Canine Mast Cell Tumours
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Mast cells are normal cells found in most organs and tissues of the body, and are present in highest numbers in locations that interface with the outside world, such as the skin, the lungs and the gastrointestinal tract (stomach and bowels). They contain granules of a chemical called histamine which is important in the normal response of inflammation. When mast cells undergo malignant transformation (become cancerous), mast cell tumours (MCTs) are formed. Mast cell tumours range from being relatively benign and readily cured by surgery, through to showing aggressive and much more serious spread through the body. Ongoing improvements in the understanding of this common disease will hopefully result in better outcomes in dogs with MCTs.

Why do dogs get Mast Cell Tumours (MCTs)?

This is unknown, but as with most cancers is probably due to a number of factors. Some breeds of dog are predisposed to the condition, and this probably suggests an underlying genetic component. Up to 50% of dogs also have a genetic mutation in a protein (a so-called receptor tyrosine kinase protein) which inappropriately drives the progression of mast cell cancer cells.

The role of these receptor tyrosine kinases in canine MCTs is very interesting and also important in understanding the role and mechanisms of the newer drugs available for treating canine MCTs: the tyrosine kinase inhibitors (see Treatment Options).
**Where in the body do MCTs occur?**

The vast majority of canine MCTs occur in the skin (cutaneous) or just underneath the skin (subcutaneous). In addition, they are occasionally reported in other sites, including the conjunctiva (which lines the eyeball and eyelids), the salivary glands, the lining of the mouth and throat, the gastrointestinal tract, the urethra (the tube from the bladder), the eye socket and the spine.

**Breed predisposition**

Some breeds of dog are predisposed to getting mast cell tumours (see table).

<table>
<thead>
<tr>
<th>Some of the breeds predisposed to mast cell tumours</th>
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<tbody>
<tr>
<td>Australian Cattle Dog</td>
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<td>Beagle</td>
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<td>Boxer</td>
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<td>Boston Terrier</td>
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<td>Bull Terrier</td>
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<td>Bullmastiff</td>
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<td>Cocker Spaniel</td>
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<td>Dachshund</td>
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<td>English Bulldog</td>
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Some breeds tend to get MCTs more commonly in certain locations, but more importantly MCTs sometimes behave in a certain way in certain breeds. For example, Pugs are renowned for getting large numbers of low-grade (less aggressive) tumours, and Golden Retrievers commonly get multiple tumours. Boxers with MCTs are generally younger than other breeds, and more commonly have lower-grade MCTs with a more favourable prognosis. In contrast, Shar-Pei’s usually get aggressive high-grade and metastatic (spread to other sites) tumours, often at quite a young age. MCTs in Labrador Retrievers are also frequently more aggressive than in other breeds.

**Age**

The average age of dogs at presentation is between 7.5 and 9 years, although MCTs can occur at any age.

**Paraneoplastic syndromes and complications of granule release**

Cancerous mast cells contain 25 to 50 times more histamine than normal mast cells. Histamine is a very inflammatory chemical, and therefore explains why some MCTs wax and wane or suddenly increase in size due to inflammation – especially after they have undergone biopsy/needle aspiration (see diagnosis). Histamine also causes the stomach lining to produce more acid – this can result in stomach ulcers, causing signs such as vomiting or black, tarry stools (this appearance is due to the presence of digested blood coming from the ulcer).
The outlook (prognosis) – can we predict whether a dog will do well or not do well due to their MCT?

No single factor accurately predicts the biological behaviour or response to treatment in dogs affected by MCTs. Various clinical factors can influence the outcome, such as whether it has spread, potentially the breed and also the tumour location.

Tumours in the nail bed, inside the mouth, on the muzzle, in the groin area and in those sites where the skin meets mucus membranes (mucocutaneous junctions), are often correlated with a worse prognosis than those in other parts of the body, although this is not always the case.

The single most valuable factor in predicting the outcome for most patients is the grade of the tumour when assessed under a microscope (the histological grade).

How is MCT diagnosed?

