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Computed Tomographic Features of Feline Prostate Gland

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The aim of the present study was to determine some anatomo-topographic features of feline prostate gland using computerized axial tomography (CAT). The study was performed in 7 sexually mature European shorthair male cats at the age of 1-2 years weighing 2.8-4.0 kg, anaesthetized prior to the examination. The positive contrast material (Ultravist 300) was applied via both the venous and the urethral routes. The study was performed with a TOMOSCAN-CX/Q scanner. The pelvis was transversally cut between the L6 lumbar segment and the pelvic arc. The distance between CT scanograms and the thickness of cross-section was 2 mm. The feline prostate was visualized dorsally in the section between the 1st and the 2nd coccygeal vertebrae, laterally in the section of hip joints and femoral diaphyses and caudally to the cranial branch of pubic bones. Three glandular dimensions were determined: length, width and height. Feline prostate gland is an oval, homogenous, relatively hyperdense structure with the radiodensity of soft tissue (from 43 HU in native scans to 54 HU with contrast enhancement).

Key words: tomcat, prostate, computed tomography.

Introduction

Feline prostate gland is situated far behind the urinary bladder. The species-specific long preprostatic urethra is located over the anterior symphyseal rim. The gland is situated behind the cranial border of pelvic symphysis under the ventral wall of the rectum. Both glandular lobes embrace the prostatic urethra dorsolaterally and are separated by a dorsomedian sulcus [6].

Initially, a computed tomographic study of healthy prostate was performed in human male [12, 13]. In men, the gland appeared as a homogenous oval structure with a radiodensity similar to that of soft tissue, length of 2-4 cm, located behind the pelvic symphysis just under the rectum. Via CT, the prostate is well visualized and its three dimensions could be precisely determined. In 30-year-old men, the craniocaudal diameter of the gland (length) was 3 cm, the anterior-posterior (height) – 2.3 cm and the lateral (width) – 3.1 cm.

Human prostate is visualized on CT as a homogenous, oval, infravesical soft tissue structure whose dimensions increased with age. Its height increased from 2.5 to 3 cm and the length and width – from 3 to 5 cm. Its soft tissue radiodensity was between 40 and 65 HU [14].

Mirowitz and Hammerman [9] performed a CT depiction of zonal anatomy of human prostate by dividing it into peripheral zone and central zone.

Ozdemir et al. [10] performed a CT study of human prostate gland on the distance between: anterior and posterior glandular surface, the base and the apex, left and right surface, anterior surface and symphysis, posterior surface and rectum.

Milosevic et al. [8] reported the CT localization of prostatic apex in men and comparing it to the topography obtained via magnetic resonance imaging and urethrography, they observed differences in apex visualization depending on method used.

Huguet [5] and Rorvik [11] studied the normal male pelvis and the prostate gland via magnetic resonance imaging and computed tomography, suggestign that MR imaging was more accurate than CT.

Mc Laughlin [7] used computed tomography and MRI for male prostate visualization, determining three glandular zones: internal, external and anterior fibromuscular.

Evelyn et al. [3] achieved a precise imaging of prostate in men using computed tomography, MRI and three-dimensional ultrasonography.

In a CT and ultrasonographic study, Atalan et al. [1] determined the length of prostate gland in the dog and its ratio vs the distance from the sacral promontory to the pelvic symphysis. A prostate length > 70% of this distance was assessed as enlarged and < 70% as normal.

The insufficient literature data referring to CT imaging of normal prostate gland in domestic carnivores, especially in cats, motivated our study. Our results could be used as reference data in the diagnostic imaging and the differentiation between normal and pathologic feline prostate glands.

Material and Methods

Seven sexually mature, male European shorthair cats at the age of 1–2 years, weighing 2.8–4 kg were studied. Prior to the investigation, the image intactness of the prostate glands was evidenced via ultrasonography.

The animals were anaesthetized with 0.03 mg/kg atropine sulfate s.c. (Atropinum sulfuricum, Sopharma), followed by 2 mg/kg xylazine i.m. (Alfazan) after 15 min and 15 mg/kg ketamine (Alfazan) i.m. after another 15 min [2].

In two cats, the CT study was done without contrast enhancement whereas in the other, a positive contrast material (Ultravist, Schering, Germany, 300 mg I/ml) was applied slowly intravenously at a dose of 3 ml/kg.

The urinary bladder was catheterized for the intraurethral application of contrast (1 ml/kg) and 3 ml/kg isotonic physiological saline (Natrii Chloridum 0.9%, Balkanpharma).

