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CASE REPORT

Open-mouth jaw locking in a 5-year-old Persian cat: a case report

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Abstract
Open-mouth jaw locking is an uncommon condition in feline patients. A 5-year-old neutered male Persian cat was evaluated for an acute inability to close its mouth and ptyalism. The general physical examination was unremarkable. A complete oral examination revealed a reduced vertical range of motion, as well as an asymmetric malocclusion with severe displacement of the mandibles to the left. Advanced diagnostic imaging included computed tomography (CT), which revealed a typical brachycephalic conformation, skeletal malocclusion and a bilateral temporomandibular joint (TMJ) subluxation, with the left coronoid process of the mandible abnormally positioned ventrolateral to the zygomatic arch. The open-mouth jaw locking was manually reduced and resolved. Once the coronoid process was repositioned, a second CT scan was performed and confirmed complete reduction of the TMJ subluxation. Supportive treatment with meloxicam was administered and a loose-fitting tape muzzle and Elizabethan collar were applied for two weeks. There was no recurrence of open-mouth jaw locking at long-term follow-up. This case report highlights the relevance of CT imaging and 3-dimensional reconstruction in the diagnosis of this unusual condition.

Keywords Dentistry · Inability to close the mouth · Cat · CT scan.

Introduction

Open-mouth jaw locking due to entrapment of the mandibular coronoid process with the zygomatic arch is a rare clinical disorder in cats (Beam et al. 2007; Hsuan et al. 2017; Lobprise and Wiggs 1992; Nutt et al. 2018; Reiter 2004). The condition may occur unilaterally or bilaterally, and its frequency could vary from once to several times a month. The duration of each episode could last from a few minutes to days and may not resolve spontaneously (Reiter 2004; Soukup et al. 2009). The appearance of these jaw locking episodes may be associated with licking, rubbing the face with the paws or against the ground, head shaking and vocalizing. Patients will often rub their faces with their paws or against the ground, shake their heads or show other signs of pain such as vocalizing (Reiter 2004; Nutt et al. 2018). The main clinical signs observed are salivation and a wide-open mouth. Physical examination usually reveals a slight protrusion of the lower jaw, a recessed row of teeth (mandibular incisors and canines) on the ipsilateral side, and a facial protrusion of the coronoid process lateral to the zygomatic arch that is often palpable (Oakes et al. 1990; Hazewinkel et al. 1993; Reiter 2004; Hsuan et al. 2017).

Radiographs are a useful imaging technique for the diagnosis of this condition (Oakes et al. 1990; Schwarz et al. 2002; Reiter 2004; Hsuan et al. 2017). Ventrodorsal, lateral and lateral oblique radiographs of the head are performed to adequately visualize the temporomandibular joint. In addition, the position of the contact zones of the coronoid process and the zygomatic arch are shown on a rostrocaudal projection. The use of advanced imaging techniques, such as computed tomography (CT) or Cone Beam Computed Tomography (CBTC), allows accurate diagnosis of mandibular abnormalities (Roza et al. 2011; Arzi et al. 2013; Nutt et al. 2018). Manual correction could be achieved by opening the mouth further, pressing the coronoid medially and closing the mouth (Hsuan et al. 2017), or using the pencil technique (Lombardero et al. 2021; Jung et al. 2023). Surgical

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treatment should be considered if manual reduction is not possible or if the condition recurs frequently (Reiter 2004; Arzi 2023). This report includes a new case in a Persian cat where CT was used in the diagnosis of this unusual disorder.

Case presentation

A 5-year-old, 3.6-kg (7.9-lb), neutered male Persian cat, was referred to the emergency service for an oral examination due to an acute inability to close its mouth and salivation. No other previous history of dental disease or trauma was reported. The general physical examination was unremarkable, and the preanesthetic complete blood count (CBC) and serum biochemical profile analysis were within the respective reference ranges.

During the conscious extraoral examination, full-mouth opening with an inability to close its mouth, decreased range of vertical motion, an asymmetric malocclusion with a severe displacement of the mandibles to the left side, and ptyalism were evident (Fig. 1) (Supplementary material).

