

## Evaluation of Computed Tomography, Clinical and Surgical Findings of Two Cats with Paranasal Tumours

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### Abstract

Feline paranasal tumours are relatively rare and require sufficient imaging for both diagnostic success and planning the treatment of cases. Radiography is inferior to computed tomography for diagnostic purposes near sinonasal cavities and tissues surrounding them, it is widely accepted that CT is the best imaging technique for tumours of this area. With the advent of 3D rendering software, it became possible to show borders of a lesion in a different manner. Such images are simpler to assess even to those with little to no experience with conventional CT. The preoperative CT images of two cats with paranasal area tumours were rendered in this study in hopes of providing better orientation to the surgeon. While the soft tissue details of 3D images were not adequate, they were useful in seeing outline of the tumours and determining the extent of bony destruction. The intraoperative findings of both cats confirmed that the 3D CT findings were useful in orientation and determination of bony defects, as the images were instrumental in determining the limits of the skull. However, the rendered images were inadequate to provide detail on soft tissue borders so conventional CT images were relied on to determine deep soft tissue borders in both cases.

**Keywords:** *Computed tomography, Paranasal tumour, Cat*

## Paranasal Tümörü Olan İki Kedide Bilgisayarlı Tomografi, Klinik ve Cerrahi Bulguların Değerlendirilmesi

### Özet

Kedilerde paranasal tümörler nispeten nadir gözlenir ve başarılı tanı ile sağaltımın planlanması için yeterli görüntüleme gerektirirler. Sinonazal kavitelelerin ve bunları çevreleyen yumuşak dokuların görüntülenmesi için radyografi bilgisayarlı tomografiye (BT) göre daha başarısızdır, bu bölgenin tümörlerinin görüntülenmesi için en iyi yöntemin BT olduğu kabul edilmektedir. Üç boyutlu biçimlendirme yazılımlarının gelişimiyle lezyon sınırlarını farklı biçimde göstermek mümkün olmuştur. Bu görüntüler, uygulayıcının normal BT görüntülerini inceleme konusunda deneyimi kısıtlı olsa bile daha kolay değerlendirilebilmektedir. Bu çalışmada, operatöre daha iyi oryantasyon sağlama amacıyla paranasal bölgede tümörü olan iki kedinin preoperatif BT görüntüleri biçimlendirilmiştir. Her iki kedinin intraoperatif bulguları, üç boyutlu BT ile elde edilen görüntülerin, kafatası sınırlarının belirlenmesini sağladığı için operasyona hazırlık ve kemik dokudaki defektlerin bulunması konusunda yararlı olduğunu gösterdi. Ancak, her iki olguda da, biçimlendirilmiş görüntüler, yumuşak doku sınırlarını belirlerken detay yetersiz kaldığı için, derin yumuşak doku sınırlarını değerlendirmek için, normal BT kesitleri kullanıldı.

**Anahtar sözcükler:** *Bilgisayarlı tomografi, Paranasal tümör, Kedi*

### INTRODUCTION

Nasal and paranasal tumours are rarely seen in cats and the previously recorded incidences of these tumours are between 1% to 8.4%<sup>[1]</sup>. The most commonly encountered type of paranasal tumours in the cat are lymphomas<sup>[2]</sup>. It is a well known fact that most feline nasal and paranasal tumours are malignant<sup>[1]</sup>. Most aggressive tumours

originating in the nasal cavity tend to expand and infiltrate into local tissues, obliterating nearby bone and soft tissue structures<sup>[3]</sup>.

Radiography is not recommended for the diagnosis of paranasal tumors due to superimposition<sup>[4]</sup>. Computed tomography images are considered superior to radiography because they reduce the risk of misdiagnosis caused by



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superimposition of neighbouring structures and provide better anatomical detail [5,6]. Computed tomography can also allow detection of bone lysis and tumour extension to nearby tissues [5]. Those findings were previously used to differentiate tumours from nasal inflammation in humans and dogs [5]. Bone lysis seen as a CT finding is especially suggestive of neoplasia. Because of these properties CT has been used to determine the surgical approach to nasal and paranasal tumours [4].

