CYTOLOGICAL AND HISTOPATHOLOGICAL DIAGNOSIS IN MAST CELL TUMORS IN COMPANION CARNIVORES

Ozana-Maria HRIȚCU[1], Aurelian-Sorin PAȘCA [1]

ozy_dulman@yahoo.ro

Abstract

Mast cells tumours are considered a member of the round cell tumour group and are one of the most frequent cutaneous and subcutaneous neoplasms in companion carnivores (up to 21%), and are more common in dogs than in cats.They can be diagnosed both through cytopathological and histopathological diagnostic.

In 2020-2021 we diagnosed 11 mast cell tumours in dogs and 2 in cats, out of which 8 through cytological and 5 through histopathological examination. The formations were located in various parts of the body, both cutaneous and subcutaneous. The histopathological examination revealed round, oval, polygonal or even spindle-like cells that had basophilic, intracytoplasmic granules and a central, large, round nucleus. The presence of eosinophils was not observed in all the tumours. The mitotic index and anaplasia degree varied greatly, depending on the benign or malignant character of the tumour.

The cytological examination revealed round cells of a mesenchymal origin that presented basophilic granulations in various degrees. The number of granules varied from case to case, but generally speaking, these were much more easily observed in cytological slides than in the histopathological ones.

Key words: *mast cell, tumour, cytopathology, histopathology, diagnostic*

Mastocytomas are neoplasms that originate from the mast cells located in the dermis or subcutaneous fat that undergo malignant transformation (9). They are more common in dogs (10-20% of cutaneous tumours) than in cats and rarely found in other species (3, 12, 14). They can develop cutaneously or subcutaneously, the later ones sometimes displaying a higher polymorphism both in aspect and behaviour (Meuten), and are more frequent on the trunk and the limbs (6). They can also have internal localizations such as intestinal, oral, visceral or cranio-mediastinal, and may also metastasize in lymph nodes, spleen, liver and kidneys (4, 11).

Some authors even mention a generalized mast cell tumour, resembling a type of leukaemia, where solid neoplasms are associated with generalized mastocytosis (2).

MATERIAL AND METHOD

In 2020-2021 we diagnosed 11 mast cell tumours in dogs and 2 in cats, out of which 8 through cytological and 5 through histopathological examination.

The cytological examination was done following a fine needle aspiration with a 22G needle and a 5ml syringe, and staining of the obtained material using the May-Grunwald Giemsa method.

The histopathological examination was done on slides obtained through fixation of the tissue fragments in 10% formaldehyde solution, paraffin embedding, 5 µm sectioning and Masson trichrome staining.

All the slides were examined using a Leica DM750 optical microscope with an embedded camera.

The nodular formations may be single or multiple, ulcerated or not and may manifest various degrees of inflammation if traumatised (1).

The diagnostic of these tumours can be done either following a fine needle aspiration and a cytological examination of the obtained material or through histopathological examination following surgical resection. For a more in-depth diagnostic and confirmation immunohistochemistry is also a variant (9, 12).

This study aims to illustrate the major features that should be investigated when examining a mastocytoma through cytology or histopathology to set a correct diagnosis and to formulate a realistic prognosis.

[1] Iași University of Life Sciences (IULS), Faculty of Veterinary Medicine

RESULTS AND DISCUSSIONS

The tumours were located in various parts of the body (head, ear pinnae, trunk), and were both cutaneous and subcutaneous. The macroscopical aspect was that of nodular formations of various sizes, relatively well delimited from the surrounding tissues. No metastases were found.

The histopathological examination revealed a homogenous population of round, oval, polygonal or even spindle-like cells that had basophilic, intracytoplasmic granules and a central, large, round nucleus.

The presence of eosinophils was observed in some tumours (Fig. 1, 3). It is considered that a normal tissular reaction would imply the presence of a relatively large number of eosinophils among proliferated mast cells due to the release of the substances contained within the intracytoplasmic granules. In some neoplasms, these additional cells were not present or were in very low numbers (Fig. 2). However, the number of eosinophils does not seem to correlate with the aggressiveness of the tumour (3).