Fig. 1 Photograph (rostral view) of the mouth of a 5-year-old castrated male Persian cat with an inability to close the mouth. Full-mouth opening with an inability to close its mouth, an asymmetric malocclusion with a severe displacement of the mandibles to the left side, and ptyalism were evident

The intraoral examination revealed moderated periodontal disease, mild attrition of the coronal third of teeth 304 and 404, an uncomplicated crown fracture of tooth 204, and absence of teeth 101, 102, 103, 202, 203, 407 and 409.

To achieve a definitive diagnosis and assess any potential underlying causes, the cat underwent general anaesthesia. The patient was premedicated with dexmedetomidine (2 µg/kg IM) (Sedadex 0.5 mg/ml, Dechra) and methadone (0.3 mg/kg IM) (Semfortam 10 mg/ml, Dechra). Once the sedative effect was achieved, the cephalic vein was catheterized, and the patient was preoxygenated with 100% oxygen via facemask for 5 min. Anaesthesia was induced with propofol intravenously to effect by administering 0.5 mg/kg followed by increasing doses of 0.5 mg/kg until orotracheal intubation was possible. Isoflurane 1.5% vaporised in a mixture of oxygen and air (60% oxygen) was administered for the maintenance of anaesthesia. A helical CT (*Aquilion Start*, *Canon Medical System*) examination of the head was performed. The patient was positioned in sternal recumbency and the following parameters were used in a bone and soft tissue acquisitions: 0.5–1 mm slide thickness, matrix 512×512, 100kVP and 120mAs. The CT scan was evaluated in a DICOM viewer software (Horos). The CT scan revealed a typical brachycephalic conformation with oral malocclusion and bilateral temporomandibular joints (TMJ) subluxation, more marked on the left side, with the ipsilateral coronoid process of the mandible abnormally positioned ventrolateral to the zygomatic arch. The articular surfaces of the TMJs, including the articular head of the coronoid process of the mandible and the mandibular fossa of the squamous portion of the temporal bone, were homogeneous in appearance, with no evidence of subchondral bone damage, sclerosis or periarticular new bone formation. The width (left- 5.7 mm, right- 5.5 mm) and depth (left- 2.2 mm, right- 2 mm) of the mandibular fossas, and the head of the mandibles or caudal portion of the condylar process (left- 4.6 mm, right – 4.6 mm) were normal in size, with well-developed articular eminences and retroarticular processes. No evidence of fractures or periarticular new bone formation in the TMJ were noted (Fig. 2). Other findings included mild to moderate periodontal disease, the presence of the distal root of tooth 409, and the presence of the roots of teeth 101, 102, 103, 202, 203. Tooth resorption on the distal root of tooth 309 and absence of tooth 407 were also noted. Mild hyperostosis of the right mandibular body with thickening of the cortex, bilateral accumulation of hyperattenuating material in the tympanic cavities, and mild bilateral retropharyngeal lymphadenomegaly were also detected.

The main possible differential diagnoses at the time of presentation included a ventrolateral displacement of the left coronoid process in relation to the zygomatic arch, TMJ fracture, TMJ subluxation/luxation, TMJ dysplasia,

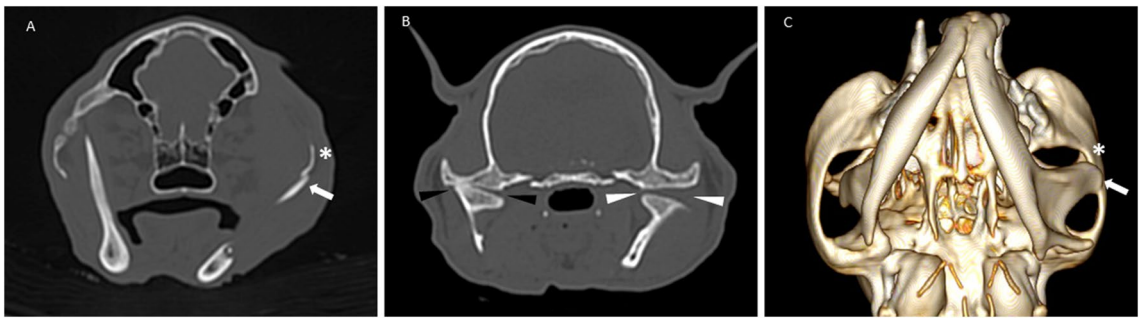

Fig. 2 Selected representative transverse CT reconstructed images with bone algorithm (A and B) and ventral 3–D rendered CT image (C), showing the ventrolateral displacement of the coronoid process of the left mandible (white arrow) in comparison to the ipsilateral zygomatic arch (asterisk) (A and C) and subluxation of the left (white arrowheads) and right (black arrowheads) TMJ (B)

