CASE REPORT

Advanced diagnostic imaging and surgical treatment of an odontogenic retromasseteric abscess in a guinea pig

V. Capello*,† and A. Lennox‡

*Clinica Veterinaria S. Siro, 20151 Milano, Italy

†Clinica Veterinaria Gran Sasso, 20131 Milano, Italy

‡Avian and Exotic Animal Clinic, Indianapolis, IN 46268, USA

A two-year-old guinea pig presented for difficulty chewing. Examination and diagnostic imaging, including computed tomography and magnetic resonance, revealed an odontogenic retromasseteric abscess associated with a mandibular cheek tooth. Treatment included removal of the abscess and marsupialisation of the surgical site for repeated debridement and healing by second intention. Unique features of this case included the use of advanced diagnostic imaging and utilisation of marsupialisation for surgical correction.

Journal of Small Animal Practice (2014)
DOI: 10.1111/jsap.12249

Accepted: 20 May 2014

INTRODUCTION

Guinea pigs are *simplicidentata*, with a single pair of maxillary incisor teeth (Crossley 1991, Legendre 2003, Capello & Gracis 2005). Like other rodent species, guinea pigs lack canine teeth. They have one premolar and three molar teeth in each quadrant which are anatomically indistinguishable, and are simply called cheek teeth. Both incisor teeth and cheek teeth are *hypsodont* (long crowned), *elodont* (continuously growing and erupting) and *aradicular*, as they do not develop anatomic roots (Crossley 1991, Legendre 2003, Capello & Gracis 2005).

In all rodent species, the masseter muscle is well developed, divided into three layers (superficial, middle and deep part), and the proximal insertion is over the entire zygomatic arch (Popesko *et al.* 1992, Capello & Gracis 2005). Unlike rabbits, the masseteric fossa is not present, and the masseter muscle covers the lateral surface of the body of the mandible, the branch and the angular process. Excessive coronal elongation and malocclusion of cheek teeth is common in guinea pigs. The underlying cause is generally thought to be improper wearing of elodont cheek teeth (Legendre 2003, Capello & Gracis 2005). Unlike rabbits, metabolic bone disease has not been reported in guinea pigs (Capello & Gracis 2005). Three guinea pigs with secondary nutritional hyperparathyroidism were affected by dental disease, but a direct relationship was not investigated (Hawkins 2010). Complications of dental disease such as periapical infection, osteomyelitis and abscesses are also reported in guinea pigs (Capello & Gracis 2005, Souza & Greenacre 2006, Capello 2008).

CASE REPORT

A two-year-old male longhaired, entire guinea pig presented for apparent difficulty in chewing. Physical examination showed slight malocclusion of the occlusal plane of the incisor teeth. Intraoral evaluation with an otoscope was unremarkable. The most striking abnormality was a large, non-painful palpable mass associated with the latero-caudal area of the right mandible (Fig 1). The tentative diagnosis was periapical infection and abscess of the reserve crown of a right mandibular cheek tooth, and the guinea pig was scheduled for radiography of the skull and intraoral evaluation. The patient was discharged with 0·2 mg/kg meloxicam (Metacam; Boeringher) every 12 hours orally, and a commercial herbivore syringe feeding product (Oxbow Critical Care; Oxbow Animal Health).

Once readmitted, 0·3 mg/kg butorphanol (Dolorex; Intervet) subcutaneously, 40 µg/kg medetomidine (Domitor; Pfizer) intramuscularly (im) and 10 mg/kg ketamine (Ketavet; Intervet) im were administered to the guinea pig, with supplemental isoflurane (Isoba; MSD Animal Health) in oxygen delivered intermittently by facemask when needed.