This paper details the clinical, CT and surgical findings of 2 cats with paranasal sinus tumours.

## CASE HISTORY

Both patients underwent complete physical and clinical examinations with bloodwork including complete hemogram and serum biochemistry. Craniocaudal, laterolateral and dorsoventral x-rays of the head and two way thorax x-rays of the thorax were taken. Rhinoscopy could not be attempted at the 1<sup>st</sup> case because the nostril was constricted and failed to yield clear images in the 2<sup>nd</sup> case.

Spiral CT scans (Xpress/GX model TSX 002a Toshiba, Toshigi-Ken) of the cats were taken in sternal recumbency under general anaesthesia. Image acquisition parameters were 120 kV, 250 mAs, with a slice thickness of 1mm. Window level was set for 200 HU and window width was set at 900 HU for the assessment both patients. A 64 bit image rendering software (Osirix®, Pixmeo SARL, Bernex - Switzerland) was used to convert conventional CT images.

Both cats were anaesthetized using the same protocol for surgery. The anaesthesia was induced with propofol (6 mg/kg, IV) before intubation and maintained with isoflurane in oxygen. Both cats received one dose of Cefazolin (20 mg/kg, IV) before surgery. Meloxicam was used for pain management (0.2 mg/kg, SC). Ringer's lactate solution was given during the operation (20 mL/kg/h). Amoxicillin clavulonate was administered for 7 days to the 1<sup>st</sup> case (20 mg/kg, PO, BID).

**CASE 1:** A 3 year old, male, mix breed cat was presented to our clinic with an enlargement of the right eye and a small mass encompassing the right nasal and frontal area. The nasal tumour, which was approximately 3 cm in diameter grew to its final size in about 3 months' time (Fig. 1).

The right submandibular lymph node was extremely large on palpation. Fine needle aspiration biopsies were collected from the tumour and submandibular lymph nodes and sent for pathological evaluation. Cytology results indicated lymphoma. The CT findings of the patient revealed a mass originating from just over the right nostril extending up to

the frontal bone of the skull, with a mediocre invasion of the right orbit, pushing the right eye cranially and laterally. No bone lysis or septal deviation was seen in the nasal bone or skull, and there was some soft tissue contrast inside the right frontal sinus (Fig. 2).

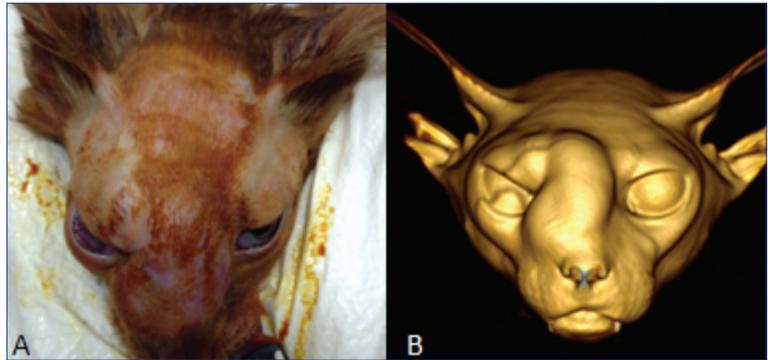


Fig 1. The preoperative (A) and 3D rendered CT image (B) of the 1<sup>st</sup> case

