

CASE REPORT

Companion or pet animals

Ultrasound diagnosis and sialadenectomy confirming a mandibular salivary gland vegetative foreign body and chronic sialadenitis in a dog

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UK.
Email: kjp44@cam.ac.uk**Abstract**

A 2-year-old, female, neutered dog presented with a right-sided, non-painful, ventral neck mass approximately 2.5 cm in diameter. Although aspirates of the mass yielded a low volume of grossly purulent exudate, there was no response to antibiotic and non-steroidal anti-inflammatory medications. Cervical ultrasound examination revealed a straight hyperechoic structure with no associated distal acoustic shadowing in the right mandibular salivary gland, surrounded by a small volume of anechoic fluid, most consistent with migrating foreign material and focal sialadenitis. The surrounding subcutaneous tissues were hyperechoic with interspersed anechoic fluid material, consistent with cellulitis. Vegetative material was considered most likely due to the shape of the structure and absence of distal acoustic shadowing. Right mandibular and sublingual sialadenectomy was performed and vegetative material was retrieved from the mandibular salivary gland. Histopathology revealed chronic pyogranulomatous sialadenitis secondary to foreign body migration. Surgical excision achieved clinical resolution at 8 weeks follow-up.

BACKGROUND

Migrating vegetative foreign material is a common cause of abscess formation in dogs, frequently affecting the subcutaneous tissues of the cervical region.^{1–9} Foreign material migration into salivary glands is a rare presentation, however. Previous reports have described a foreign body in the parotid salivary gland in a human, in the parotid salivary duct or parotid gland of three dogs, and multiple grass awns within the mandibular salivary duct of a horse.^{4,10–13} To the authors' knowledge, this is the first report describing vegetative foreign material within the mandibular salivary gland of a dog, whereby the foreign material is presumed to have migrated via the mandibular duct.

Cervical swellings are a common occurrence in first opinion practice, and recognition of potential differential diagnoses for these is important. In this case, foreign material within the right mandibular salivary gland presented as a firm, cervical mass. Differential diagnoses included abscessation of the subcutaneous tissues, lymphadenomegaly, sialadenitis, granuloma and neoplasia.³ Palpation of the cervical region may allow identification of the structure(s) affected, though further diagnostic tests are usually indicated for a definitive diagnosis to be reached.

Ultrasonography is a widely available diagnostic imaging modality in first opinion and referral practices. It can be used to identify the normal structures of the neck and, as demonstrated by this case report, help differentiate the potential causes of cervical masses.^{7,9,14–16} Its use in the localisation of foreign material in the thoracic cavity, subcutaneous cervical region, metatarsal region, lumbar muscles and parotid duct has been well described.^{1,2,10,17} Specific limitations of ultrasound in the diagnosis of foreign material must be acknowledged, however, such as operator experience, anatomical location, foreign body texture and size. Antibiotic treatment before ultrasound examination can reduce local soft tissue changes, which aid identification of foreign material on ultrasound.^{17–19} Computed tomography (CT) is commonly used instead of, or alongside, ultrasonography in the investigation of cervical swellings and in cases where migrating foreign material is suspected.^{4,11}

Foreign body migration into salivary ducts or glands may manifest as sialocholes or sialadenitis.^{20–22} Medical management alone is often unsuccessful due to the potential for recurrent sialadenitis, abscessation, cellulitis and myositis while foreign material remains in situ.^{4,11,21} Definitive treatment may be achieved by non-surgical retrieval of the foreign material if it is at an amenable location, which is usually

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restricted to the parotid duct in the dog.⁴ In this case, surgical excision of the mandibular salivary gland was recommended given the location of the foreign material within the body of the gland and lack of response to medical management.^{3,21,23}

CASE PRESENTATION

A 2-year-old, female, neutered, crossbreed dog was presented to the Queen's Veterinary School Hospital (QVSH), University of Cambridge, with a 1-month history of a non-painful, right-sided ventral neck mass. The mass had been unresponsive to medical treatment comprising amoxicillin clavulanic acid (MiPet Synuclav 250 mg tablets, Norbrook Laboratories; 15 mg/kg twice daily per os [orally, PO]) and meloxicam (Meloxidyl 1.5 mg/mL oral suspension, Ceva Animal Health; 0.1 mg/kg PO once daily). These medications were discontinued in the week before referral. Preceding investigations included fine-needle aspiration of the mass, which had revealed grossly purulent fluid; cytological examination of the fluid was not performed.