The granulation pattern also varied between cases. We observed classical mast cells that contained a large number of cytoplasmic granules, sometimes masking the nucleus, but also situations where the granules were either poorly stained, in low numbers or lacking (Fig. 4). This one of the most important differential criteria between round cell tumours and the lack of specific granules can make for a more difficult diagnosis (10). In our practice, we found that both histology and cytology can be useful to highlight this feature.

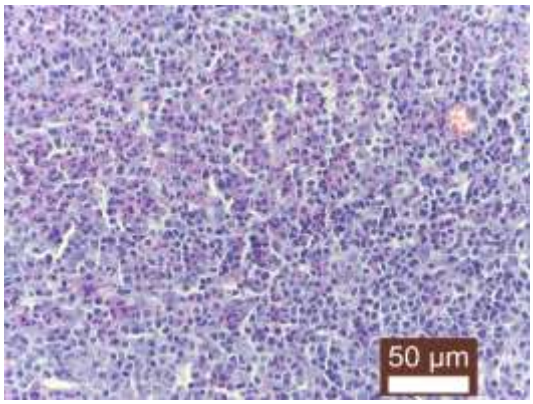

Fig. 1 – Cutaneous mastocytoma. Cords of mast cells and numerous eosinophils. Masson trichrome stain

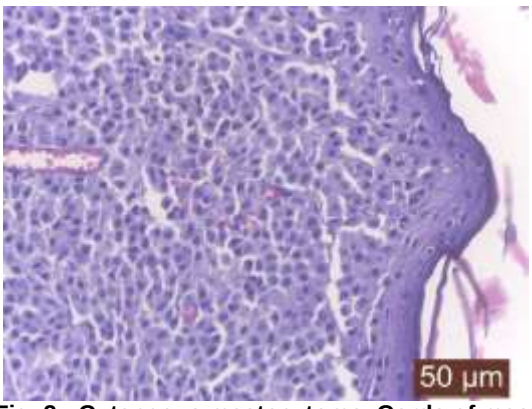

Fig. 2 - Cutaneous mastocytoma. Cords of mast cells without eosinophils. Masson trichrome stain

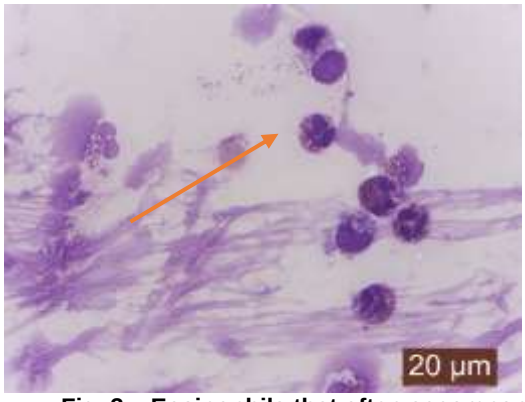

Fig. 3 – Eosinophils that often accompany mast cells in tumoral proliferation. MGG stain

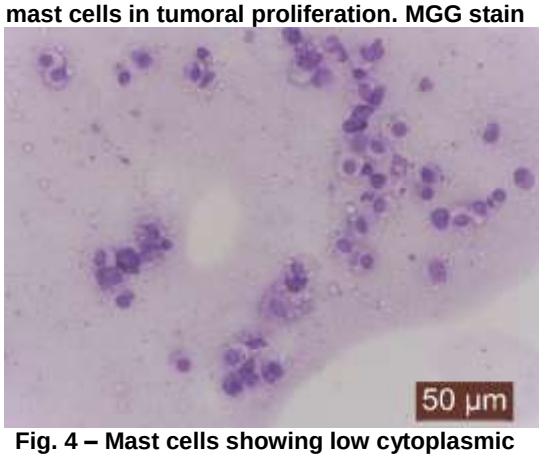

Fig. 4 – Mast cells showing low cytoplasmic granulation. MGG stain

Another feature that aided in evaluating the grade of the tumours is the consistency of cytological characteristics. We observed in some cases that the proliferated mast cell displayed marked anisokaryosis, different cellular shapes (epithelioid, spindle), variable number of nucleoli, nuclear indentations, and inconsistent chromatin pattern (Fig. 5). These features were seen both in histological and cytological preparations.