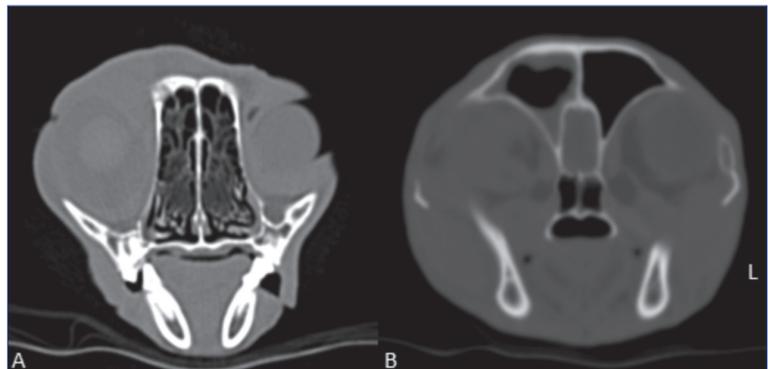


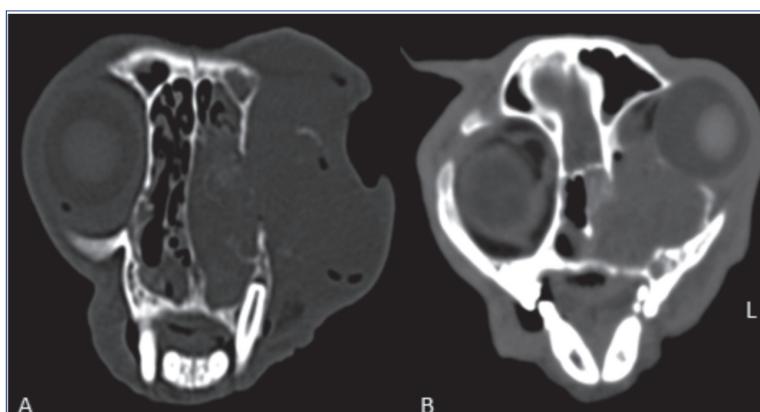
Fig 2. The mass over the right orbit and nasal bone with no invasion to the nasal cavity (A) and increase in soft tissue density on in the right frontal sinus (B)



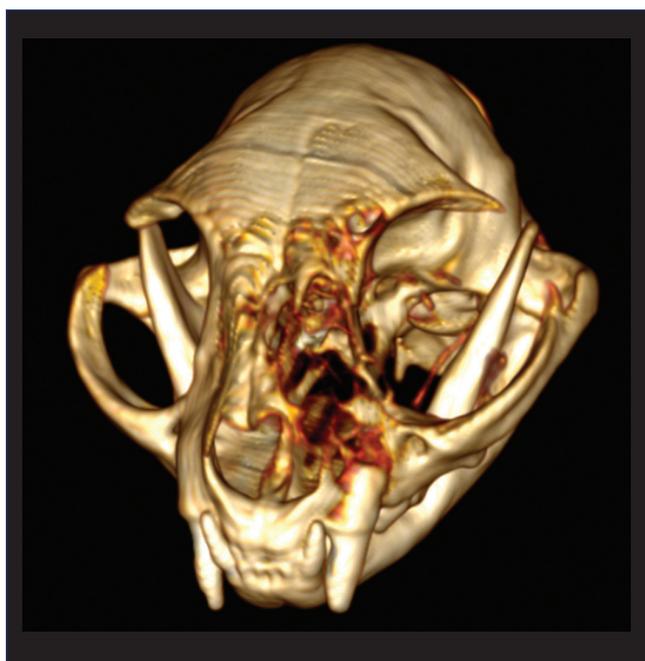
Fig 3. No bone lysis or deformation is seen on the 3D rendered image of the 1<sup>st</sup> case



**Fig 4.** The clinical (A) and 3D rendered CT image (B) of the 2<sup>nd</sup> case



**Fig 5.** The mass completely filling and extending outward from the maxillar area, obliterating the bone and invading the nasal area completely and slightly deviating the nasal septum (A). The orbital part of the tumour is pushing the eye laterally, invading the nasal cavity and frontal sinus (B)



**Fig 6.** Extensive bone lysis on left nasal bone and orbital lamina

The patient's 3D CT rendering showed no lysis to the bones of the skull (*Fig. 3*). The patient owner did not accept chemotherapy due to probable side effects so the cat was taken into surgery to improve his quality of life. The tumour had mild adhesions to nearby soft tissues and bones and could be easily excised. The exposed frontal and orbital regions of the skull were intact as was seen in 3D rendered images. A small sinusotomy defect was made to irrigate the right frontal sinus. The soft tissue contrast inside the sinus was confirmed to be mucous content during the operation. Pathology identified the mass as low grade lymphoblastic lymphoma. In the postoperative period the cat healed fine in 10 days and the stitches were removed. After five months, the tumour recurred in the same location and the cat was euthanized in accordance with the owner's wishes.

