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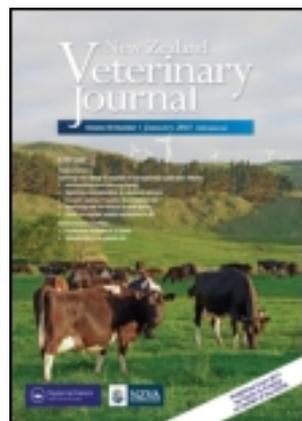
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Facial swelling and discharging lesions associated with abnormalities of the mandible in kunekune pigs

RM Archer^a, JF Weston^a, CL Herdan^a & MC Owen^a

^a Massey University Veterinary Teaching Hospital, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North, 4442, New Zealand

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*Clinical Communication***Facial swelling and discharging lesions associated with abnormalities of the mandible in kunekune pigs**RM Archer*[§], JF Weston*, CL Herdan* and MC Owen***Abstract**

CASE HISTORIES: Four adult kunekune pigs developed facial swelling at the base of the right ear that ruptured and discharged food material. A further six pigs that had similar clinical signs were reported by members of the New Zealand Kunekune Association who responded to an email survey, one of which was confirmed by post-mortem examination.

CLINICAL FINDINGS: Inside the mouth of each pig there was an opening at the junction of the body and ramus of the mandible just lateral to the most caudal visible molar that was impacted with masticated feed. The food packed into the mandible resulted in infection and progressive erosion of the medullary cavity of the bone until it reached the ramus where it eroded through the lateral cortex. The feed material then tracked through the soft tissues to form a subcutaneous abscess, which eventually ruptured resulting in a draining lesion. In Case 2, which had had the lesion for 2 years, the cavity in the mandible was lined with mucosa that had healed to the skin to produce a fistula. In all four pigs there was also a lesion in the left side of the mandible that was not as developed as that on the right side.

DIAGNOSIS: The facial swellings were produced by feed material that had impacted into the mandible through an opening immediately caudal to the cheek teeth and then emerged through one or more lesions in the lateral aspect of the ramus of the mandible.

CLINICAL RELEVANCE: Although it has not been previously reported, anecdotal reports and our survey suggest that this condition may occur relatively frequently in kunekune pigs. It should be considered as a differential diagnosis for facial swellings and discharging lesions in these animals.

KEY WORDS: *Kunekune pig, mandible, abnormality, facial swelling, discharging lesion*

Introduction

Kunekune pigs are a breed of domestic pig found in New Zealand. In the Māori language, kune means 'fat and round', and these pigs are short-legged and sturdy, with a blunt, turned-up

snout. By the 1980s approximately 50 purebred kunekune pigs remained in New Zealand but since then their numbers have increased. The authors have found only one published report of a veterinary problem in kunekune pigs, being confirmation of malignant catarrhal fever in one of two sick animals in Britain (Wessels *et al.* 2011). In this report we describe the examination and clinical findings of five kunekune pigs which each had facial swelling and chronic discharging lesions involving the mandible close to the base of the right ear, which discharged food material.

Case histories and clinical findings**Case 1***Case history*

A 30-month-old castrated male kunekune pig was examined at the Massey University Veterinary Teaching Hospital (MUVTH) because of low body condition that had developed over the previous 6 months. Compared with its two female litter mates, the male pig ate more slowly and had to be fed alone to consume its ration.

Clinical findings

The pig weighed 28 kg, was emaciated and had a 1 cm diameter deep lesion, packed with debris, on the right side of the face 4 cm below the base of the ear.

The pig was fasted for 12 h and then anaesthetised by injection I/M of 2 mL of a mixture of 250-mg tiletamine and 250-mg zolazepam (Zoletil 100, Virbac NZ Ltd; Auckland, NZ) reconstituted with 2.5 mL ketamine (Ketamine 100 mg/mL; Parnell Technologies NZ Ltd, Auckland, NZ) and 2.5 mL xylazine (Xylaze100 mg/mL; Parnell Laboratories), hereafter referred to as TKX. This dose resulted in prolonged anaesthesia and hypothermia, and a reduced dose rate of 1 mL/40 kg live weight was used for subsequent procedures.

