

IX.—Scottish National Antarctic Expedition: Observations on the Anatomy of the Weddell Seal (*Leptonychotes Weddelli*). By David Hepburn, M.D., C.M., Professor of Anatomy, University College, Cardiff (University of Wales). Part II.*

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GENITO-URINARY ORGANS.

In my former contribution I gave a general summary of the animal under consideration, and discussed in detail the peritoneal arrangements of its abdominal cavity and the naked-eye anatomy of its alimentary organs. In the present paper I shall give an account of the genito-urinary system.

The kidneys were situated on each side of the dorsal mesial mesentery. Each was covered on its ventral aspect by the peritoneum forming the dorsal wall of the greater peritoneal sac. The right kidney was quite free from contact with the liver and the duodenum, while the left kidney was equally free from contact with the spleen. Both kidneys were therefore situated well back towards the pelvic end of the abdominal cavity. Each kidney measured 5 inches in the longitudinal diameter and 2 inches in the transverse diameter. The hinder or caudal end of each reached a point two inches from the pelvic inlet, which, as formerly described, was narrow and well defined by the course of the hypogastric (umbilical) arteries.

The surface of the kidney indicated lobulation, but the lobules were not separated from each other. The hilum was placed ventro-mesially, and at its point of emergence from the surface of the kidney the ureter was nearer to the caudal than to the cephalic end of the organ. On opening up the hilum, the ureter was seen to result from the union of two main tributaries, each of which, in its turn, was formed by the junction of several smaller rootlets, which corresponded more or less closely in number to the number of the kidney lobules. There was no distinct pelvis to the ureter, which was gradually formed by the junction of smaller ducts in the manner indicated. Nevertheless, the widest point of the ureter was found at the junction of its two main tributaries. The ureter and its chief tributaries lay on the ventral (anterior) aspect of the renal vessels, and not on their dorsal (posterior) aspect, as is the case in man.

The size of the ureter suggested a vessel about half the diameter of an average human radial artery. The ureter followed a course along the dorsal wall of the abdomen towards the pelvic inlet; and half an inch beyond the termination of the abdominal aorta, or, in other words, at the point where the common iliac artery divided into its external and internal branches, the ureter crossed to the mesial side of the internal iliac and hypogastric arteries, and continued its course along the margin of the pelvic inlet. In this position the ureter and the hypogastric artery were both in their turn crossed

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by the *vas deferens*, which now assumed the mesial position to both of the others. Up to this point the ureter had not entered the pelvic cavity, and about three-quarters of an inch onwards, that is, in the direction of the tail, the ureter, still lying close to the pelvic brim, entered the lateral aspect of the urinary bladder, travelling between the folds of a lateral vesical mesentery or peritoneal ligament. Thus, as a consequence of the great obliquity of the pelvic inlet, the ureter was able to reach the bladder by skirting the pelvic brim, and at no point did it require to enter or sink into the interior of the pelvis.

The urinary bladder was placed mesially, and was attached to the ventral wall of the abdomen by a ventral mesial mesentery composed of peritoneum, which, as formerly described, closely invested the bladder except on its pubic aspect. The apex of the bladder extended to the umbilicus, where it still presented an open lumen. There was no obliterated part or urachus, and throughout its entire length it presented a uniform calibre, suggestive of an empty portion of small intestine. Developmentally, it may be said to represent an enlarged and patent allantois; but as this animal was only two days old at the time of its death, probably a sufficient period had not elapsed for the closure of the umbilical end of the organ.

The hypogastric arteries were carried along each lateral aspect of the bladder, suspended in peritoneal folds half an inch in width, so that these arteries were not in contact with the wall of the bladder until they reached a point between 2 and 3 inches from the umbilicus, where the peritoneal folds disappeared, and the arteries closed in upon the sides of the bladder.

The length of the bladder from the umbilicus to the prostate gland was 10 inches. The prostate gland lay close to and on the abdominal side of the symphysis pubis.

The interior of the bladder was lined by a mucous membrane, presenting numerous rugosities, which to a large extent lay parallel to each other, and in the longitudinal axis of the bladder. Towards the outlet the mucous membrane became comparatively flat and smooth.

The orifices of the ureters were longitudinal oblique narrow slits 2 mm. in length and 5 mm. apart. The lateral margins of each of these openings were continued towards the outlet as slight ridges for a distance of 10 mm. These ridges met in the mesial plane, thus forming a mesial longitudinal ridge or *uvula vesicæ*. The actual *trigonum vesicæ* was therefore a triangular area 5 mm. wide at its base and 10 mm. long on each side.

The *uvula vesicæ* was continued into the urethra, and became continuous with the *crista urethræ*, which attained its greatest prominence 20 mm. from the apex of the *trigonum vesicæ*. The *sinus pocularis* was represented by a very small mesial aperture opening on the distal side of the summit of the *crista urethræ*.

