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Localization, Density, Shape and Dimensions of Mast Cells in Feline Prostate Gland

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The localization, density, shape and dimensions of mast cells in prostate glands of 9 sexually mature clinically healthy male cats, aged 1-2 years were investigated following euthanasia. The material was fixed in Carnoy's fixative, dehydrated, embedded in parrafin and stained with toluidine blue. The localization and the shape of mast cells were observed via light microscopy whereas the density and their dimensions - by an eyepiece micrometer. The data were statistically processed (Descriptive statistics, Data Analysis, Excel). It was found out that the predilection site of mast cells was in prostatic stroma. A considerable concentration of mast cells was observed in the interstitium by the glandular epithelium unlike the peripheral subcapsular stroma. Single mast cells, located by the basal membrane of the glandular epithelium, intraepithelially and intraluminally in tubuloalveolar parenchyma were detected. The shape of mast cells observed in feline prostate gland was most commonly fusiform and more rarely, oval cells were encountered.

Key words: mast cells, prostate gland, tomcat.

Introduction

The data referring to mast cells in mammalian prostate glands are relatively scarce and they are primarily about men and rats, both in normal and pathological states.

In the urogenital tract of humans, rat and mice, mast cells are found out in the connective tissue under the epithelial layers adjacent to blood and lymph vessels and peripheral nerves [6, 8, 9].

Localization of mast cell in the genitals of male rats showed that both their number and density were high [5].

The density of mast cells in the ventral part of prostate in the rat during puberty was high and decreased considerably with age [7].

The localization and the number of mast cells in human male genitals and especially in prostate gland, vary depending on the influence of exogenous and endogenous factors such as stress, allergy, inflammations and vascular thrombosis [1, 3, 6, 12]. Their density is significantly altered in benign and malignant prostatic lesions thus determining their role in the specific prevention of tissue metaplasia. The increased concentration of mast cells and the difference between the density in the intratumoural and peritumoural prostatic regions evidenced their biological importance in these processes [2, 4, 11].

The mast cell profile in prostatic lesions is always changed and therefore, is a confident marker of initial pathology of the gland [1].

The lack of data about the localization, density, shape and dimensions of mast cells in feline prostate gland motivated the present study in order to reveal their functional role in the prostate of these animal species.

Materials and Methods

Prostate glands of 9 clinically healthy, sexually mature male European shorthair cats (at the age of 1-2 years), weighing 2.8-4 kg were studied. The cats were euthanized i.v. with 200 mg Thiopental (Biochemie, Austria).

The material was fixed in Carnoy's fixative for 4 hours, then put in 70° ethanol for 12 hours, dehydrated in an ascending ethanol series, cleared in xylene and embedded in paraffin.

The cross-sections (5-7 μm) were stained with 0.1% solution of toluidine blue in McIvane's buffer, pH 3 [10].

The localization and the shape of mast cells were determined via light microscopy and their density (in mm^2) and dimensions (in μm) were measured with an eyepiece micrometer.

The data were statistically processed (Descriptive statistics, Data Analysis, Excel).

Results and Discussion

The total area of studied histological sections was 204 mm^2, the stromal area being 132 mm^2 (64.7%) and the parenchyma – 72 mm^2 (35.3%).

From 2992 observed mast cells, 2924 (97.7%) were into the glandular stroma and the other 68 (2.3%) — into the parenchyma. The mast cells counts in stroma were 22.15 per mm^2, whereas in parenchyma – 1.06 per mm^2.

The average mast cell counts in the stroma of a histological section was 328.22 ± 26.01, standard deviation 78.04 and in parenchyma: 7.56 ± 2.54, standard deviations 7.35. The minimum and maximum values of these parameters were between 212 and 453 cells in the interstitium and between 0 and 21 in glandular parenchyma.

The length of cells in the interstitium varied from 10.2 μm to 34 μm (mean 21.08 ± 0.67 μm), whereas in parenchyma reached 34 μm (mean 11.26 ± 1.33 μm).

The width (thickness) of mast cells in stroma varied between 6.8–17 μm (mean 9.14 ± 0.26 μm) and in the parenchyma reached 17 μm (mean 6.07 ± 0.71 μm).

The light microscopic studies showed that the predilection site of mast cells was in prostatic stroma, particularly within the interstitium surrounding the glandular epithelium (Fig. 1) and sometimes they communicated with the basal membrane of parenchymal cells (Fig. 2).

In single cases, intraepithelial localization of mast cells was observed, as well as cells, penetrating into the tubuloalveolar glandular lumen (Fig. 2).

The considerable density of cells into the interstitium (Fig. 3) was relatively lesser than the density closely to the glandular parenchyma (Fig. 1) and higher than the density in the periphery under the capsule (Fig. 4).

A higher concentration of mast cells was observed especially around the venous vessels of the stroma than around the arterial ones (Fig. 4).

Often, the observed cells were near the interstitial lymphoid cell clusters (Fig. 3).