**CASE 2:** A four year old, male, mix breed cat was presented to our clinic with a large tumoral mass on the left side of its head. The patient history was unclear as the cat was mostly free-roaming and the owner only saw it at the time of feedings. The cat had bloody-mucoid discharge from the left nostril. The left eye was enlarged and slightly exophthalmic and the conjunctive tissue surrounding it was oedematous and hyperaemic (*Fig. 4*). The mass was solid and unmoving during palpation.

Fine needle aspiration and tru-cut biopsies were performed during short term propofol anaesthesia. Fine needle aspiration biopsies were obtained both from the mass and the closest (left) submandibular lymph node. Cytology results were inconclusive. Computed tomography images of the head were taken from the cat's head to determine the dimensions and invasion margins of the tumour. The cranial margin of the tumour originated from both nasal and maxillary regions, extending caudally to both the frontal area and the temporal boundary of the left eye. The tumour completely filled the left nasal cavity, deviating the nasal septum slightly to the right, the ventral wall of the frontal sinus was completely obliterated and the frontal sinus was mostly filled by the mass. Some fluid/soft tissue contrast was also seen inside the left sphenoid sinus. There was no lysis on the sinus wall neighbouring the brain. There was also some soft tissue contrast presence in the right frontal sinus, separate from the mass. The left eye deviated from the orbit, laterally and caudally, because of the mass, and there was bone lysis on the orbital lamina (*Fig. 5*).

After 3D rendering was done to show the skull, the lysis of the bony structures could be clearly defined (*Fig. 6*).

Surgery was chosen as the course of action in accordance with the patient owner's wishes after all possible

complications were explained. Amoxicillin Clavulonate was administered for 1 week before surgery, until the bloody discharge dissipated. The mass did not come off easily over the bone and orbit, necessitating aggressive resection. The void regions that could be seen in 3D rendered images were filled with tumour masses. In addition to successfully remove the tumour, a sinusotomy was performed in addition to removing some of the remaining bony coverage of the area and all of the exposed mass was excised. The left eye was also enucleated. The tumour's margins were not very clear but all of the intra and periocular muscles were removed. The patient died 4 hours after the surgery due to respiratory collapse followed by cardiac failure. Histopathological examination identified the mass as rhabdomyosarcoma.

## DISCUSSION

Two cases were presented to our hospital at a relatively advanced stage of their respective tumours so the clinical signs were rather obvious in differentiating the disease from rhinitis. Both had facial deformity, exophthalmus, epiphora, nasal discharge, and sneezing which are commonly known clinical symptoms of nasal tumours [7]. Paranasal tumours are more likely to be seen in older cats (8+ years), but reports of younger cases are present [1]. Both our patients were young adults, 3 and 4 years old respectively, which is common.

The recommended evaluation of paranasal tumour patients include bloodwork, serum biochemistry, urinalysis and orthogonal thorax and nasal radiographs [7]. Normal diagnostic procedure in nasal or paranasal tumour patients should also include rhinoscopy, biopsy, CT evaluation [4] and both cases in this report underwent these evaluations.

The most commonly encountered paranasal tumours in the cat are lymphomas, followed by squamous cell carcinomas [4,7]. Fine needle aspiration biopsies were collected from the closest lymph nodes of both cats in addition to other biopsies as suggested before [7]. When fine needle biopsy cytologies and tumour histopathology were evaluated in the 1<sup>st</sup> case, low grade lymphoblastic lymphoma was diagnosed. However the 2<sup>nd</sup> case was diagnosed with rhabdomyosarcoma, which originates from striated muscles [8]. This led us to believe the mass did not originate from the nasal cavity and invade the bulbar area but the other way round. Though retrobulbar tumours occur rarely in cats, some may cause bone lysis and invade sinonasal cavities [9].

The advantage of CT imaging over radiography is well known [4,6,10]. The addition of software that allows 3D rendering of images provide the clinician a better orientation in our opinion. In our opinion 3D CT images allow better visualisation of bony structures and make it easier to determine the margins of the operation. CT imaging provides "slices" of every possible location on the scanned locus, 3D software provides a better overview of the bony structures and simplifies explanation of lesions. In a recent study, the 3D CT views and prints were obtained and it was found to be successful in preoperative planning [11].