Cytology
Cytology means looking at the cells under a microscope, and the sample for this is usually obtained by ‘fine-needle aspirate’. Fine-needle aspirates of MCTs involve taking a small sample of the tumour with a thin needle. This is generally a straightforward procedure which can be done conscious and without sedation in most patients. It should be performed prior to any surgery, because a pre-operative diagnosis of MCT influences the type and extent of surgical intervention required.

Biopsy
This involves taking a larger piece of tumour tissue and sending it away to a pathologist for analysis. This can be performed to help decide on the best treatment, or it can be performed when the tumour has been removed to find out the grade of the tumour.

The pathologist looks at the sample of the tumour under the microscope and performs grading to indicate how aggressive the tumour is.

MCT grade and outlook (prognosis)

Low grade (grade 1) tumours and around 75% of intermediate (grade 2) tumours are cured with complete surgical excision. Unfortunately, most high grade (grade 3) tumours and around 25% of intermediate grade tumours have already spread by the time they are diagnosed (even if this spread cannot be detected on scans at the time of diagnosis). These cases benefit from chemotherapy treatment. In some dogs, further analysis of the biopsy samples is useful in determining the best management options.

The tumour grade is very important in determining the appropriate therapy for dogs with MCTs.

Further investigations – ‘staging’ of the MCT

As well as performing fine needle aspiration and biopsies of the MCT to determine its grade, additional tests may be required to determine the stage of the tumour i.e. whether or not it has already spread. These further tests can include sampling of nearby lymph nodes, chest X-rays and abdominal ultrasound scanning. Which tests are performed will depend on a number if factors, and these will be discussed with you by the specialist.

Treatment options

Surgery is the cornerstone of management of MCTs, and complete surgical removal is often curative in dogs with low or intermediate grade MCTs. However, to achieve a cure, in some circumstances a significant amount of tissue surrounding the tumour must be excised to ensure that all the tumour cells are removed. This can require a high level of surgical experience and expertise, in order to perform complex reconstructive surgical techniques – we are able to provide this expertise at Willows.

If complete removal is not possible, or where the tumour appears to be more aggressive (e.g. high-grade) then radiation therapy and chemotherapy treatments become more useful. The optimum treatment depends on the tumour grade, stage and other factors unique to the individual dog.

Chemotherapy can be used -
• before surgery to shrink a tumour down
• after surgery if the tumour appears more aggressive on analysis of a biopsy
• as palliative treatment if a tumour cannot be removed, has already spread or if an owner does not want to pursue surgical intervention.

Fortunately, the drugs used for chemotherapy in MCTs are extremely well tolerated and most owners are very happy with their dog’s quality of life on treatment. A new group of drugs...
called tyrosine kinase inhibitors is also available – these block proteins (called tyrosine kinases) which are found on the surface of cancerous mast cells. They can be used where tumours cannot be surgically removed or have recurred despite previous treatments. They can have some side effects, but most dogs tolerate these drugs well.

Fortunately, Willows has European and RCVS Recognised Specialists in the fields of both medical and surgical oncology, and is a leading centre for cancer treatment in dogs and cats. The expertise provided by a combination of medical and surgical cancer specialists has particular advantages in MCT treatment.

**Summary**

Dogs have a unique risk to develop MCTs in the skin, and they can be frustrating to manage, even for specialist oncologists.

Knowing what the best treatment is for an individual dog depends on knowing the grade of the MCT and whether or not it has already spread.

It is important to recognise that most dogs can survive for a long time with mast cell cancer and can be cured. However, some dogs have a more aggressive type of MCT and treatment in these cases is of a more palliative nature, trying to improve patient comfort and life expectancy, but without being able to achieve a cure.

**Why should I bring my dog to Willows for diagnosis and management of lymphoma?**

Willows is unique in the UK in having recognised, accredited cancer specialists working in both the medical and surgical aspects of tumour diagnosis and management.

We aim to provide the best possible care and treatment for your pet in our state-of-the-art hospital. Our oncologists work closely with the imaging Specialists who run Willows sophisticated imaging facilities, as well as with expert anaesthesia and analgesia Specialists and 24-hour veterinary and nursing staff, all of whom help to give our patients the very best treatment and care.

**If you have any queries or concerns, please do not hesitate to contact us.**
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