The lateral radiographic projection showed an abnormal occlusal plane of the incisor teeth. The left oblique projection was unremarkable (Fig 2A). The right oblique projection showed a radiotransparent area caudal to the right mandibular third molar (M3), consistent with periapical infection. The angular process of the mandible appeared radiotransparent, consistent with bone lysis (Fig 2B). The ventrodorsal projection showed a

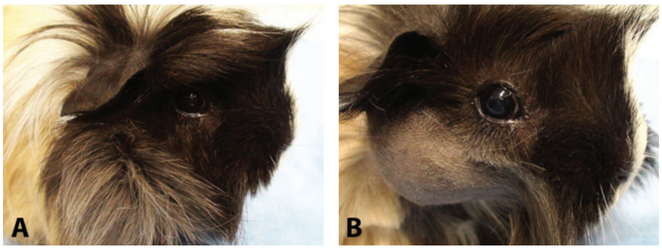

FIG 1. Facial swelling at presentation, before (A) and after shaving (B)

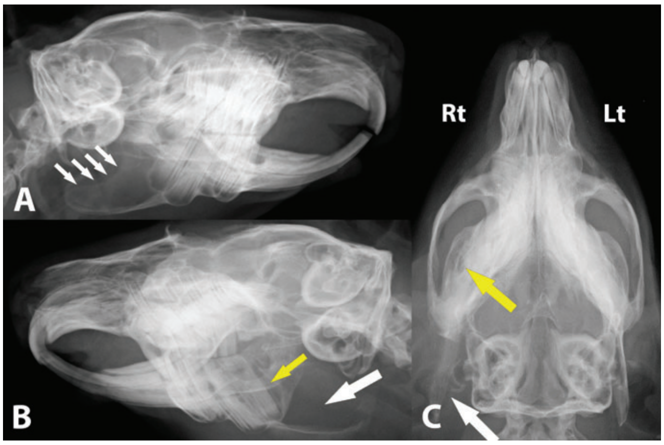

FIG 2. Skull radiographs. (A) Right 30° ventral-left dorsal projection. The white arrows highlight the normal dorsal border of the angular process of the mandible. (B) Left 30° ventral-right dorsal projection. The radiotransparent area caudal to the right third molar (M3) (yellow arrow) is consistent with periapical infection. Radiolucency of the angular process of the mandible is consistent with bone lysis (white arrow). (C) Ventrodorsal projection. Note the small radiolucent area at the right mandible (yellow arrow) and apparent lysis of the angular process (white arrow)

small radiotransparent area at the right mandible, and apparent lysis of the angular process (Fig 3B). Endoscopic intraoral inspection was unremarkable, and there were no abnormalities associated with the right mandibular M3.

On the basis of radiographic findings of suspected lysis or osteomyelitis of the mandible, computed tomography (CT) and magnetic resonance imaging (MRI) of the skull were scheduled in order to determine the exact relationship of the abscess with tooth structures, and in order to plan a surgical approach. The anaesthetic procedure was repeated as described earlier.

Axial CT views showed a curved and deformed reserve crown and apex of the right mandibular M3, surrounded by an area of bone lysis (Fig 3A, B). Three-dimensional (3D) surface reconstruction of the skull demonstrated the affected tooth and bony lysis creating a fenestration in the body of the mandible and lysis of most of the angular process of the mandible (Fig 3C). The temporomandibular joint appeared normal. Lytic areas were also present at the condylar process and in the left mandible (Fig 3D). MRI clearly depicted the size and shape of the abscess, demonstrating that it was bilobed, with a cranio-dorso-medial smaller abscess adjacent to the largest (Fig 4).