General clinical examination revealed a non-painful, right-sided, ventral neck mass, measuring 3–4 cm in diameter, located at the level of the right mandibular salivary gland. The right mandibular lymph node was palpable as a separate, distinct structure. The remainder of the clinical examination was unremarkable.

INVESTIGATIONS

An oropharyngeal examination under sedation revealed a right-sided ranula.

Cervical ultrasonography was performed (see Figures 1 and 2 and Video 1) using a linear transducer (MHz 5–18, EPIQ Elite, Philips Medical Systems). This confirmed the right mandibular salivary gland to be anatomically located caudal to the mandibular lymph nodes, of normal size (short axis 1.15 cm), and the parenchymal echogenicity was similar to the left side. Within the medial aspect of the right mandibular salivary gland there was a hyperechoic linear structure measuring 1.1 cm with no evidence of acoustic shadowing, surrounded by a very small pocket of anechoic fluid. The hyperechoic linear structure was straight and sharply marginated, tapering at the medial aspect. A thin hypoechoic tract (consistent with fluid) was traced from the linear structure to the subcutaneous tissue surrounding the medial aspect of the right salivary gland and the mandibular lymph nodes. Significant abscessation surrounding the linear structure within the salivary gland was not appreciated. The subcutaneous fat overlying the right mandibular gland was hyperechoic and interspersed with fluid pockets, consistent with cellulitis or oedema. In comparison, the left mandibular salivary gland was within normal limits and symmetrical in size with the right (short axis 1.15 cm). The right mandibular lymph nodes were hypoechoic and mildly enlarged compared to the left, measuring 0.37–0.43 and 0.32 cm in maximal short-axis diameter, respectively.

These ultrasound findings were most consistent with a straight foreign body located within the right mandibular salivary gland, with focal inflammation (sialadenitis) and adjacent oedema and/or cellulitis in the surrounding soft tis-

LEARNING POINTS/TAKE-HOME MESSAGES

- Intraparenchymal salivary gland foreign bodies and associated sialadenitis with regional oedema/cellulitis should be considered as a differential for ventral neck swellings.
- Ultrasonography is a good first-line diagnostic imaging modality to investigate cervical swellings, and is widely available in primary care practice.
- The mandibular salivary gland structure and pathology can be accurately interrogated with cervical ultrasound.
- Sialoadenectomy, when a foreign body is detected within the salivary glands, should achieve a curative outcome.

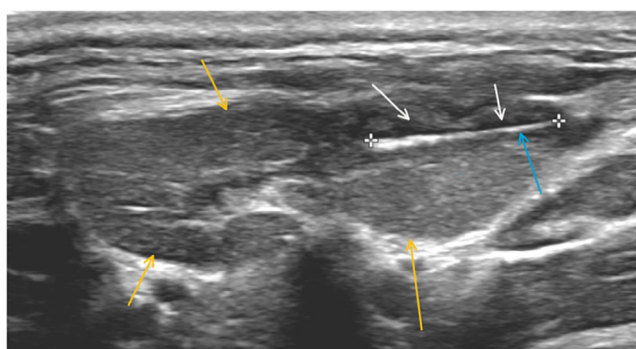


FIGURE 1 Ultrasonographic image of the right mandibular salivary gland (outline depicted by yellow arrows). Foreign body within salivary gland (blue arrow). Small pocket of anechoic fluid (white arrows).

sues. Vegetative material was considered most likely, given its shape and the absence of acoustic shadowing.

The mild right mandibular lymphadenopathy may have been a normal variation or due to reactive hyperplasia resulting from chronic inflammation in the cervical region. As the pathology was mainly confined to the mandibular gland, our presumption was that the ranula formed as a result of sublingual gland trauma incurred during foreign body ascension along the mandibular duct.

Fine-needle aspirates of the anechoic fluid pocket around the foreign material and the soft tissues adjacent to the right mandibular salivary gland were considered; however, due to the small size of the fluid pockets described, and the fact the results were unlikely to alter the treatment plan (sialadenectomy with foreign material retrieval), such sampling was not performed.