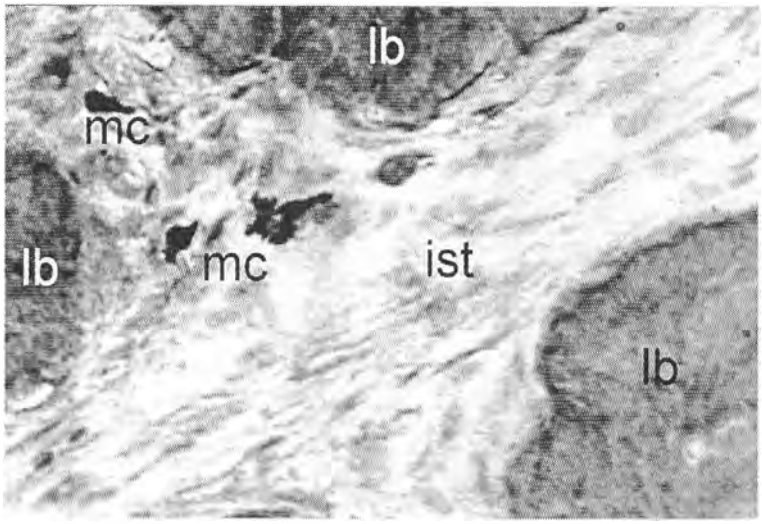

Fig. 1. Mast cells (mc) located in the trabecular interstitium (ist) between glandular lobules (lb) (× 400)

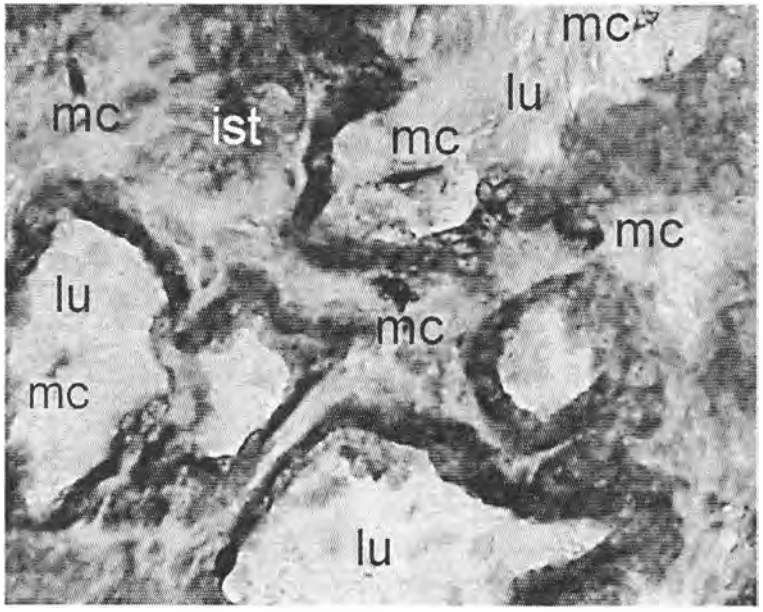

Fig. 2. Mast cells (mc) located between the basal membrane and interstitium (ist) of the glandular epithelium and penetrating the tubuloalveolar lumen (lu) (× 400)

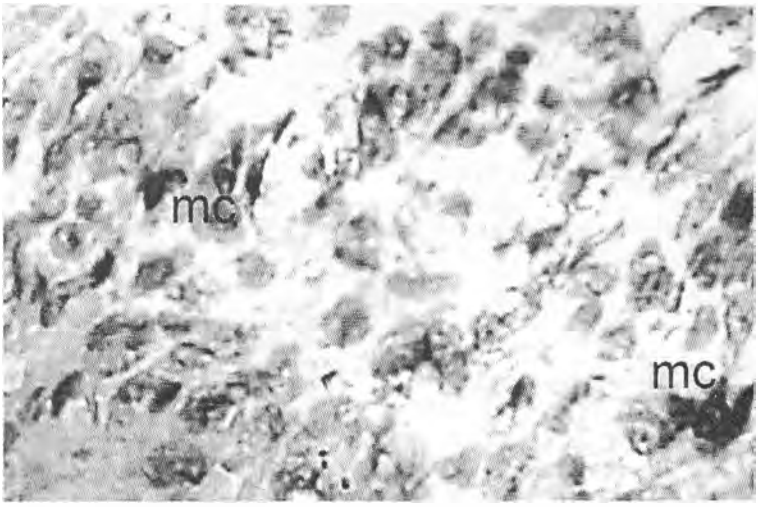

Fig. 3. Single mast cells (mc) among the connective tissue cells of the stroma (× 400)