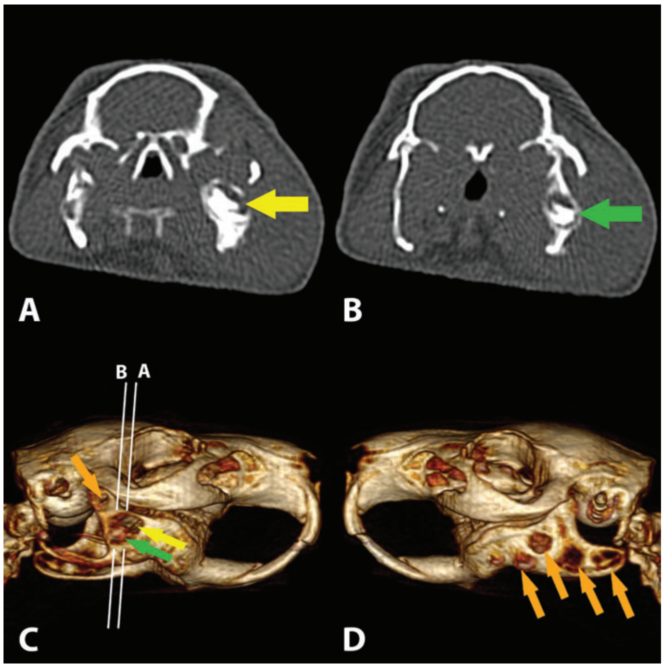

FIG 3. Computed tomography of the skull. (A, B) Axial views. Note the curved and deformed reserve crown (A, yellow arrow) and diseased apex (B, green arrow) of the right fourth cheek tooth, surrounded by an area of bone lysis. The temporomandibular joints are not affected (B). Scanning planes correspond to white lines shown in (C). (C, D) Three-dimensional (3D) volume reconstruction of the skull. Reserve crown (yellow arrow) and apex (green arrow) of the affected cheek tooth are visible, as well as the fenestration of the body of the mandible. Lysis of most of the right angular process of the mandible is present, as well as a point of lysis at the condylar process (orange arrow). Areas of bone lysis were also present at the left mandible (orange arrows) (D)

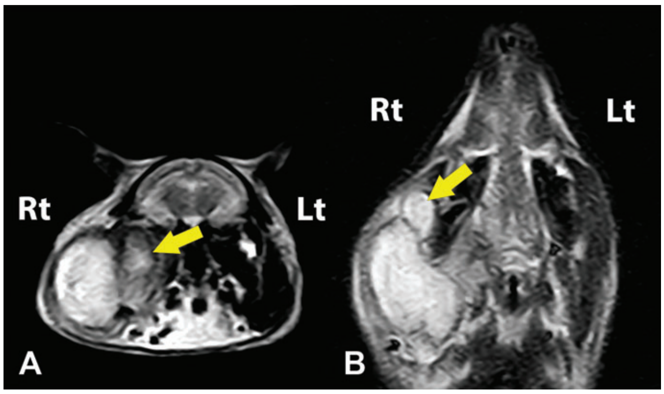

FIG 4. Magnetic resonance of the skull. Axial (A) and coronal view (B). The large abscess was bilobed, with a cranio-dorso-medial smaller abscess adjacent to the largest (yellow arrow)

The patient was scheduled for surgical excision of the abscess one week later. Butorphanol was used for analgesia as above, but anaesthesia was induced and maintained with 70 µg/kg medetomidine and 20 mg/kg ketamine im. Supplemental isoflurane in oxygen was delivered via nasal mask as needed. A 24 gauge intravenous catheter (Surflo; Terumo Corporation) was placed in the cephalic vein, and a balanced electrolyte solution (lactated Ringer's solution, S.A.L.F. Laboratorio Farmacologico) was delivered at 10 mL/kg/hour.