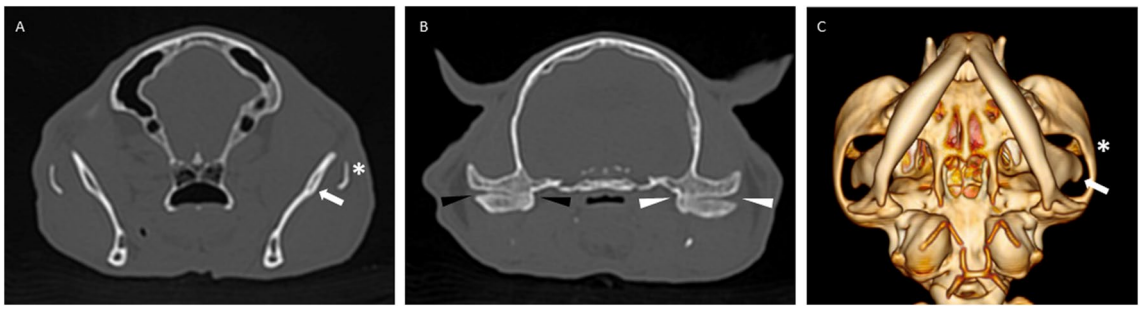

Fig. 3 Selected representative transverse CT reconstructed images with bone algorithm (A and B), and ventral 3–D rendered CT image (C) after manually reduced open-mouth jaw locking, revealing physiologic position of the coronoid process (white arrows) of the left mandible in comparison to the ipsilateral zygomatic arch (asterisk) (A and C), and a complete reduction of the subluxation of the left (white arrowheads) and right (black arrowheads) TMJ to their physiologic position (B)

maxillofacial trauma, and neoplasia. The definitive diagnosis was an open-mouth jaw locking due to ventrolateral displacement of the left mandibular coronoid process relative to the zygomatic arch with secondary TMJ subluxation and malocclusion. Other incidental findings included mild bilateral otitis media and reactive retropharyngeal lymphadenomegaly, and in the absence of clinical signs no treatment was necessary.

After the CT scan, the open-mouth jaw locking was manually reduced and resolved. To perform the closed reduction, the patient was placed in sternal recumbency and a bony prominence (the left coronoid process) was felt adjacent to the ipsilateral zygomatic arch. Vertical mouth opening was forced as wide as possible and the left coronoid process was manually repositioned medially allowing the realignment of the mandible into its original physiologic occlusion. Once the coronoid process was repositioned, the mouth was carefully opened and closed to ensure that normal range of movement was restored. A second CT scan with the same parameters was performed. This confirmed a correct position of the coronoid process medial to the zygomatic arch and a complete reduction of the TMJ subluxation (Fig. 3).

An injection of meloxicam (0.05 mg/kg [0.09 mg/lb], SC) was administered and a loose-fitting tape muzzle made with adhesive tape (Fig. 4) and Elizabethan collar were applied for two weeks to attempt to maintain the occlusion and to prevent new episodes of open-mouth jaw locking. The muzzle allowed the patient to open his mouth 20% of vertical motion, allowing him to stick out his tongue and use it to eat. The owners reported no problems with the muzzle, which remained in place for two weeks. The muzzle was made with adhesive tape and consists of two parts; a wider part that circumferentially surrounds the head to prevent the wide opening of the oral cavity, and two other narrower parts anchored to the first part, on both sides, behind the ears for its to be fastened. The tape was perforated to favour ventilation and prevent dermatitis. The owner was informed that surgery would be indicated in cases of recurrence whereby resection of the zygomatic arch and/or of the coronoid process would be performed. The patient recovered without complication and was discharged from the hospital after 24 h of observation. Supportive treatment with meloxicam (0.05 mg/kg [0.045 mg/lb], PO, q 24 h,) was administered for 5 days to manage postoperative discomfort and a soft diet was recommended for a month.