Also, in some slides, multinucleated cells were present (Fig. 6, 7, 8, 9) with two or even five nuclei. The binucleation is not usually used as a criterion for the grading of tumours, but it is a feature that may indicate an abnormal behaviour of the cells and may be observed both through

histology and cytology (3). The variation of cytological characteristics is considered an important indicator of malignancy (3).

The proliferative behaviour of the tumours varied greatly, with some neoplasms showing almost no mitotic figures whilst others displayed up to 6 mitotic figures on just one microscopical field with 1000x magnification power (Fig. 10, 11, 12).

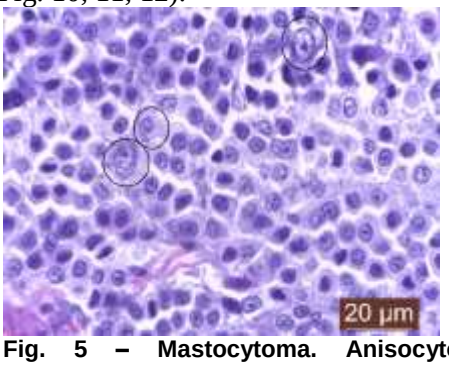

Fig. 5 – Mastocytoma. Anisocytosis, anisokaryosis, anisonucleoliosis. Masson trichrome stain