The prostate gland did not attract attention, and at first sight one would have doubted its presence. Certainly in cutting into the urethra from its pubic aspect no variation in consistence was detected. Still, there was a definite thickening of the pubic wall of the urethra corresponding to the general position of the urethral crest. On the

other hand, on the rectal or pelvic aspect of the urethra, and in relation to the urethral crest, there was a mesial longitudinal thickening of firm consistence, from 5–6 mm. in length. Into the hinder end of this denser part the vasa deferentia entered. The pelvic portion of the urethra was therefore not surrounded by visible prostatic tissue at its vesical end, and the prostatic tissue was not prolonged in relation to the urethra as far as the sub-pubic pelvic wall, because, whereas the prostate was only from 5–6 mm. in length, the pelvic urethra measured from 35–40 mm. long. No doubt the extreme youth of the animal accounts for the primitive condition of the prostate, but it is interesting to note that the part readily recognisable is the mesial longitudinal lobe. A portion of the prostatic part of the urethra, along with the surrounding tissue, was prepared for microscopic examination. Definite glandular prostatic tissue was revealed in relation to the pubic and lateral aspects of the urethra. On the rectal aspect of the urethra dense fibrous tissue was displayed. The two vasa deferentia were visible, each quite distinct from the other, so that their close proximity and apparent fusion previous to their entering the prostate on its rectal aspect was not a real fusion. The urethral crest presented the section faces of the bifurcated end of the uterus masculinus (Müllerian ducts).

Each testis was lodged in its own peritoneal pouch, which was situated to the outer side of the pubic body, in the depression between the *pubis and the head of the tibia*. These pouches were completely separated from each other by the keel-like projection of the pubic symphysis, and thus they did not form any object comparable to a scrotum. The testes had descended through the abdominal wall on the ventral aspect of Poupart's ligament, *i.e.* through the inguinal canal, and not through the crural canal, notwithstanding the novel position occupied by the testis in relation to the limb as a whole. The tunica vaginalis testis was in open communication with the sac or cavity of the abdominal peritoneum, and thus the whole condition might fairly be said to resemble two imperfectly descended testes, although in this case there was no scrotum into which they could have descended, nor was it possible for them to descend any farther. Each testis was considerably flattened, and measured 25 mm. long by 14 mm. wide.

No hydatids of Morgagni were visible. The epididymis presented a globus major and a globus minor. It did not lie close to the testis, but was supported by a mesentery, which at its deepest measured 10 mm. The vas deferens was similarly supported, and therefore it presented itself clear from the epididymis at the distal end of the testis, instead of lying close to it as far as the proximal end of the testis, as in man.

The vas entered the inguinal canal in the usual way and crossed the iliac fossa, running superficial to the external iliac vessels and the hypogastric artery. Thereafter it hooked round the hypogastric artery, and, passing to its mesial side, it proceeded backwards, *i.e.* tailwards, towards the base of the urinary bladder, taking its place to the mesial side of the ureter on its course. As the vas approached the proximal or pelvic end of the prostate gland it came into such close contact with its fellow of the opposite

side that their adjacent walls became firmly blended together. This produced the appearance of an enlargement common to both of them, but there was no dilatation or ampulla on each one. There was no trace of seminal vesicles.

The penis was constructed on familiar lines. A strong, flexible cylindrical structure was present in the body of the penis extending 7 mm. from the base of the glans penis backwards. A portion of this structure was removed for microscopical examination. In transverse section it presented a circular outline, and was equally associated with the two corpora cavernosa penis. Its resistance to the knife suggested young bony tissue, and accordingly it was decalcified. Afterwards sections were cut out of paraffin, mounted, and stained in hæmatoxylin and eosin. Under the microscope it presented the distinctive characters of cancellated bone, being more spongy towards the centre of the section and denser towards the surface, where it was closely enveloped in a fibro-vascular sheet of membrane, comparable to periosteum. Numerous bone-cells were embedded in the developing processes of bone. No trace of hyaline cartilage could be detected. No doubt this short cylindrical piece of young bone is comparable to the much larger os penis of the walrus, as well as to the furrow-shaped and partly bilateral os penis of the fox and the dog. The bulb on each corpus cavernosum penis was situated in relation to the crus penis, and not on the penile portion of the organ. From the region between the bulb of the corpus spongiosum penis and the rectum, *i.e.* corresponding to the central point of the perineum, there were two parallel bands of tissue running forwards towards the distal end of the body of the penis. These were similar to muscular bands which I have elsewhere* described in connection with the penis of the porpoise. Probably these act as retractors of the penis. As in the case of the porpoise, a microscopic examination of sections cut longitudinally and stained after Van Gieson's method revealed unstriped muscular fibres, with fibrous tissue bundles. Since there is no scrotum in the porpoise, whose testes are situated intra-abdominal, and since in the seal under consideration each testis occupied a recess placed under the integumentary layers in relation to the inner side of the head of the tibia, it seems not unfair to consider these non-striped muscular bands as being homologous to the tunica dartos layer of an ordinary scrotum, more especially as the muscular fibres of the tunica dartos are of the unstriped or involuntary variety.

* "The Anatomy of the Genito-urinary Apparatus of the adult male Porpoise," HEPBURN and WATERSTON, *Trans. Royal Physical Society, Edinburgh*, 1902.