The study was done using an axial computer tomograph TOMOSCAN – CX/Q with a table height of 149 cm and FOV = 250. The scan time was 4.5 s, filter 1, 120 kV anode power and a 100 mA current. A high resolution mode and CT index of 0.5 were used.

The animals were positioned in dorsal recumbency.

In the computed tomography study, the pelvis was cut transversally from the L6 lumbar segment and the pelvic arc with section thickness of 2 mm.

Some of obtained images are presented.

Results and Discussion

The topography of feline prostate was determined using the following bone markers: the respective vertebra (dorsally), the hip joints (laterally) and the pelvic symphysis (ventrally).

The CT transverse image of feline pelvis, scanned through the third sacral vertebrae (Fig. 1, S3 level), depicts the cranial parts of hip joints and the pelvic brim that ventromedially is scarcely detectable (cranially, it is completely visualized). The non-contrasted preprostatic urethra is observed dorsomedially to the anterior border of the symphysis, ventromedially to the hip joints and ventrally to the rectum. Its lumen was hypodense, and the wall – relatively hyperdense and homogenous. The image of Fig. 1 allowed us to assume that the CT localization of feline preprostatic urethra was in the transverse plane through the third sacral vertebra, the cranial parts of hip joints and the anterior border of the symphysis.

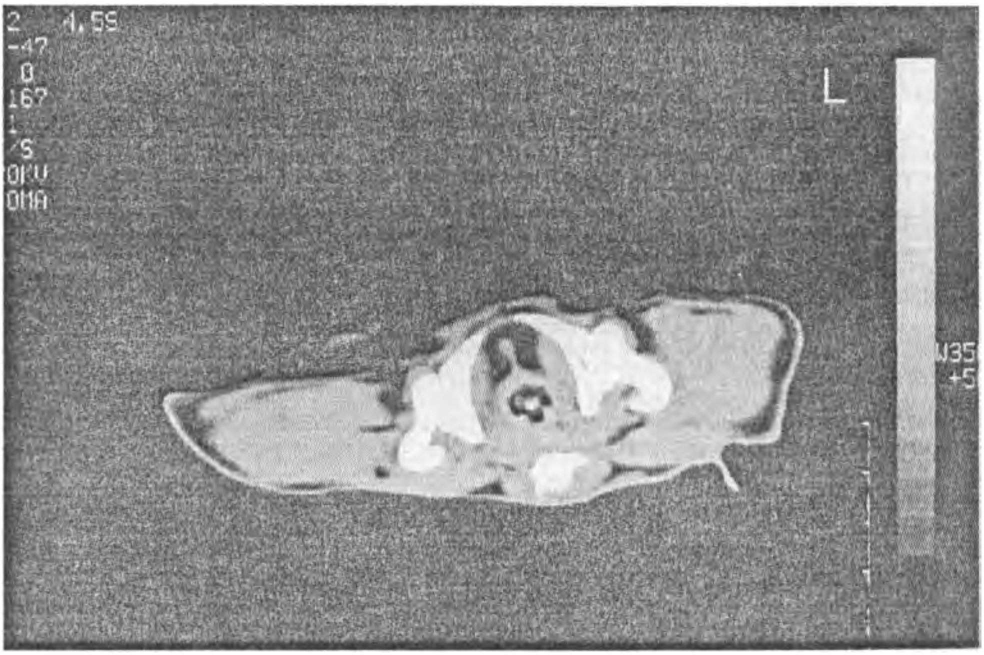

Fig. 1. Transverse CT image of feline pelvis through the 3rd sacral vertebra (section thickness 2 mm)

Fig. 2 (at the level of C1) depicts the image of cranial parts of the prostate, evident by the thickened urethral wall ventrally, laterally and especially dorsolaterally under the rectum. The lumen of prostatic urethra was contrasted (hyperdense) and prostatic areas were relatively hypodense compared to urethral and rectal walls. The gland was well differentiated from the adjacent soft tissues. The feline prostate image appeared from scanning in the transverse plane passing through the first coccygeal vertebra and proximal femoral diaphyses and caudodorsally to the cranial branch of pubic bones.