Examination of the oral cavity revealed feed packed in the mouth lateral to the mandible on both sides. Once an endotracheal tube was in place the lesion and the oral cavity were lavaged. The lesion on the right side was approximately 3 cm in diameter and extended into the mandible at the junction of the body and ramus. Examination of radiographs showed that the medullary cavity of the caudal part of the body and ramus of the mandible had been eroded, resulting in a large cavity containing material of mixed radio-opacity. The most caudal

* Massey University Veterinary Teaching Hospital, Institute of Veterinary, Animal and Biomedical Sciences, Massey University, Palmerston North 4442, New Zealand.

[§] Author for correspondence. Email robertmichaelarcher@hotmail.com

CT Computed tomography
MUVTH Massey University Veterinary Teaching Hospital
TKX Tiletamine and zolazepam reconstituted with ketamine and xylazine

mandibular molar was displaced caudally, separate from the rest of the cheek teeth, so that the caudal maxillary molar did not have an opposing tooth.

The impacted feed was removed and five days later a soft swelling developed on the forehead above the left eye. Palpation indicated that this swelling contained gas and fluid.

Two days later the pig was anaesthetised again for examination using computed tomography (CT), which revealed cavities and lesions of the mandible on both the left and the right sides of the mouth, close to the junction of the body and ramus, which were packed with feed (Figures 1 and 2). On the right side, entrapped food and infection had eroded a cavity in the caudal body and ramus of the mandible which ruptured out through an opening in the lateral cortex of the right ramus. Examination of CT images revealed the tract in the soft tissues along which food material and infection passed resulting in a discharging lesion below the ear. On the left side, impacted food and subsequent infection had eroded through the upper part of the lateral cortex of the left ramus through a number of openings (Figure 1). Gas and purulent material mixed with partly masticated feed had then tracked dorsally to produce a soft subcutaneous swelling above the left eye. This abscess was incised, debrided and lavaged, and left open to drain.

In an effort to reduce the amount of food trapped in the mandible, the pig's diet was changed from food scraps and pig meal to a wet slurry containing canned dog food, milk and universal pellets (Winslow Feeds, Ashburton, NZ) and the pig was moved onto a rubber floor to prevent consumption of straw bedding. The two lesions on the face were lavaged daily with dilute povidone iodine solution.

The two female litter mates of this case were examined and found to be normal. They were larger than the male pig, weighing 43 and 45 kg. Both animals were anaesthetised and examined using CT which showed their mandibles were normal and their mandibular cheek teeth formed a uniform arcade with no separation of the caudal molars, as had been seen in the male pig (Figure 2).

Sixteen days after first examination the male pig was anaesthetised again. The right side of the mandible was lavaged again to remove impacted feed material. In an attempt to reduce food entrapment and enable the pig to clear the opening with its tongue, the opening within the mouth into the right side of the mandible was enlarged to three times its original size in a rostro-caudal direction. This surgical procedure was repeated on the left side of the mandible two weeks later.

Seven months after discharge from the hospital the pig had improved in body condition. The pig was again anaesthetised and the internal mouth and mandible examined. Some food was still trapped in the cavities, although the lesions on the face had healed.

Case 2

Case history

A 4-year-old kunekune sow had developed a pruritic swelling just below the right ear 2 years prior to examination. This abscess had ruptured and then healed, but recurred producing a green coloured discharge. Otherwise the pig seemed healthy although she had lost weight since farrowing 9 weeks previously, when presented at the MUVTH.

Clinical findings

The sow weighed 83 kg and was thin. A fistula 1.5 cm in diameter was evident just caudal to the lateral canthus of the eye and a plug of food was present in the lesion.

The sow was anaesthetised using a 2-mL injection of TKX I/M. A cavity packed with masticated feed material was evident in the mouth at the junction of the body and the rami of both sides of the mandible. After removing the impacted ingesta, endoscopic examination revealed the oral mucosa to be continuous with the tissue lining the cavity in the mandible and that dorsally this lining merged in turn with that of the fistula on the face. On the left side of the mouth, the opening into the mandible continued into a round cavity within the body of the mandible that was about 3-cm deep.