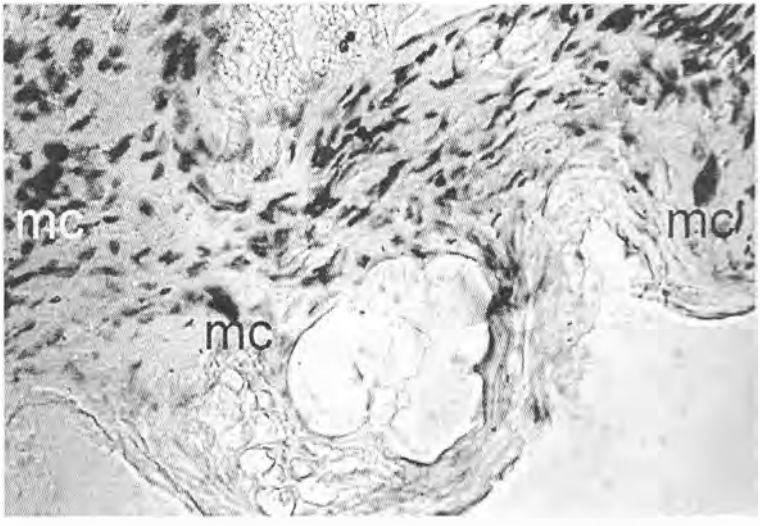

Fig. 4. Mast cells (mc) located in the prostatic myoelastic stroma immediately under the glandular capsule (× 400)

The density of studied cells was relatively reduced from the central towards the peripheral parts of glandular stroma (Fig. 4 and Fig. 1).

The most typical shape of mast cells in feline prostate in this study was fusiform and rarely oval (Fig. 1 and Fig. 3).

For the first time, intraepithelial and intraluminal localization of mast cells in the tubuloalveolar parenchyma of feline prostate gland was observed. These data add further knowledge about mast cell localization in mammalian prostates, that is known to take place only in the interstitium [5, 6, 7, 8, 9].

The predominant stromal localization of mast cells in feline prostate looked like their occurrence in rats, mice and humans [6, 7, 8, 9].

The placement of mast cells of feline prostate in the connective tissue was similar to the predominant interstitial fibromuscular prevalence of those cells in benign, malignant, inflammatory and vascular prostatic lesions, thus suggesting about the affinity of mast cells to the connective tissue component of the gland [1, 2, 3, 4, 11, 12].

Considering the opinion of G a l l i [6] it could be assumed that the mast cells in the storoma of feline prostate possibly participate in the local immune competency.

The considerably high concentration of mast cells in the glandular stroma (328.22) vs their density in the parenchyma (7.56) allowed us to imply an involvement in the motility of stromal smooth muscle cells, vascular tone regulation, microcirculation and the local organ homeostasis.

The relatively larger dimensions (length and width) of mastocytes in the interstitium vs those in the parenchyma are suggesting about their active role in the connective tissue part of the prostate in cats.

References

1. A m i r, T., R. P a i, C. R a g h u v e e r. Mast cell profile in prostatic lesions. – Indian Journal of Medical Science, **52**, 1998, No 11, 507-513.
2. A y d i n, O., D. D u s m e z, L. C i n e l, E. D o r u k, A. K a n i k. Immunohistological analysis of mast cell numbers in the intratumoral and peritumoral regions of prostate carcinoma compared to benign prostatic hyperplasia. – Pathol. Res. Pract., **198**, 2002, No 4, 267-271.
3. B a n k l, H., C. S a m o r a p o o m p i c h i t, B. P i k u l a, L. L a t i n o v i c, H. B a n k l, K. L e c h n e r, P. V a l e n t. Characterizatoin of human prostate mast cells and their increase in periprostatic vein thrombosis. – American Journal of Clinical Pathology, **116**, 2001, No 1, 97-106.
4. D e n g, W., P. L i, G. L i, Y. Z h a o. The distribution of mast cells in benign and malignant prostate lesions and its biologic significance. – Sichuan Da Xue Xue Bao Yi Xue Ban, **35**, 2004, No 5, 623-625.
5. F r i t z, F., R. P a b s t. Numbers and heterogeneity of mast cells in the male genital tract of the rat. – Int. Arch. Allergy. Appl. Immunology, **88**, 1989, No 3, 360-362.
6. G a l l i, S. J. New Concepts about the mast cell. – The New England Journal of Medicine, **328**, 1993, No 4, 257-265.
7. H a m m e l, I., P. R o i z m a n, R. M a s s a s, A. A b r a m o v i c. Ontogeny of mast cells in the ventral prostate of the rat. – Int. Arch. Allergy. Appl. Immunology, **93**, 1990, No 2-3, 212-215.
8. M a j e e d, S. K. Mast cell distribution in rat. – Arzneimittelforschung, **44**, 1994, No 3, 370-374.
9. M a j e e d, S. K. Mast cell distribution in mice. – Arzneimittelforschung, **44**, 1994, No 10, 1170-1173.
10. P e a r c e, A. — In: Histochemistry. 2th ed. London. J.& Churchill Ltd., 1960. 692 p.
11. S a r l, S., O. C a n d i r, O z t u r c and K o s a r. Mast cell variations in tumour tissue and with histopathological grading in specimens of prostatic adenocarcinoma. – BJU Internatoinal, **84**, 1998, No 7, 51-855.
12. T h e o h a r i d e s, T., N. F l a r i s, C. C r o n i n, A. U c c i, E. M e a r e s. Mast cell activation in sterile bladder and prostate inflammation. – Int. Arch. Allergy. Appl. Immunology, **92**, 1990, No 3, 281-286.