In our cases, the rendered images provided a better orientation in explaining and understanding the extent of deformation/obliteration on bones, mainly because there is little or no experience needed for reading 3D CT scans. In the cases reported here, the 3D rendered images were useful in showing the outside borders of lesions and determining the damage on bony structures. This helped estimate surgical approach beforehand. To determine the changes in deeper soft tissues we had to rely on cross-sectional CT images, 3D rendering could not provide a view of multiple layers of soft tissue. This may be because of poor rendering technique or limitations of the software used.

In conclusion, 3D rendering was a helpful tool to determine limits of invasive masses near sinonasal cavities in the aforementioned cases. But in our cases, only the outline of the head and skull provided useful images, rendering of soft tissues did not yield valuable information. Considering that, we think 3D rendering is a valuable technique when used in addition to conventional CT for imaging paranasal tumours.

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## REFERENCES

- Mukaratirwa S, Van der Linde-Sipman J, Gruys E:** Feline nasal and paranasal sinus tumours: clinicopathological study, histomorphological description and diagnostic immunohistochemistry of 123 cases. *J Feline Med Surg*, 3, 235-245, 2001. DOI: 10.1053/jfms.2001.0141
- Psalla D, Geigy C, Konar M, Marçal VC, Oevermann A:** Nasal acinic cell carcinoma in a cat. *Vet Pathol Onl*, 45, 365-368, 2008. DOI: 10.1354/vp.45-3-365
- MacPhail CM:** Surgery of the Upper Respiratory System. In, Fossum TW (Ed): *Small Animal Surgery Textbook*. 4<sup>th</sup> ed., 948-954, Elsevier Health Sciences, Philadelphia, 2013.
- Tromblee TC, Jones JC, Rttue AE, Dru Forrester S:** Association between clinical characteristics, computed tomography characteristics, and histologic diagnosis for cats with sinonasal disease. *Vet Radiol Ultrasound*, 47, 241-248, 2006. DOI: 10.1111/j.1740-8261.2006.00134.x
- Schoenborn WC, Wisner ER, Kass PP, Dale M:** Retrospective assessment of computed tomographic imaging of feline sinonasal disease in 62 cats. *Vet Radiol Ultrasound*, 44, 185-195, 2003. DOI: 10.1111/j.1740-8261.2003.tb01269.x
- Kuehn NF:** Nasal computed tomography. *Clin Tech Small Anim Pract*, 21, 55-59, 2006. DOI: 10.1053/j.ctsap.2005.12.010
- Malinowski C:** Canine and feline nasal neoplasia. *Clin Tech Small Anim Pract*, 21, 89-94, 2006. DOI: 10.1053/j.ctsap.2005.12.016
- Nakaichi M, Itamoto K, Hasegawa K, Morimoto M, Hayashi T, Une S, Taura Y, Tanaka K:** Maxillofacial rhabdomyosarcoma in the canine maxillofacial area. *J Vet Med Sci*, 69, 65-67, 2007. DOI: 10.1292/jvms.69.65
- Attali-Soussay K, Jegou JP, Clerc B:** Retrobulbar tumors in dogs and cats: 25 cases. *Vet Ophthalmol*, 4, 19-27, 2001. DOI: 10.1046/j.1463-5224.2001.00123.x
- Reetz JA, Mai W, Muravnick KB, Goldschmidt MH, Schwarz T:** Computed tomographic evaluation of anatomic and pathologic variations in the feline nasal septum and paranasal sinuses. *Vet Radiol Ultrasound*, 47, 321-327, 2006. DOI: 10.1111/j.1740-8261.2006.00147.x
- Dorbandt DM, Joslyn SK, Hamor RE:** Three-dimensional printing of orbital and peri-orbital masses in three dogs and its potential applications in veterinary ophthalmology. *Vet Ophthalmol*, Early Access Article, Jan 22, 2016. DOI: 10.1111/vop.12352