node itself was of flattened oval shape, measured $30 \times 17 \times 5$ mm, lay dorsal to the common carotid artery underneath the reflexion of the bursal parietes and was separated by the carotid sheath from the main group of the anterior cervical nodes — the pre-carotid nodes (Fig. 2).

This postcarotid node was clearly a dorsally outlying member of the anterior cervical group of lymph nodes, topographically somewhat isolated because of its special functional relationship with the epipharyngeal bursa. Two small nodes (epijugular nodes), situated upon the jugular vein somewhat caudal of the pre-carotid nodes, represented caudal outliers of this same node group.

Dense leashes of lymphatic vessels connected both the postcarotid node and the two epijugular nodes to the pre-carotid group of six nodes : a less obtrusive lymphatic connection obtained between the postcarotid node and the epijugular nodes.

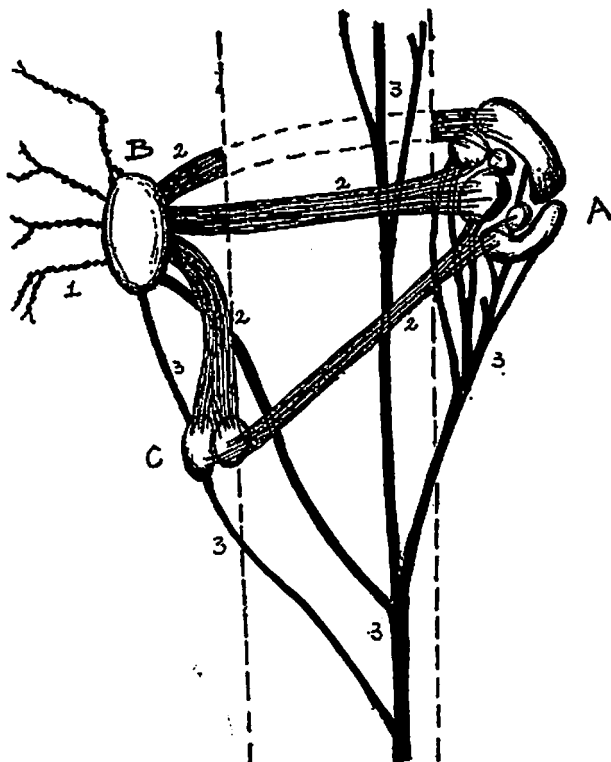


Fig. 2. — Indian rhinoceros (*Rhinoceros unicornis*). 15 years old male (1975). Diagram of anterior cervical lymph nodes and lymph drainage of epipharyngeal bursa. Common carotid artery shown by broken lines. A = precarotid nodes; B = postcarotid node; C = epijugular nodes; 1 = primary afferents from epipharyngeal bursa; 2 = leashes of inter-nodal afferents (annectants); 3 = efferent lymphatics.

The inter-nodal leash components were doubtless afferent in function although descriptively as much efferent from one group of nodes as afferent to another and hence perhaps best termed “annectants”, to distinguish them from both the primary afferent lymphatics arising in the tissues and the much stouter, plainly efferent, lymphatics draining a given node cluster.

The annectants joining the postcarotid and epijugular nodes to the precarotid nodes coursed indifferently under or over the common carotid artery (occasionally over the jugular vein) in leashes intimately related or even adherent to that artery wall. These stout leashes of physiologically afferent lymphatics manifested a striking and unusual morphological characteristic — their interruption *en route* by a peculiar lymphoid formation. Such formation appeared as a flattish, almond-shaped or elongate mass, of extremely soft consistency and of reddish-brown colour, which was traversed longitudinally by very fine lymphatic vessels in close-set

parallel series. The whole arrangement suggested a lymphatic rete or pseudo-capillary formation but was most probably a localised organisation of diffuse lymphoid tissue of lymphopoietic function. Such arrangements characterised virtually all internodal annectants (functional afferents) and were absent from all the larger and manifestly efferent lymphatic vessels. Those associated with the precarotid node annectants were firmly embedded in the tunica adventitia of the common carotid artery, being separable therefrom with difficulty.

As noted the postcarotid (bursal) node received all its afferents from the epipharyngeal bursa. Its annectants passed in considerable numbers (a) ventrally to the precarotid node and (b) caudally to the epijugular nodes. Unmistakably efferent vessels from its caudal pole passed into either (a) the epijugular nodes or (b) the terminal efferents from the precarotid nodes (Fig. 2). Thus epipharyngeal bursa lymph was collected primarily by the postcarotid node, whence it gained the cervical lymph duct either indirectly through the precarotid and epijugular nodes or directly through the precarotid node efferents.

COMMENTARY

The morphological findings reported for the epipharyngeal bursa of this present specimen of Indian rhinoceros confirm previous findings both in this species and in the Rhinocerotidae in general. Their fuller quota of anatomical detail however, strongly reinforces the claim for recognition of the bursa as an organ of tonsillar function. It is apparent on the morphological evidence alone that the bursal lymphoid tissue is of such physiological importance as to necessitate the provision of a specific arterial supply, an elaborate and rapid venous drainage and the allocation of a particular member of the anterior cervical group of lymph nodes to the reception of its lymph. Indeed the anatomico-physiological relationship of postcarotid node to epipharyngeal bursa is exactly comparable to that obtaining, in Man, between the "tonsillar" node and the palatine (faucial) tonsil.

SUMMARY

An account is given of epipharyngeal bursa anatomy in an adult Indian rhinoceros (*Rhinoceros unicornis*) with special reference to vascular arrangements and lymphatic drainage. A structural peculiarity of the internodal afferent lymphatics is noted. The morphological evidence adduced confirms previous observations and emphasises the essentially tonsillar function of the bursa.

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