The oral cavities of the sow's three 9-week-old piglets were also examined. One piglet was clinically normal, one had a 2-mm diameter mucosal ulcer where the mandible changed angle just lateral to the cheek teeth on the right side, and the third had a 5-mm horizontal linear ulcer in the mucosa at the change in angle of the mandible just lateral to the cheek teeth on both sides of the mouth.

Three months after the first examination the sow was re-presented for euthanasia because she had developed an abscess on her face above the left eye (Figure 3). At post-mortem examination this abscess contained food material. The cavity in the left side of the mandible had increased in size and erosion of the medullary cavity of the body and ramus of the mandible through to the mandibular cortex at the most dorsal aspect of the coronoid process was evident. The feed material had then tracked dorsally resulting in the subcutaneous abscess. The cavity in the right side of the mandible was lined by mucosa that was connected to the oral cavity and to the skin which had grown 2 cm down the opening from the skin surface to produce the fistula. The caudal molar teeth adjacent to the abnormal openings on both sides of the mandible were tilted horizontally so the occlusal surface was directed medially (Figure 4).

Case 3

Case history

A 5-year-old kunekune sow was presented at the MUVTH with a pruritic swelling on the right side of the face which had been first noticed 6 months previously. A veterinarian who had examined the sow 1 month previously had identified a lesion that communicated with the oral cavity and had recommended antibiotic treatment for a week. Following treatment the lesion appeared to heal. Otherwise the pig appeared normal and remained in good body condition on a grass diet.

Clinical findings

On examination this sow had a fistula 1 cm in diameter, 6 cm ventral to the base of the right ear that contained a plug of solid feed material. There was no inflammation or skin irritation around the lesion. The sow was anaesthetised using a 1-mL injection of TKX I/M. Masticated grass was evident packed into a cavity 2 cm in diameter in the right side of the mandible at the junction of the body and ramus, just lateral to the last molar. Once the impacted grass was removed it was possible to view the tips of a pair of curved forceps within the mouth when they were introduced into the fistula on the side of the face. No cavity was initially visible in the left mandible. However a small opening was

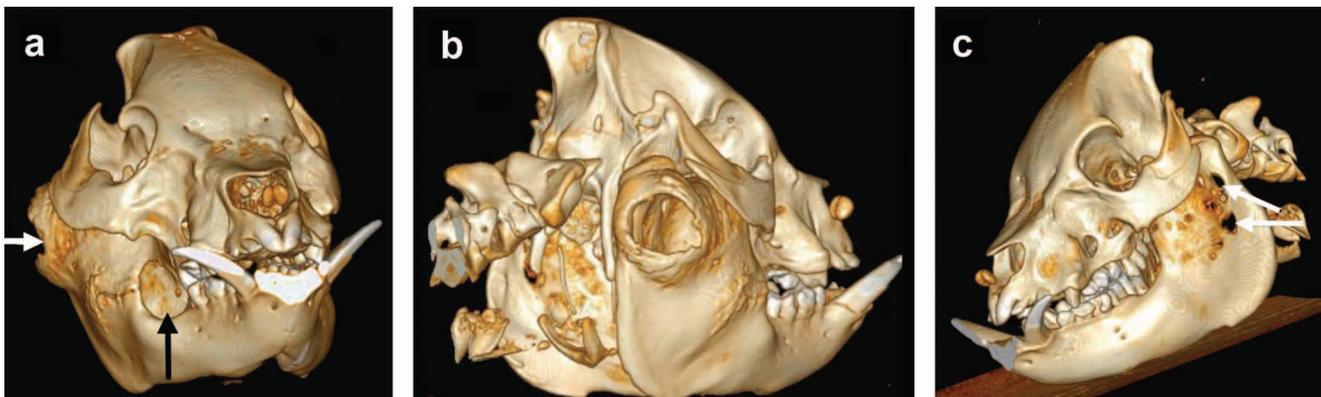


Figure 1. Three dimensional computed tomography images of the skull of a 30-month-old kunekune pig with an abnormal mandible (Case 1). (a) Rostral view showing opening into the body of the right side of the mandible (black arrow), connecting with an opening surrounded by roughened new bone in the ramus (white arrow). (b) Caudal view clearly showing the opening in the ramus on the right side of the mandible. (c) Lateral view showing openings in the ramus of the left side of the mandible (white arrows).