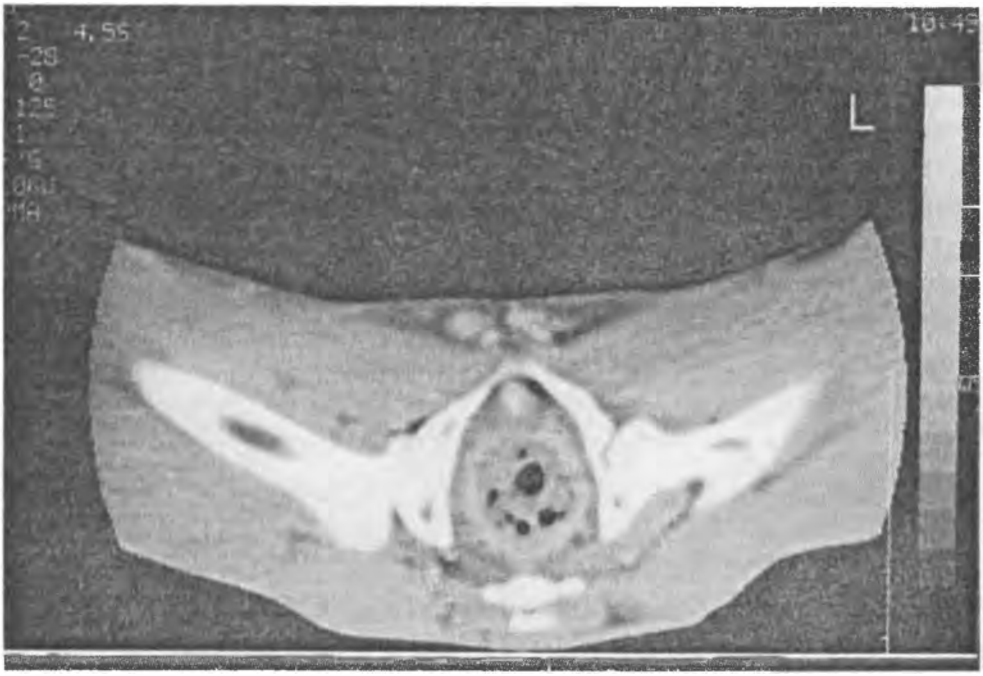

Fig. 2. Transverse CT image of feline pelvis through the 1st coccygeal vertebra (section thickness 2 mm)

The complete CT image of prostate is shown in Fig. 3 (at the level of C1-C2) where the lumen of prostatic urethra was also contrasted (hyperdense) and glandular lobes were visulaized dorsolaterally to the urethra under the ventral rectal wall, that is hyperdense than the prostate itself. The feline gland is a oval, homogenous and relatively hyperdense structure on the background of adjacent soft tissues (with the exception of urethral and rectal walls). It is observed during the transverse scanning of the pelvis between the 1st and the 2nd coccygeal vertebrae (dorsally), the hip joints with femoral diaphyses (laterally) and caudally to the cranial branch of pubic bones. Its margins are adequately distinguished from adjacent soft tissue structures.

The radiodensity of feline prostate is a soft tissue one (43 HU — native and up to 54 HU — wit contrast enhancement). The gland width (lateral dimension) is 9,7 mm, the height (dorsoventral) — 3.1 mm (Fig. 3) and the length (craniocaudal) — 8 mm.

Caudally, the scan between 2nd and 3rd coccygeal vertebrae, the caudal parts of hip joints and over the caudal parts of pubic bones, the initial part of membranous urethra is observed. Its lumen is contrasted (hyperdense) and its wall — comparatively thinned (Fig. 4). At this level, there is no image of the prostate.