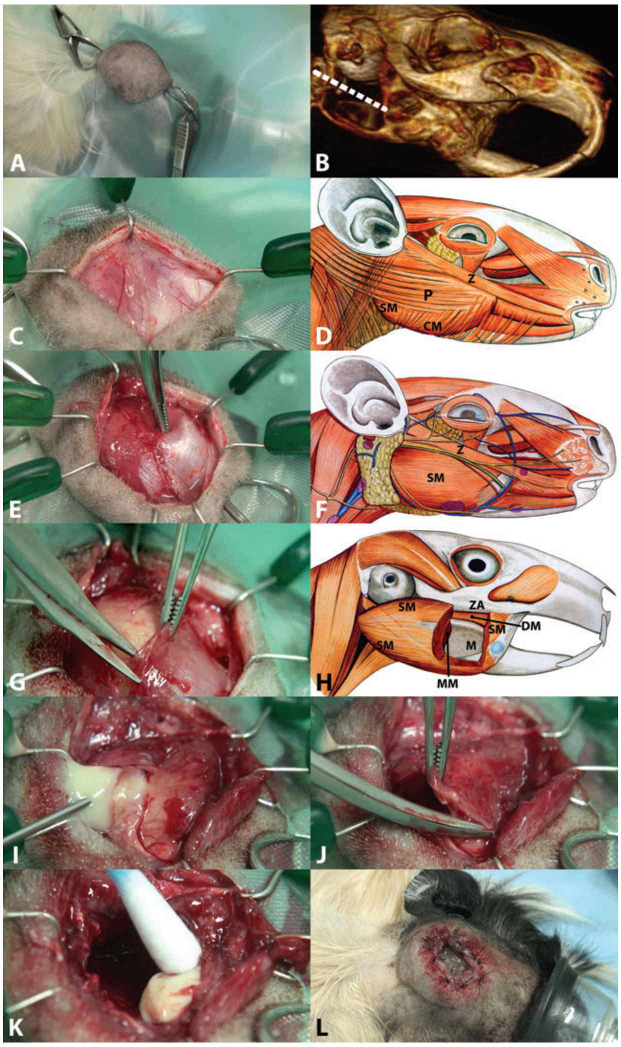

FIG 5. Surgical excision of the bilobed retromasseteric abscess. The patient was placed in lateral recumbency and surgically prepared (A). The incision line and relationship with the affected area are shown on the three-dimensional (3D) reconstruction of the computed tomography images (B). After the incision of the skin, the superficial layer of muscle (platysma) was exposed with the aid of a retractor (Lone Star retractor; Lone Star Medical Products, Inc. Stafford, TX, USA) (C). Superficial muscles of the head of the guinea pig. P Platysma, CM Cutaneous muscle of face, SM Superficial part of masseter muscle, Z Zygomatic muscle (D). Exposure of the superficial part of the masseter muscle and part of its aponeurosis after blunt dissection of the platysma. The masseter is stretched due to the underlying abscess. The tip of the forceps demonstrates the softness of the content of the swelling (E). Superficial part of the masseter muscle, after removal of the platysma. SM Superficial part of masseter muscle, Z Zygomatic muscle (F). After dissection of the caudal aspect and retraction of the superficial part of the masseter muscle, the middle portion was dissected in a similar caudocranial direction, exposing the yellow capsule of the abscess (G). Superficial, middle and deep parts of the masseter muscle. SM Superficial part of masseter muscle, MM Middle part of masseter muscle, DM Deeppart of masseter muscle, ZA Zygomatic arch, M Mandible (H). Most of the pus was drained from the abscess before excision of the capsule, using an 18 gauge needle (I). The round capsule of the abscess was excised and removed, in order to expose the underlying portion of the mandible. A portion of the capsule was submitted for culture and sensitivity testing. (J). The capsule of the craniomedial abscess was dissected from a caudocranial approach, and the pus was completely removed (K). Marsupialisation of the surgical site and apposition of the healing promoting cream (L). (D, F, H) Modified from (Popesko et al. 1992) with permission

Owing to the anatomy of the masseter muscle, the surgical approach was caudal over the abscess, rather than over the affected tooth (Fig 5). Extraoral extraction of the affected tooth was not attempted because of difficulty of exposure and risk of fracture of the lytic mandible. Marsupialisation of the surgery site was performed to allow postoperative flushing, monitoring and healing by second intention. The guinea pig recovered uneventfully, and was hospitalised in order to assist feeding and to monitor and debride the wound.