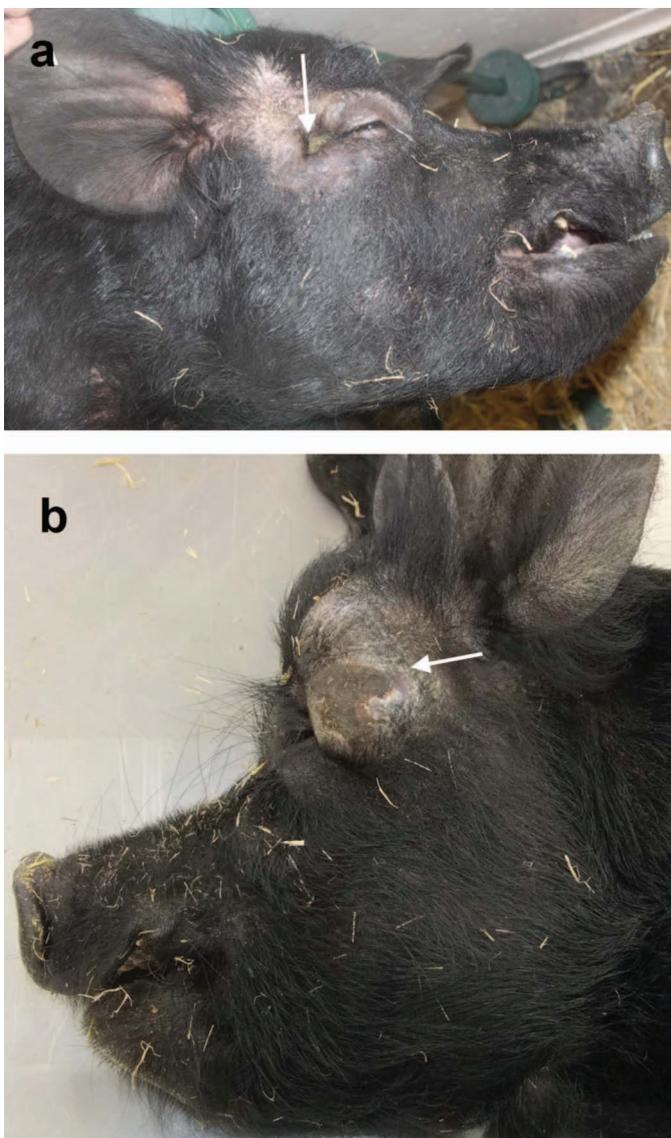


Figure 3. Head of a 4-year-old kunekune sow that had an opening into each mandible inside its mouth (Case 2). (a) Fistula on the right side of the face, adjacent to the lateral canthus of the eye, which contained a plug of masticated food (arrow). (b) Swelling on the left side of the face between the left eye and base of the ear (arrow). When this swelling was incised it was full of feed material.



Figure 2. Computed tomography cross sectional images, just caudal to the level of the eyes, of the skull of (a) a 30-month-old kunekune pig with an abnormal mandible (Case 1) showing a grossly widened mandible. On the right side impacted feed fills an abnormal cavity (arrow); on the left side this has been removed using lavage, showing a large black air-filled cavity (arrow); at top right, an oblique elongated dark area has been produced by gas within a subcutaneous abscess located between the left eye and the left ear (arrow). (b) Comparable image from a normal litter mate.



Figure 4. Axial view of the right side of the mandible of a 4-year-old kunekune sow that had an opening into each mandible inside its mouth (Case 2). A large opening is present at the junction of the body and ramus of the mandible, caudal to the cheek teeth (arrow). The most caudal tooth is slanted medially and its occlusal surface is obliquely placed.

identified at the junction of the tooth and gum caudal to the last molar, which was about 2 cm in depth.

Case 4

Case history

A 9-year-old kunekune sow had a lesion on the face, between the right ear and right eye, which the owner thought had developed recently.

Clinical findings

The sow was obese and estimated to weigh 120 kg. A fistula 2 cm in diameter was present on the right side of the face from which a discharge containing feed emanated. The sow was anaesthetised using a 4-mL injection of TKX I/M. There were food-impacted cavities in both sides of the mandible at the junction of the body and ramus. The cavity in the right side of the mandible connected with the lesion on the face. There was no facial swelling on the left side and the depth of the cavity was not investigated.

