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MDCT Images of the Head of a Horse with Malignant Melanoma

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A 17-year-old, gray Thoroughbred gelding was presented with recurrent epistaxis following exercise for over one year. Multidetector-row computed tomographic (MDCT) examination of the head performed under general anesthesia indicated the presence of malignant melanoma. MDCT examination revealed the exact location and size of masses in the right guttural pouch first identified by endoscopy and in the left guttural pouch unidentified by endoscopy. MDCT examination revealed the presence of a blood clot that filled the right maxillary sinus. The horse was euthanized due to poor prognosis as a riding horse and the owner's decision, and MDCT findings were confirmed by postmortem examination. MDCT is suggested as a useful technique for diagnosis of head problems such as neoplasia and sinusitis which are typically difficult to detect by endoscopy.

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Melanoma is a common disease in aged gray horses, and is slow growing despite being metastatic and invasive [6]. Melanoma in gray horses is most commonly of a primary dermal [3], but rarely of a non-primary dermal etiology [6]. Equine melanoma is reported to represent 3.8% of all equine tumors [5] and has 4 distinct clinical syndromes: melanocytic nevus, dermal melanoma, dermal melanomatosis, and anaplastic malignant melanoma [7]. While malignant melanoma invades the whole body, benign melanoma is usually localized and is not metastatic [6]. However, equine benign melanoma may become malignant with time metastasizing to the whole body. When that happens, metastasis is frequently observed in all lymph nodes, liver, the spleen, skeletal muscles, and lungs [3].

In live animals, diagnosis of melanoma is usually confirmed by histopathological tests using biopsy samples [4]. However, it is difficult to detect the presence of melanomatous masses in areas that cannot be palpated. It is therefore necessary to establish a diagnostic technique that enables identification of melanomatous masses in such parts of the body.

A 17-year-old, gray Thoroughbred gelding riding horse (body weight, 480 kg) was presented at the hospital of Obihiro University of Agriculture and Veterinary Medicine with recurrent epistaxis following exercise for over one year. Masses at the base of the right and left ears had been gradually enlarging since epistaxis was first recognized 1 year earlier. At that time, only traces of epistaxis were observed following exercise. However, epistaxis persisted thereafter as frequently as once a week, despite the use of hemostatic and other treatments.

Physical examination revealed normal body temperature (38.2°C), heart rate (36 beats/min), and respiration rate (24/min). Swellings of approximately 10 cm protruding bilaterally were found on the dorsal aspect of the parotid areas. Blood tests revealed no significant abnormalities (white blood cell count: 9000/ μ l, hematocrit: 43.0%, total protein: 7.0 g/dl). Blood chemistry tests revealed a high blood glucose level (344 mg/dl), but the results of other tests were within normal range.

Plain X-ray examination showed opaque areas in the nasal meatus and guttural pouches (imaging conditions: 80 kV, 30 mA, 0.2 second, XG-IV, Fuji Film, Japan) (Fig. 1). Examination using an endoscope (EVE EG300FP, FUJINON, Japan) revealed previous

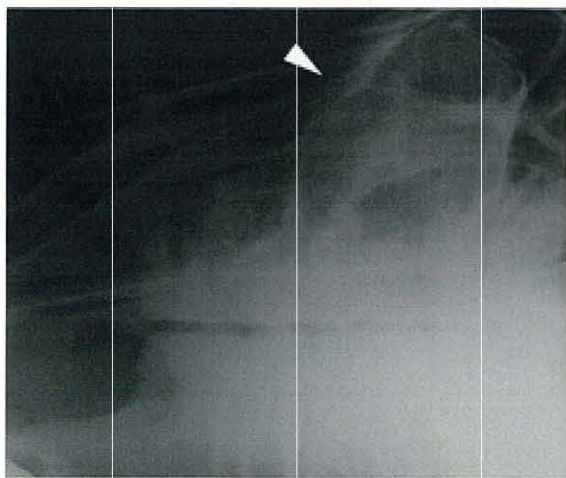


Fig. 1. Plain CR X-ray image in a lateral view, from the left tip of the nose to the nasal meatus. An opaque area can be seen on the dorsal side of the nasal meatus (white arrowhead). Imaging conditions: 80 kV, 30 mA, 0.2 sec.

hemorrhage from the nasomaxillary aperture into the middle meatus of the right nasal cavity and a black mass in the lateral compartment of the right guttural pouch (Fig. 2). No hemorrhage was observed in the trachea. Biopsy of a mass on the left neck region, obtained using fine needle aspiration (FNA) technique (FINECORE-14G \times 100 mm, Dr. Japan, Japan), revealed an excessive amount of melanin pigments in intercellular spaces as well as cells that contained numerous melanin pigments (Fig. 3).