Postoperative treatment included 5 mg/kg marbofloxacin (Marbocyl; Vetoquinol) im every 12 hours for 3 days then orally for 7 days, and 0·2 mg/kg meloxicam (Metacam; Boeringher) every 12 hours orally for 10 days. Supportive feeding was continued. The exposed portion of the mandible and the marsupialised site were flushed with saline solution, gently debrided with cotton tipped applicators and packed with healing promoting cream (HEALx Soother Plus; Harrison's products) twice daily.

The guinea pig accepted syringe feeding well within 8 hours of surgery (Fig 6A). Despite reduced function of the right masseter muscle, physiological movements of the mandible did not appear to be affected. On day 3, the patient gradually began to eat lettuce (Fig 6B) and then pellets. The guinea pig was discharged 10 days after surgery, with twice weekly re-evaluations over the next few weeks.

Culture and susceptibility testing of the abscess capsule reported *Streptococcus* spp., which were susceptible to marbofloxacin. The site healed completely after one month (Fig 6C to F). Follow-up radiographs taken four weeks after surgery did not show worsening of the periapical lysis compared with the same projection taken before surgery (Fig 7). The guinea pig was then lost to further follow-up.

DISCUSSION

Early diagnosis of dental disease and facial swellings is often challenging in long-haired patients. Reduced food intake, especially in conjunction with difficult prehension of food, chewing and swallowing, is usually related to abnormalities of the clinical crowns and functionality of the temporomandibular joint in guinea pigs. In this particular case, the temporomandibular joint was not affected and the abnormalities of clinical crowns were relatively mild. This resulted in mild clinical signs despite the size of the associated abscess.

While radiographs were helpful in this case, advanced diagnostic imaging, in particular CT with both axial and 3D views, was superior for diagnosis and for planning the surgical approach (Capello & Cauduro 2008, Capello & Lennox 2008, Capello 2011).

MRI is utilised for imaging soft tissues, and demonstrated the presence of a smaller, cranial abscess that likely would have been missed at surgery without it. In this case, both CT and MRI were complementary and provided benefits for planning treatment.

Areas of lysis of the left mandible resembled patterns of metabolic bone disease in rabbits. While this may have been a

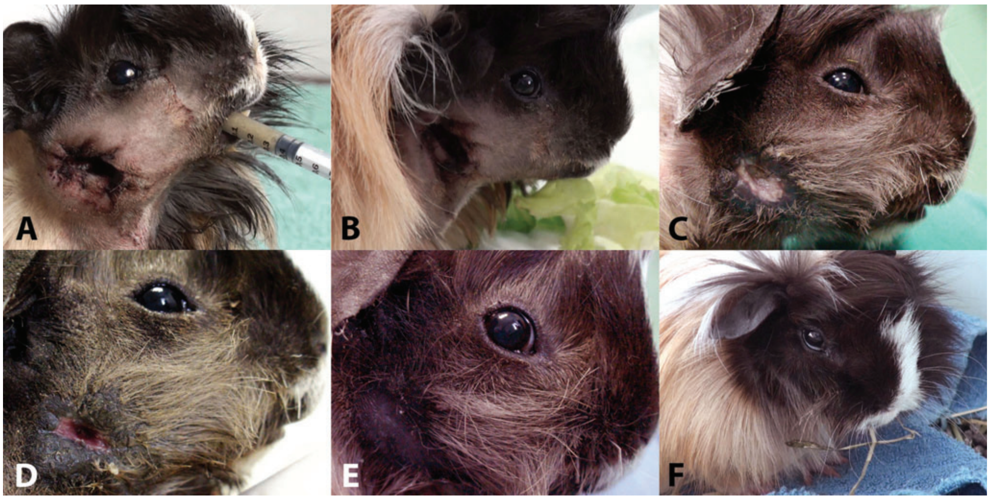

FIG 6. (A, F) Support feeding the day after surgery (A). On day 3, the guinea pig was able to eat lettuce on his own (B). Follow-up at two (C), three (D), and four (E) weeks. The guinea pig eating hay. Note hair re-growth at five weeks (F)

FIG 7. Follow-up radiographs taken four weeks after surgery. Worsening of periapical lysis is not noted

contributing factor, there is no current evidence that metabolic bone disease is an underlying cause of dental disease in guinea pigs (Capello & Gracis 2005).