Survey of members of the New Zealand Kunekune Association

Discussions about Case 1 with local veterinarians and veterinary students at Massey University produced anecdotal evidence of similar problems in other kunekune pigs. Consequently, an email survey was sent to 36 members of the New Zealand Kunekune Association for whom addresses were available in June 2011. Twenty-one replies were received in which seven breeders reported owning a total of nine pigs that had shown similar clinical signs. Of the nine pigs reported, all of which had been examined by a veterinarian, six had cranial lesions that discharged masticated food material (Table 1). The other three had recurrent swellings and abscesses close to the base of the ear or eye but feed material was not reported in the exudate.

The castrated male pig reported in that survey subsequently developed weight loss and anorexia. The pig was euthanised in November 2011 and its head was sent to MUVTH for post-mortem examination and CT. Within the mouth there were openings into both the left and right sides of the mandible similar to those seen in Cases 1–4. These openings communicated with cavities in both sides of the mandible that connected to lesions on both sides of the face. The pig had two discharging lesions, 2 cm in diameter, on the right side of the face ventral to the base of the right ear. The right side of the face was swollen due to a large abscess lateral to the ramus of the mandible. Almost all of the

lateral cortex of the right ramus of the mandible had been destroyed by infection. There was a small discharging lesion 0.5 cm in diameter on the face, between the left eye and the base of the left ear, which communicated with a lesion approximately 1 cm in diameter in the proximal aspect of the coronoid process of the left ramus of the mandible. The most caudal left and right mandibular molars were displaced medially and did not oppose their opposite maxillary teeth.

Discussion

This clinical communication reports five cases of kunekune pigs that had lesions on the face, close to the base of the ear, which discharged food material. We have been unable to find any published reports of similar conditions in any species. In these pigs, examined while anaesthetised or post mortem, food entered the mandible through an opening just lateral to the last visible molar at the junction of the body and ramus of the mandible. Although all of these pigs had lesions on the right side of the face, they also had abnormalities in the left mandible that we assume were similar in aetiology but at different stages of progression. In Case 1, the erosion of the inside of the left side of the mandible had reached the ramus and had broken out through a number of openings in the lateral cortex. While this pig was at MUVTH, the gas, feed and purulent material leaking from the mandible tracked dorsally to form a subcutaneous abscess on the top of the head between the eye and ear. The gas was presumably responsible for the dorsal tracking, in contrast to the more lateral direction that occurred in the cases where the lesion developed below the base of the ear.

Although the development of lesions were not observed from the beginning, our observations in the cases studied are consistent with the suggestion these likely arose from deformation of the mandible and teeth which resulted in cheek and gum injuries during eating. In Case 1, the most caudal molar was displaced caudally and separated from other cheek teeth. In contrast, the mandibular cheek teeth in its siblings formed a continuous arcade with no gap to the caudal-most molars. In Case 2, the caudal molars on both sides of the mandible were more horizontal than vertical and their occlusal surface was directed medially. In both Case 1 and Case 2, the caudal maxillary molar was unopposed and might have traumatised the opposite gum on the mandible and started the lesion that then impacted with feed. Another possibility is trauma to the gum caused by feed when the pig masticated. We do not know the relevance of the small mucosal ulcers seen in two of the piglets born to one of the affected pigs.

Table 1. Results of a survey of members of the New Zealand Kunekune Association for six kunekune pigs reported to have cranial lesions that discharged food material.

Gender	Age (years) ^a	Location of lesions	Weight loss	Veterinary treatment	Outcome
Female	3	Left-side face	No	Surgical incision, Lavage	Alive as 3-year-old
Female	6	Right-side face	No	Surgical incision, Lavage	Slaughtered
Female	7	Below left ear	Yes	None reported	Euthanised
Male	5	Above eye	No	Abscess drained, Antibiotics	Slaughtered
Castrated Male	1	2 lesions below right ear	No	Debride lesions, Daily Lavage	Alive as 3-year-old
Castrated Male	Unknown	Below right ear	Yes	None reported	Euthanised, examined post mortem

