

Intracranial meningiomas in cats

Author : Lara A Matiasek

Categories : [Vets](#)

Date : September 20, 2010

Lara A Matiasek discusses signs of feline meningioma and diagnostic investigation methods, plus takes us step by step through the surgical procedure

MENINGIOMAS are the most common primary brain tumours in cats.

Clinical signs depend on the tumour location, but often the initial presentation in cats is unspecific (lethargy, behavioural change). Feline meningiomas are often fibrotic and, in contrast to dogs, usually not infiltrative. Therefore, surgical removal is easier and the postoperative long-term prognosis is good.

Location and behaviour

Intracranial meningiomas are mainly located in the rostral cranial fossa in cats, however they may also occur in the middle and caudal cranial fossa. They are often found in the region of the cerebral convexities, the falx cerebri or the transverse fissure and originate from arachnoid cap cells. In addition, intraventricular meningiomas, which arise from the tela choroidea, have been described – in particular, associated with the third ventricle. Multiple meningiomas occur in 14 to 17 per cent of affected cats. Meningiomas are very slow-growing tumours, and various histological subtypes have been described in the cat. Even though they are considered histologically benign, their biologic behaviour, as a space-occupying lesion, may be malignant.

Signalment and clinical signs

These tumours mainly develop in feline patients older than 10 years. Meningiomas in young cats are rare, and have been associated with mucopolysaccharidosis type one. There is a slight predominance of males among affected cats. No breed predisposition exists.

Clinical signs depend on the location of the mass. Forebrain meningiomas may cause changes in mental status or behaviour:

- ipsilateral circling;
- contralateral blindness/menace deficit despite normal pupillary light reflex and palpebral reflex; and
- contralateral deficits in proprioception and facial sensation.

In dogs, the main initial clinical sign is seizures, whereas in cats, only 11 to 29 per cent are reported to reveal seizure activity. The most common initial clinical signs in feline patients with forebrain meningiomas are lethargy and behavioural changes.

Caudal fossa meningiomas can result in cranial nerve deficits, vestibular signs, hemi or tetraparesis, and may cause cerebellar signs (dysmetria, ataxia, intention tremor). In some cases, precise neurolocalisation is not possible, as secondary effects, such as brain oedema, obstructive hydrocephalus, brain herniation and secondary syringomyelia may occur ([Figures 1a](#), [1b](#) and [1c](#)).

However, as feline meningiomas are extremely slow growing, cats can adapt clinically for a long time before any abnormalities are displayed. Reportedly, up to 50 per cent of affected cats do not manifest any clinical signs and the diagnosis may be an incidental finding during postmortem examination.

Diagnostic investigations

A minimum database for any patient with clinical signs of brain dysfunction should be obtained (haematology, serum biochemistry and, ideally, urine analysis).

Survey radiographs of the thorax and abdominal ultrasonography can help rule out a primary tumour or malignancy elsewhere in the body. However, meningiomas do not typically metastasise.

Advanced imaging techniques to diagnose intracranial meningiomas include CT and MRI. Meningiomas on CT usually present as an extra-axial, extensive contrast-enhancing mass with effect on brain symmetry. Secondary calvarial hyperostosis above the mass is a common finding in cats ([Figure 2a](#)), which might well be detected radiographically. MRI provides superior soft-tissue detail to CT, allowing the visualisation of more distinct features of the tumour, such as cyst formation, haemorrhage, necrosis (the latter is a much more common feature in dogs than in cats)

and secondary effects on the brain – for example, oedema.

With CT, lesions might be obscured in certain regions of the brain (for example, caudal fossa) due to beam hardening artefact, which does not occur with MRI. Typical MRI features of a meningioma are a well-delineated, extra-axial, typically strongly contrast-enhancing mass ([Figures 2a](#) and [2b](#)). Contrast enhancement may be homogenous or heterogenous, and rarely primarily peripherally. In T2-weighted images the mass is mostly of increased signal intensity when compared to cerebral grey matter, and iso to hypo-intense in T1-weighted images. A “dural tail” sign ([Figure 3](#)), even though not pathognomonic, is often associated with meningiomas. This is a linear enhancement of thickened meninges adjacent to the mass seen on post-contrast images. It is considered to be due to either neoplastic infiltration of the meninges beyond the margins of the mass, an inflammatory response or meningeal hypervascularity. Calcification of meningiomas may be present, and result in a signal void on T1 and T2-weighted and gradient-echo images on MRI, or hyper-density on CT.

If the imaging criteria are consistent with a meningioma, a cerebrospinal fluid (CSF) tap can be avoided – in particular, if there are signs of increased intracranial pressure. CSF changes are usually non-specific, including albuminocytological dissociation and occasional mild, possibly neutrophilic, pleocytosis, even though the latter feature is more likely to be found in dogs.