Unlike in rabbits, most odontogenic abscesses of the mandible are retromasseteric in the guinea pig, owing to the anatomy of the cheek teeth and the masseter muscle. This makes the surgical approach even more challenging and is associated with a less favourable prognosis. The goal of surgery in this case was to approach the abscess beneath the masseter muscle as far caudally as possible in order to preserve the cranial insertion of the muscle to the zygomatic arch.

The following are noted in similar cases in rabbits: omission of marsupialisation of abscesses at this site in favour of primary closure often results in recurrence; dissection or disinsertion of muscle layers has not resulted in functional problems.

In cases of periapical infection, removal of affected tooth and bone is highly recommended (Capello & Gracis 2005). In this case, extraction of the affected cheek tooth was not pursued for several reasons. Extraction of non-mobile cheek teeth via the oral approach is difficult in guinea pigs owing to their particular anatomy which includes a short clinical crown and a long curved reserve crown; and clinical experience shows that attempts often result in tooth fracture. Extraoral extraction was not considered, as this required a more aggressive disruption of the masseter muscle, and in this specific case incurred the risk of additional fractures of the mandible and the condylar process and damage to the temporomandibular joint.

In this case, the site healed uneventfully, and follow-up radiographs did not demonstrate worsening lysis or osteomyelitis.

Conflict of interest

None of the authors of this article has a financial or personal relationship with other people or organisations that could inappropriately influence or bias the content of the paper.

References

Capello, V. (2008) Diagnosis and treatment of dental diseases in pet rodents. *Journal of Exotic Pet Medicine* **17,** 114-123

Capello, V. (2011) Novel diagnostic and surgical techniques for treatment of difficult facial abscesses in pet rabbits. Proceedings of the North American Veterinary Conference. Orlando, FL, USA, January 15 to 19, 2011. pp 1685-1689

Capello, V. & Cauduro, A. (2008) Application of computed tomography for diagnosis of dental disease in the rabbit, guinea pig and chinchilla. *Journal of Exotic Pet Medicine* **17,** 93-101

Capello, V. & Gracis, M. (2005). Rabbit and Rodent Dentistry Handbook. Ed A. M. Lennox. Wiley-Blackwell, Ames, IA, USA (formerly Zoological Education Network, Lake Worth, FL)

Capello, V. & Lennox, A. M. (2008). Clinical Radiology of Exotic Companion Mammals. Ed W. R. Widmer. Wiley-Blackwell, Ames, IA, USA. pp 76-87

Crossley, D. A. (1991) Clinical aspects of rodent dental anatomy. *Journal of Veterinary Dentistry* **12**, 131-134

Hawkins, M. G. (2010). Secondary nutritional hyperparathyroidism with fibrous osteodystrophy in 3 guinea pigs. Proceedings of the Association of Exotic Mammal Veterinarians. San Diego, CA, USA, August 1, 2010. p 121

Legendre, L. F. (2003) Oral disorders of exotic rodents. *Veterinary Clinics of North America Exotic Animal Practice* **6**, 601-628

Popesko, P., Rjtovà, V. & Horàk J. (1992) A Colour Atlas of Anatomy of Small Laboratory Animals Vol. 1: Rabbit, Guinea Pig. Wolfe Publishing Ltd, London, UK. pp 164-166

Souza, M. J., Greenacre, C. B., Avenell J. S., *et al.* (2006) Diagnosing a tooth root abscess in a guinea pig (Cavia porcellus) using micro computed tomography imaging. *Journal of Exotic Pet Medicine* **15**, 274-277