For MDCT examination, the horse was first sedated using medetomidine hydrochloride (4 μ g/kg, i.v., Domitor, Meiji, Co., Ltd., Japan) and then laid down following administration of diazepam (30 mg/kg, i.v., Horizon 10 mg, Astellas Pharma, Japan) and ketamine hydrochloride (2.2 mg/kg, i.v., Animal Ketalar 50, Sankyo Yell Yakuhin, Japan). For MDCT image capture (imaging conditions: 135 kV, 150 mA, slice thickness: 5 mm, helical pitch: 5.5, imaging time: 40 sec), the horse was positioned in lateral recumbency on a trestle used for large animals (1,800 mm W \times 3,200 mm L \times 850 mm H), which was connected to the top table of an MDCT unit (ASTEION 4, Toshiba, Japan). General anesthesia was maintained with a triple drip containing 5% GGE, 0.1% ketamine, and 0.05% xylazine (EMASUS 2% Injection, Intervet, Japan). Image data were processed using software that analyzes high-precision, high-speed 3D images (Virtual Place Advance, AZE, Japan). A



Fig. 2. Endoscopic image showing a black mass in the lateral compartment of the right guttural pouch (white arrowhead indicates the mass).

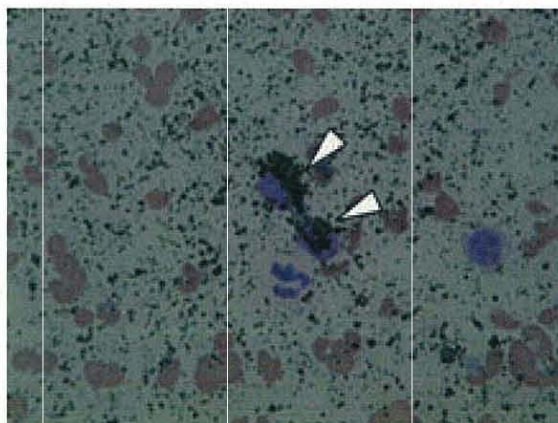


Fig. 3. Histopathological findings observed in a FNA biopsy sample. Numerous granules of melanin are scattered over the entire slide. Cells that contained numerous granules of melanin in cytoplasm are shown with white arrowheads.

cross-sectional image of the guttural pouches revealed a clearly protruding mass in the right guttural pouch, and unclear masses in the lateral outer region of the left guttural pouch (Fig. 4a). A cross-sectional image of the paranasal sinus led to detection of an opaque mass of 81.1 mm \times 37.4 mm in the frontal sinus (Fig. 4b).

The horse was euthanized due to poor prognosis as a riding horse and the owner's decision, and a postmortem examination was performed. Necropsy showed hard masses as large as 10 cm at the base of the