^a When lesion developed

Euthanised = subject to euthanasia as a result of lesions

The openings into the mandible in the cases examined by us were smooth in outline and positioned just lateral to the cheek teeth, except in the left side of Case 3, the least developed lesion we saw, where it was just behind the last visible molar. Once food started to pack into the cavity, progressive erosion of the medullary cavity and then rupture through the thinnest part of the mandibular cortex is thin, often on the lateral aspect of the vertical ramus, seems logical as does the subcutaneous abscess and resulting discharging lesion. The progression of the lesion in the left mandible of Case 2 is supportive of this theory. The mucosa-lined cavity and fistula in the right side of Case 2, that had the oldest lesion, presumably resulted from epithelialisation of the inside of the eroded mandible, the oral mucosa advancing to join the skin.

If malformation of the mandible and abnormally positioned teeth were related to the development of the lesions observed, then genes responsible for the small size and short length of the snout in kunekune pigs may play a role. Miniature horses are known for having more dental problems than the larger breeds because of relatively large teeth being overcrowded in a shorter jaw (Easley 2005). Where intensive inbreeding has been used in animal species to reduce body size, teeth reduce proportionately less in size than the mandible; for example, the teeth of a 110 kg Miniature horse are similar in size to those of a 450 kg Quarter horse, while the mandible is markedly reduced in size (Easley 2005). The recovery of the kunekune breed from a population of only about 50 pigs in the 1980s to the much larger numbers present today would likely have involved considerable inbreeding, although a genetic predisposition to or cause of the mandibular abnormalities observed remains speculative.

The surgical treatment in Case 1, whereby we increased the size of the openings into the mandibles in a medial direction in the hope that less food would be trapped behind a smaller orifice and that the tongue may be able to help clear some feed, may have helped but was not curative. Sealing the cavity by surgically moving adjacent tissue on the gum or lip would be difficult and the contamination and infection in the mandible would still have to be treated.

Once adult pigs developed a fistula which enabled impacted feed to drain they seemed to be minimally affected. When the swelling on the face first developed there were reports of irritation and scratching. Case 1 was very thin and ate slowly and the mandible on both sides had active lesions with inflammation and infection present, whereas in Case 2 the fistula had been present for 2 years and the cavity inside the right mandible had a mucosal lining with no evidence of inflammation. Once an abscess or draining lesion develops a simple procedure that may hasten the progression to fistula formation would be to encourage drainage by increasing the size of the opening in both the skin and the lateral cortex of the vertical ramus of the mandible, being careful not to cut the dorsal buccal branch of the facial nerve, to make it easier for feed to drain. One owner reported being able to lavage a large fistula with a hose each day (Table 1). Case 1 resented lavage of the lesions, but the lesions were small so that it hurt the pig when the catheter-tip syringe was inserted.

We do not know if the wetted slurry we fed Case 1 did in fact reduce the amount of food packed into the mandible. From the cases we saw and were reported most of the kunekune pigs graze pasture as their main feed and require little else. The masticated

grass within the mandible of Cases 2 and 3 was firmly packed into the cavity, and created a solid plug in the fistula.

Because of the small volume used (1–2 mL in most cases), the anaesthetic mixture (TKX) made up to be 50 mg/mL of each of tiletamine-zolazepam, ketamine and xylazine was easy to inject intramuscularly behind the ear with minimal restraint in these tame pigs. A dose rate of 1 mL/10 kg liveweight (5 mg/kg of each drug) resulted in prolonged anaesthesia with hypothermia in Case 1 so reduced dose rates were used for subsequent procedures and cases. Although anecdotal, from our experience a dose rate of 1 mL/40 kg was sufficient to achieve recumbency, oral examination, debridement of the cavity in the mandible and recovery within an hour. Two studies of TKX in pigs indicated that the ketamine may not be necessary, while the addition of butorphanol improved analgesia (Ko *et al.* 1993; Henrikson *et al.* 1995; Rauser *et al.* 2008).

We have described five cases and received reports of another five probable cases of kunekune pigs with an opening in their mandible that resulted in a lesion on their face that discharged feed material. Surgery to enlarge the hole in the mandible to reduce food entrapment did not appear to be successful, but in some cases these pigs maintained a healthy bodyweight despite the lesions.

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