Follow-up examination was performed 14 days after the procedure. The owner reported a normal appetite, no salivation, and the cat was able to yawn and eat without pain or discomfort. Clinical oral examination revealed physiologic occlusion and normal range of vertical motion.

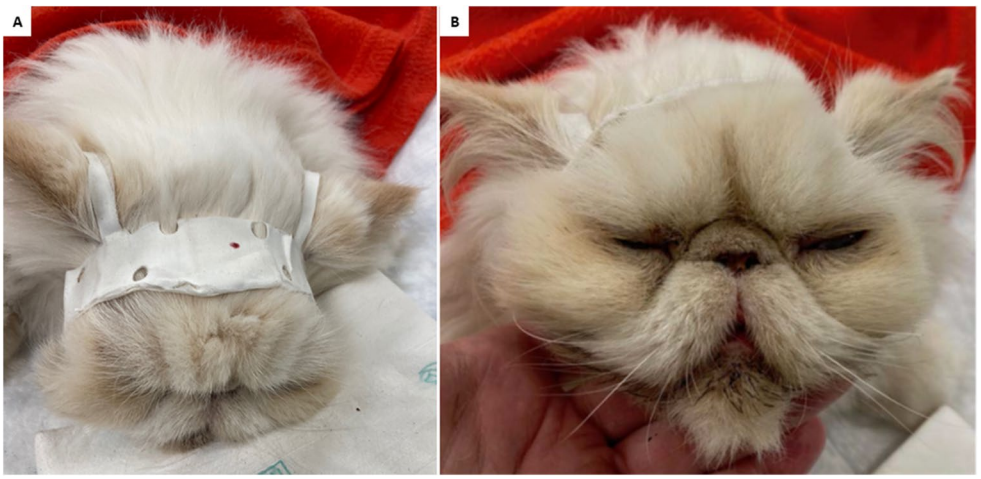

Fig. 4 **A** and **B** Loose-fitting tape muzzle made with adhesive tape used by the patient

Discussion

This report emphasizes the value of performing a CT examination in cases of open-mouth jaw locking in cats. It illustrates that in this unusual disorder (Nutt et al. 2018), the CT can provide a definite diagnosis which can guide the clinician further towards proper treatment options. Specific anatomic morphometry and morphology of the temporomandibular joints using a CBCT has been published (Villamizar- Martínez et al., 2022), which helps with the evaluation of these complex joints.

Differential diagnoses of a cat's inability to close its mouth include TMJ luxation or fractures, mandibular fractures, lateral displacement of the coronoid processes beyond the zygomatic arches, Class I malocclusion resulting in tooth interlocking, foreign bodies, tumors, and muscular neuropathies (Beam et al. 2007; Nutt et al. 2018; Reiter et al. 2019; Kot et al. 2021; Vedrine 2023). Considering our cat's acute history of an inability to close its mouth, the absence of any reported trauma, and the clinical examination described, the most probable diagnosis was an open-mouth jaw locking.

Open-mouth jaw locking is identified by the incapacity to close the mouth due to the ventrolateral displacement of the mandibular coronoid process compared to the zygomatic arch. On physical examination, a noticeable prominence corresponding to the coronoid process may be palpated adjacent to the zygomatic arch. Frequent clinical signs in cats include hypersalivation, discomfort, and a downward tilt of the mandible on the affected side (Lobprise and Wiggs 1992; Soukup et al. 2009), as described in the clinical case in our report.