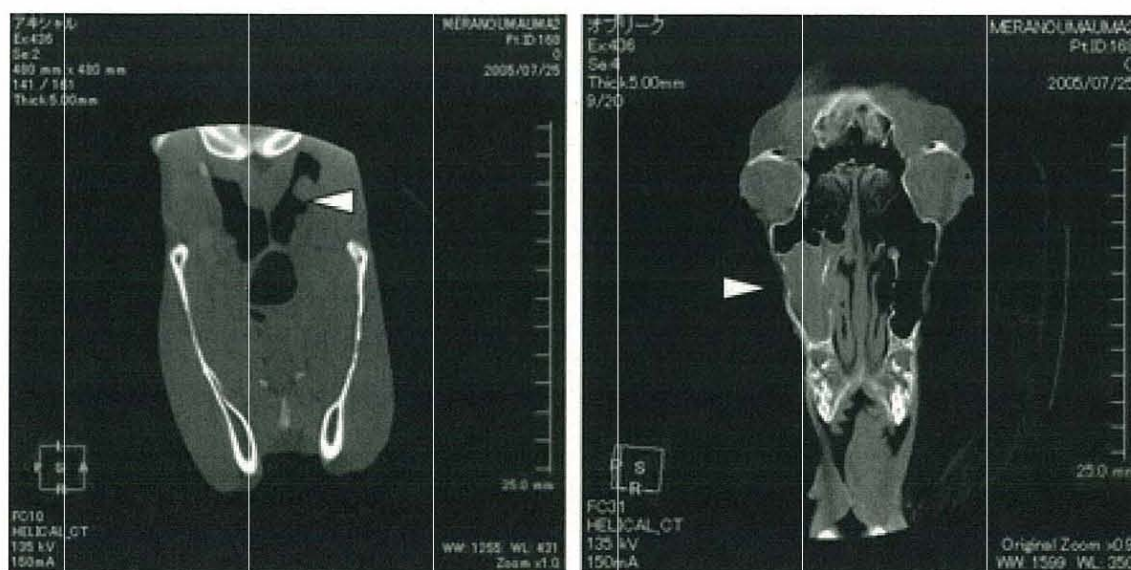


Fig. 4. MDCT images of the head. Cross-sectional view of the guttural pouches shows clear protrusion of a mass in the right guttural pouch (white arrowhead), and unclear mass in the outer region of the left guttural pouch (a: WW 1255, WL +431). Horizontal view of the paranasal sinus (b: WW1599, WL +350) reveals an opaque area in the right sinus (white arrow head, 37.4 mm × 81.1 mm, CT value: 235.6).

right and left ears, the posterior edge of the left mandible, the right and left armpit, the inside of the upper lip, and in the perianal region. These masses were nodular aggregates that consisted of black nodules ranging in size from 1.5 cm to 4 cm. The aggregates were also black inside when cross-sectioned, and looked different. One of the aggregates had a necrosed liquefied core, while another contained calcified, granular, sand-like particles. A mass found at the posterior edge of the left mandible, in particular, invaded the parotid gland as well as the mandible. Similar nodules were found in the anterior mediastinal lymph nodes, internal iliac lymph nodes, and axillary lymph nodes as well as in the muscularis at the base of the tail inside the right and left scapulas, and between the 4th and 6th intercostal space adjacent to the left parietal region. These nodules were assumed to be metastasized melanomas. Metastasized melanomas were also located numerous around the larynx and some surrounded the left internal carotid artery (Fig. 5).

The right maxillary sinus was filled with blood clots (Fig. 6). After removing these blood clots, the mucus layer inside the right maxillary sinus was reddish and its surrounding tissue was roughened. However, no visible tumor tissue was observed in the mucus or the blood

clots. From the observations above, it is believed that the horse suffered from anaplastic malignant melanoma, which is commonly seen as dermal melanoma in aged gray horses.

The etiology of the blood clots in the right maxillary sinus was unclear even at necropsy. Epistaxis might have occurred when pooled blood in the sinus flowed out to the nasal meatus. Plain X-ray images showed blood clots in the maxillary sinus and masses in the guttural pouches as opaque areas, however, many images were needed to identify the exact locations of these lesions. Diagnosis with MDCT on the other hand was more effective, since images of tomographic, sagittal, and horizontal sections could be produced from a single scan followed by data reconstruction.