Therapy and prognosis

Management strategies for intracranial meningiomas include palliative and primary therapies. Palliative treatment includes glucocorticoids at an anti-inflammatory dosage (for example, prednisolone 0.5mg/kg to 1.0mg/kg sid). This will decrease permeability of tumour capillaries, blood supply to the tumour, and any inflammation associated with the mass. CSF production will be reduced. These changes result in decreased brain oedema and reduced intracranial pressure and, therefore, reduced clinical signs. Anti-epileptic drugs (for example, phenobarbitone 1.5mg/kg bid) can be given if the patient reveals seizures. However, depression and ataxia might be enhanced through this drug. As meningiomas in cats are usually extremely slow growing, and clinical signs can initially be quite unspecific, the tumour is often very large at the time of diagnosis. Therefore, palliative treatment will give survival times most likely of a few weeks to a couple of months only, and the owner might feel fairly soon that the cat has no good quality of life.

Surgical removal is the treatment of choice for operable intracranial meningiomas in cats. Brain surgery requires careful planning, including measurement on CT or MRI regarding the size of the tumour and exact location in respect to visible and palpable bony landmarks (for example, occipital protuberance). It should also be reserved to centres with dedicated anaesthetists and experienced neurosurgeons.

General approaches to the brain include:

- transfrontal;

- rostromentorial,
- caudomentorial and
- suboccipital craniotomy/craniectomy, or combination of these.

For tentorial meningioma, a unilateral temporal supracerebellar transtentorial approach has been described. A modified temporal approach might be chosen for temporal basal meningiomas. The most common approach, at the author's institution, is rostromentorial ([Figure 4](#)). With craniotomies, the excised bony plate is replaced during closure, with craniectomies it is not replaced. In the author's opinion, craniectomies should be performed for extra-axial masses, and the removed bone plate should also be submitted for histopathology to assess possible bone infiltration.

The patient should be securely positioned in sternal recumbency – either fixed in a head stand or carefully taped to the table ([Figure 5](#)) – and care must be taken not to obstruct the jugular veins.

After incision of the skin and the underlying muscles, the area of skull to be removed is located and marked. The author uses a high-speed pneumatic drill and burrs a small hole at each corner of the proposed defect ([Figure 6a](#)). However, the extent of the craniotomy/craniectomy might be determined by the location of venous sinuses (dorsal sagittal and transverse sinus). A trough, connecting each mark, is drilled down to the inner periosteum ([Figure 6b](#)). The craniectomy flap is then gently elevated. Care needs to be taken of the middle meningeal artery when approaching the lateral cerebral hemisphere. Unless the dura is adhering to the craniectomy flap, a durotomy needs to be performed. It is important to visualise clear margins of normal brain tissue adjacent to the meningioma ([Figure 7](#)) before gently freeing the tumour from the surrounding brain.

Feline meningiomas mostly peel out quite easily as a solid mass ([Figure 8](#)). However, care needs to be taken that at least 75 per cent of the meningioma is freed from surrounding brain tissue before removal is attempted, as otherwise, in-toto removal is difficult. In cases where this is not possible, due to anatomic location (for example, tentorial or deep-falx meningiomas), a technique consisting of tumour fenestration and enucleation can be considered.

The surgical defect can be covered with a lyophilised sheet that will enhance fibroblast growth before overlying fascia, muscle and skin are closed. If the defect is very large, a cranioplasty by means of moulded polymethylmethacrylate can be considered. However, in the author's experience, this is not necessary.

A one-to-one intensive care postoperative monitoring for the first 48 hours after surgery is essential. If the patient is stable after that period, close monitoring until discharge – which can normally be expected about one week after the surgery – is still required.

In contrast to dogs, adjuvant postsurgical radiotherapy is usually not necessary in cats and might

only be considered if surgical resection is macroscopically incomplete, or the tumour reoccurs and repeat surgery is not an option. Some authors administer hydroxyurea after surgery in an attempt to diminish tumour regrowth.

There is a lack of convincing data regarding radiotherapy or chemotherapy alone for the treatment of feline intracranial meningiomas and surgery is considered the treatment of choice.

The outcome for cats with intracranial meningiomas that undergo tumour excision alone is good ([Figures 9a](#), [9b](#) and [9c](#)). Even though perioperative mortality is about 20 per cent, median survival after surgical removal is 26 months. Recurrence is reported in about 22 per cent of cats within a follow-up period ranging from 18 to 47 months, and about three-quarters of patients are recurrence-free after 27 months.

Even though the cat's activity should still be restricted for two to three months following surgery, it can, for the majority of cases, be expected that the cat will eventually achieve the same quality of life it had before it started showing signs.