This pathology has been widely described in dogs, but there is scarce literature reported in cats (Lobprise and Wiggs 1992; Reiter 2004; Beam et al. 2007; Soukup et al. 2009; Hsuan et al. 2017; Nutt et al. 2018). Whilst a limited number of cases have been documented in domestic shorthair (DSH) cats and Siamese breeds, there appears to be a higher prevalence in Persian cats (Oakes et al. 1990; Beam et al. 2007; Nutt et al. 2018). The presented manuscript highlights the importance of computed tomography (CT) to evaluate the underlying cause of the open-mouth jaw locking in cats. This overrepresentation of the Persian breed could be due to its brachycephalic skull conformation, which could lead to a flattening of the zygomatic arch, and to the possible laxity and spasticity of the maxillofacial muscles (Soukup et al. 2009; Mestrinho et al. 2015; O'Neill et al. 2019). Other possible factors contributing to this condition in any breed could be previous maxillofacial injuries, dysplasia of the TMJ, fractures of the TMJ, and the presence of neoplasms (Soukup et al. 2009; Moores 2018), which were absent in the present case. In the presented case, no specific underlying cause was identified to explain the findings apart from a possible predisposition in brachycephalic breeds as previously reported. However, although very thin CT slide thickness was used (0.5 mm), very subtle lesions might pass unnoticed. In those cases, cone beam CT might provide slightly more information. However, it was not the aim of this report the comparison between the different imaging modalities. There are several publications regarding jaw locking in cats where they showed different cases of TMJ dysplasia with flattened mandibular condyloid processes and mandibular fossas (Nutt et al. 2018), and a case of rotation at the symphysis due to asymmetric mandibular bodies (Beam et al. 2007). Delesalle et al. (2021) compared the morphometry of the temporomandibular joint in brachycephalic and mesocephalic cats using CT scan and CBTC. They found a significant conformational differences in the TMJ in brachycephalic cats, including a narrower mandibular fossa, a shorter head of the mandible, and a wider angle of congruency. The less developed condylar process in brachycephalic cats, with a smaller mandibular fossa, suggested a potential anatomical basis for TMJ dysfunction, which could also lead to jaw locking disorder. However, only a shorter head of the mandible, typical for

brachycephalic breeds, was seen in the case presented, and none of the other changes previously described in those reports was identified, as the left mandibular fossa was concave in appearance, with no evidence of flattening or deformation, showing a normal width (5.7 mm) and depth (2.2 mm). Also, the head of the left mandible appeared homogeneous and normal in size (4.6 mm), with no evidence of flattening.

In the past, traditional extraoral radiography had been used to evaluate this condition and its potential etiology, with uncertain success. However, CT has widely emerged as the gold standard diagnostic imaging modality for TMJ abnormalities and related structures including fractures involving the condyle or temporal bone, (sub) luxations, among others (Soukup et al. 2009; Arzi 2023). The CT findings reported in cases of open-mouth jaw locking in cats are similar to the ones seen in our case, including malocclusion, ventrolateral displacement of the coronoid process of the mandible, ipsilateral secondary TMJ subluxation, and mild contralateral TMJ subluxation (Soukup et al. 2009; Hsuan et al. 2017; Nutt et al. 2018).

Our report adds further weight to the recommendation of using CT in the diagnosis of open mouth jaw locking in cats. It also highlights that CT could aid conservative treatment of this condition, by post-reduction confirmation of correct occlusion. In addition, the CT images provided in our manuscript are pre- and post-treatment CT images which differs with the previously reported study (Nutt et al. 2018). However, further research and advanced imaging studies are needed to better understand the anatomical and functional aspects of the temporomandibular joint in brachycephalic cat breeds, as it has been done in mesocephalic domestic shorthair cats (Villamizar-Martinez et al. 2022).

Different treatment options have been described, including both a manual reduction (Hsuan et al. 2017) and surgical approaches. The primary surgical techniques documented in cats include partial zygomectomy, partial coronoidectomy, mandibular condylectomy and, a combination of symphysiotomy, symphysiectomy and intermandibular arthrodesis (Lobprise and Wiggs 1992; Reiter 2004; Beam et al. 2007; Soukup et al. 2009). Given the acute presentation in our patient, manual realignment of the mandible under anesthesia was established as the first-line treatment. In addition, a tape muzzle and Elizabethan collar were applied in an attempt to maintain mandibular reduction. The cat remained in good health, with no evidence of recurrence, oral discomfort or pain, even during activities such as eating or yawning, with a similar result obtained in a study that also performed closed and manual reduction of the mandible (Hsuan et al. 2017).

Conclusions

In a presumptive diagnosis of open-mouth jaw locking in a cat, with an acute presentation and no previous history of trauma, CT examination is recommended, as it allows fast identification of coronoid displacement and evaluation of the skull for other abnormalities.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11259-024-10535-5.

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Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

Animal ethics The owner has provided consent for the necessary surgical intervention at the Veterinary Hospital Veterios and for the publication of his pet's data. No approval of research ethics committees was required.

Consent to participate A written inform consent was signed by the owners of the patients.

Consent to publish Not applicable.

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