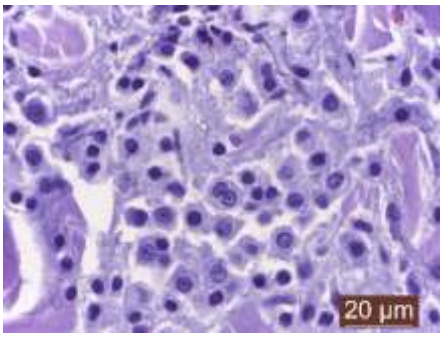

Fig. 6 - Binucleated cell. Mastocytoma. Masson trichrome stain

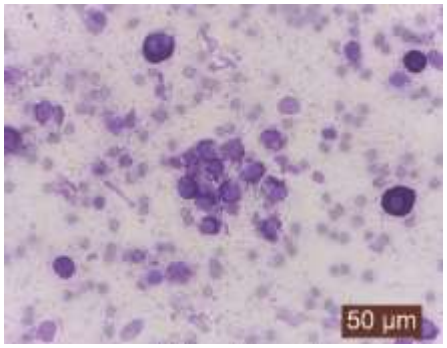

Fig. 7 – Binucleated cell. Mastocytoma. MGG stain

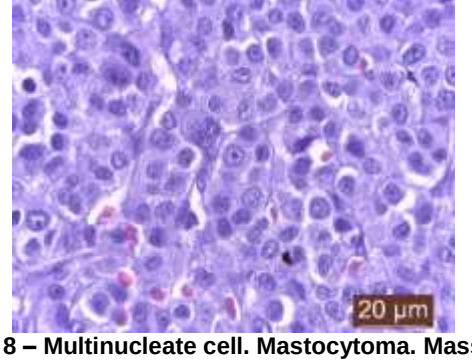

Fig. 8 – Multinucleate cell. Mastocytoma. Masson trichrome stain

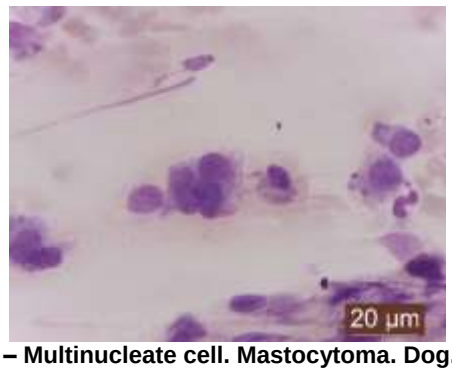

Fig. 9 – Multinucleate cell. Mastocytoma. Dog. MGG stain

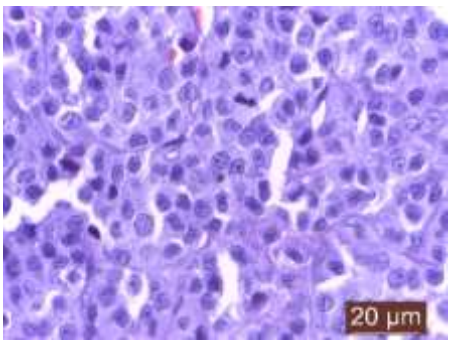

Fig. 10 – Mitosis. Mastocytoma. Masson trichrome stain

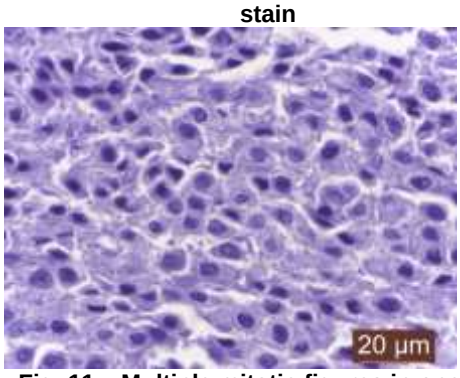

Fig. 11 – Multiple mitotic figures in one field with 1000x magnification power. Mastocytoma. Dog. Masson trichrome stain

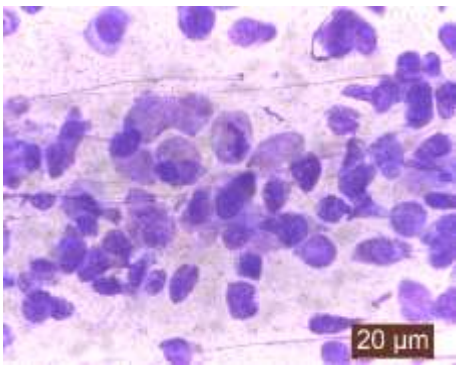

Fig. 12 – Mitotic figure observed through cytology. Mastocytoma. Dog. MGG stain

The cytological examination revealed round cells of a mesenchymal origin that presented basophilic granulations in various degrees. The number of granules varied from case to case, but generally speaking, these were much

more easily observed in cytological slides than in the histopathological ones.

For mast cell tumours a grading system is used to evaluate de malignancy of the neoplasm which categorizes as follows: grade I – well-differentiated, uniform cellular population, cytoplasmic granules present, low mitotic index; grade II – moderately differentiated cells, moderate mitotic index, infiltrative behaviour; grade III – high number of cellular atypia, high mitotic index, lack of cytoplasmic granules, deeply infiltrative behaviour (5). The grading system is meant to be applied on histological slides, but many features can be observed also through cytology, some authors considering that cellular atypia and multinucleation may even be more easily noticeable by using this technique (13).

Other authors have proposed a different grading system with is based only on the mitotic index, the presence of multinucleated cells and abnormal nuclei (7). Mitotic figures can be observed through cytology, as also the other characteristics.

Generally, the interpretation of this grading scheme is heavily influenced by the subjectivity of the examiner and can be inconsistent (8). However, grade II mast cell tumours are generally the most diagnosed type and most of them resolve through surgical excision with only 8% rate of recurrence (15).

CONCLUSIONS

The diagnosis and grading of cutaneous and subcutaneous mast cell tumours can be done both through histopathology and cytology, these techniques allowing for the identification of the necessary criteria.

We consider that when cytological samples are of good quality, the diagnostic and grading of a mast cell tumour can be done to a satisfactory level and with fewer costs or trauma to the patient

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