In MDCT examination, anatomic structures are not problematic as long as the gantry can move over the area of interest. This advantage over conventional techniques adds to the effectiveness of MDCT. Another advantage is that MDCT imaging time is relatively short (40 sec in this study). In fact the total time for MDCT examination was only 15 min, and this included securing the horse, performing a test scan to determine the optimal position, and transporting the horse. The shorter imaging time required for MDCT in comparison with conventional CT reduces anesthesia

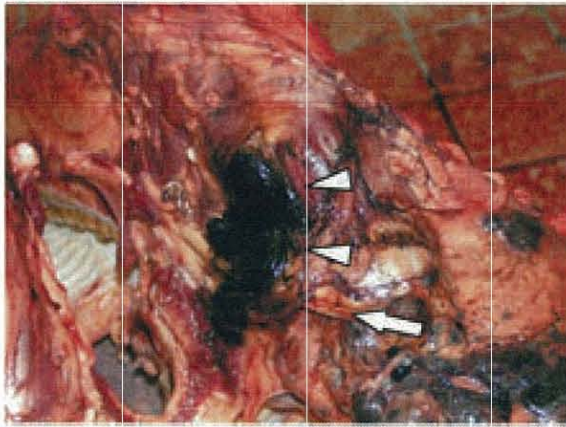


Fig. 5. Necropsy findings in the left guttural pouch. A black mass (white arrowhead) appears to be surrounding the internal carotid artery (white arrow).

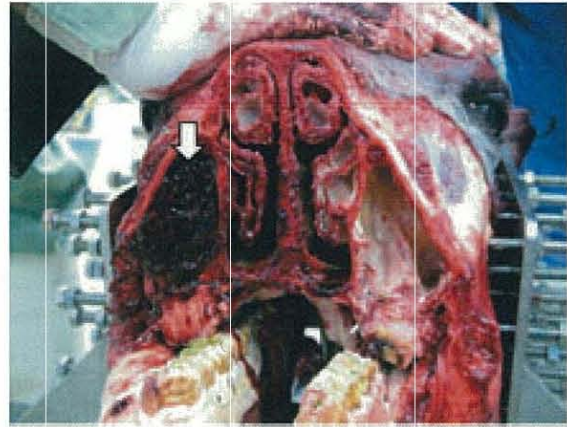


Fig. 6. Cross section of the head showing the right maxillary sinus filled with blood clots (white arrow).

time and therefore the risk of complications.

The MDCT unit used in this case technically differs from conventional single-slice CT units, since serial radiography could be taken by continuous rotation of the X-ray tube and detectors [2]. Thus, the images captured were in series allowing 3D reconstruction of imaging data. MDCT examination confirmed not only the exact location and size of the black masses in the right and left guttural pouches but also abnormal findings in the right maxillary sinus identified at necropsy. MDCT was found to be particularly advantageous in its ability to capture images of the abnormal findings in the paranasal sinus in this case, since they could not otherwise have been found without necropsy. Therefore, we consider MDCT with 3D reconstruction of the captured images provides more detailed and precise information in terms of the location of the affected area.

In the present case, it was difficult to judge whether the MDCT-detected black masses in the guttural pouches were tumors or blood clots. Generally, the use of a contrast CT technique with iodine contrast medium is considered necessary in order to confirm blood flow into a mass [1]. MDCT is a promising technique for the diagnosis of head problems, such as

intracranial tumors, sinusitis, and ethmoid haematoma, which are difficult to detect in live animals by endoscopy. Accordingly, further development of MDCT as a diagnostic technique for animal head problems is warranted.

References

1. Cuenod, C.A., Fournier, L., Balvay, D., and Guinebretiere, J.M. 2006. *Abdom. Imaging* **31**: 188–193.
2. Hu, H. 1999. *Med. Phys.* **26**: 5–18.
3. MacGillivray, K.C., Sweeney, R.W., and Del Piero, F. 2002. *J. Vet. Intern. Med.* **16**: 452–456.
4. Seltenhammer, M.H., Simhofer, H., Scherzer, S., Zechner, P., Curik, I., Solkner, J., Brandt, S.M., Jansen, B., Pehamberger, H., and Eisenmenger, E. 2003. *Equine Vet. J.* **35**: 153–157.
5. Sundberg, P., Burnstein, T., Page, H., Kirkham, W., and Robinson, R. 1977. *J. Am. Vet. Med. Assoc.* **170**: 150–152.
6. Tarrant, J., Stokol, T., Bartol, J., Wakshlag, J., and Blue, J. 2001. *Equine Vet. J.* **33**: 531–534.
7. Valentine, A. 1995. *J. Vet. Intern. Med.* **9**: 291–297.