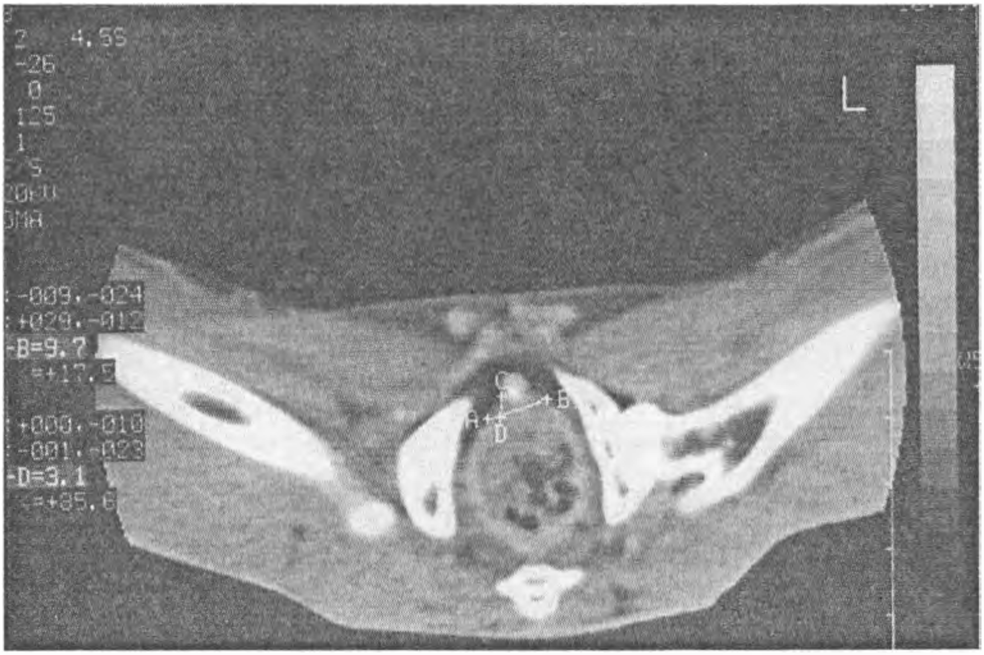

Fig. 3. Transverse CT image of feline pelvis between the 1st and the 2nd coccygeal vertebrae (section thickness 2 mm)

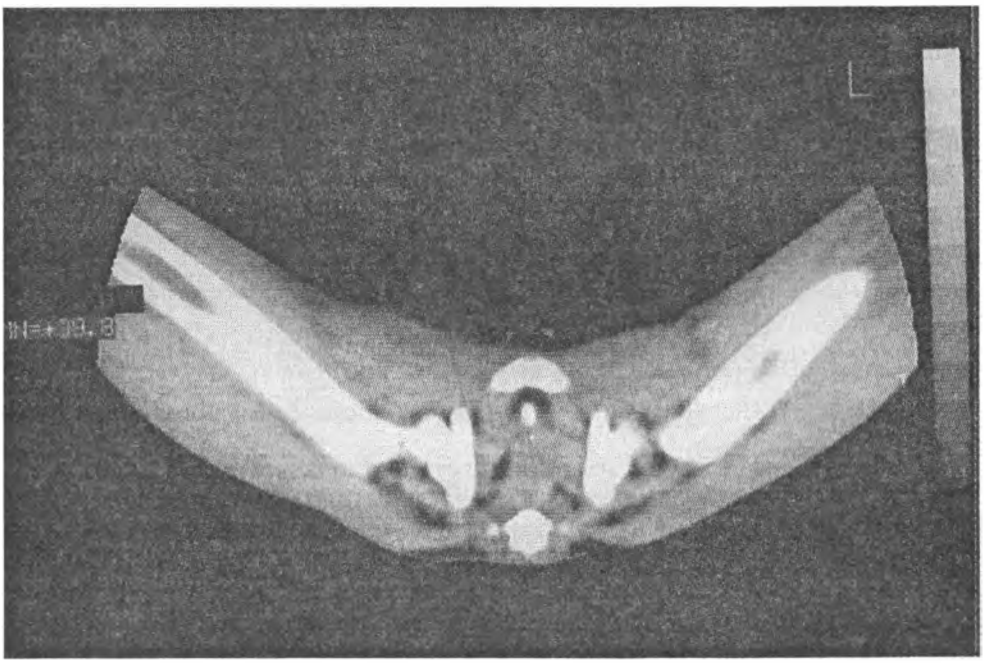

Fig. 4. Transverse CT image of feline pelvis between the 2nd and the 3rd coccygeal vertebrae (section thickness 2 mm)

The soft tissue density of feline prostate gland is similar to that in men [14]. Unlike men, however [7, 9], no glandular zones are present on CT images of male cats.

The glandular dimensions are not analogous to those of human prostate because of the size of the studied species itself [10].

Unlike human prostate [8], feline prostate lacks an apex and such a finding is not observed.

Compared to Atalan [1], who defined the length of the gland in dogs and its ratio to pelvic height, we present the three dimensions of prostate — width, height and length.

Conclusions

The CT image of feline prostate appears during the scanning in the transverse plane through the first coccygeal vertebra, the hip joints with the proximal femoral diaphyses and caudodorsally to the cranial branch of pubic bones.

An entire image of prostate is seen during the transverse scan of the pelvis between 1st and 2nd coccygeal vertebrae (dorsally), the hip joints with femoral diaphyses (laterally) and caudally to the cranial branch of pubic bones.

Feline prostate gland is an oval, homogenous, relatively hyperdense structure with the radiodensity of soft tissue (from 43 HU in native scans to 54 HU with contrast enhancement), visulaized dorsolaterally to the prostatic urethra under the ventral rectal wall and well differentiated from the adjacent soft tissues in the pelvis.

The gland width (lateral dimension) was 9.7 mm, the height (dorsoventral) — 3.1 mm (Fig. 4) and the length (craniocaudal) — 8 mm.

At scan of pelvis in the planes through the 3rd sacral vertebra and the 2nd and the 3rd coccygeal vertebra, the prostate gland is not visualized.

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