TREATMENT

Given the high suspicion of a migrating foreign body in the right mandibular salivary gland with secondary sialadenitis and ranula formation, sialadenectomy of the right mandibular and sublingual salivary glands was performed. The patient was premedicated with medetomidine (Sedator solution for injection, Dechra UK; 2.5 µg/kg) and methadone (Methadyne Injection, Jurox Animal Health; 0.2 mg/kg), administered

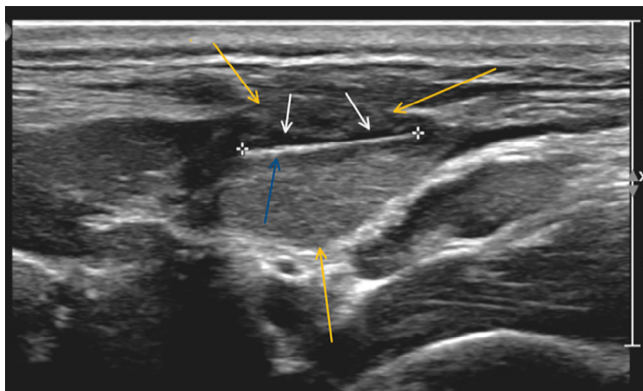


FIGURE 2 Ultrasonographic image of the right mandibular salivary gland (outline depicted by yellow arrows). Foreign body within salivary gland (blue arrow). Small pocket of anechoic fluid (white arrows).

intravenously (IV). Anaesthesia was induced using propofol (Propofol plus Emulsion for Injection, Abbott Animal Health; 3 mg/kg IV), and was maintained by placement of an endotracheal tube through which 100% oxygen and isoflurane were delivered. A mandibular nerve block using bupivacaine (Marcain polyamp Injection, AstraZeneca UK; 2 mg/kg) was performed and additional perioperative analgesia was provided by a continuous-rate infusion of ketamine (Anesketin solution for injection, Dechra UK; 10 µg/kg/min IV).

Right mandibular and sublingual sialadenectomy was performed via a ventral approach.²⁴ The patient was positioned in dorsal recumbency, and the skin was incised parallel and medial to the right mandibular body, extending approximately 5 cm cranial and caudal to the caudal aspect of the right mandibular ramus. The platysma muscle was incised and the right mandibular salivary gland was identified, surrounded by significant fibrosis. Intracapsular dissection of the right mandibular and sublingual salivary gland complex was performed, with the dissection continuing rostral to the level of the lingual nerve given the presence of the ranula on oropharyngeal examination. When no further salivary tissue was identified at the rostral extent of the dissection, a single circumferential ligature was placed around the mandibular and sublingual salivary ducts using 2 M (3-0) polydioxanone and the salivary tissue was excised.

The surgical site was closed routinely with apposition of the mylohyoideus and platysma muscles before closure of the skin, using 3-0 poliglecaprone 25 suture material. An indwelling surgical drain was not placed. Intraoral examination at the end of surgery revealed resolution of the ranula, and therefore marsupialisation was not performed.

The intraoperative findings were consistent with a chronic sialadenitis of the right mandibular salivary gland. Following removal, vegetative material was retrieved from the body of the right mandibular salivary gland (see Figure 3).

OUTCOME AND FOLLOW-UP

The right mandibular and sublingual salivary gland complex was submitted for histopathological examination. The right mandibular salivary gland featured a pyogranulomatous focus with a histological diagnosis of marked, chronic sialadenitis. As the inciting vegetative material had been retrieved

before laboratory submission, there was no evidence of residual foreign material or large bacterial colonies in the tissue submitted. Similar but less severe changes were noted in the right sublingual salivary gland.

The patient was hospitalised overnight on methadone (Methadyne Injection, Jurox Animal Health; 0.2 mg/kg IV every 4 hours) to maintain an adequate level of analgesia, which was discontinued the following morning before discharge. Clinical signs consistent with colitis, presumed to be stress associated, were noted during hospitalisation, and consequently the post-operative analgesia protocol comprised paracetamol codeine (Pardale-V 400 mg oral tablets, Dechra; 16 mg/kg PO every 8 hours). Considering the foreign body had been successfully retrieved with en bloc removal of the associated salivary tissue, and there were no bacterial colonies reported on histopathology, post-operative antibiotics were not prescribed. Routine incision care instructions were provided, and the patient was discharged with an Elizabethan collar to prevent incision interference.

A post-operative consultation with the primary care practice was performed 2 weeks after discharge from the QVSH, during which the skin sutures were removed. Appropriate incision healing was reported, with no seroma formation, ongoing cellulitis or abscessation noted. Telephone follow-up with the owner 8 weeks after discharge was suggestive of a full recovery from surgery, with no post-operative complications and no recurrence of swelling in the cervical region.

DISCUSSION

Foreign bodies located in the salivary glands are encountered infrequently, with few published case reports in dogs.^{4,10,11} To the authors' knowledge, this case report is the first description of a vegetative foreign body within the mandibular salivary gland of a dog.

The route of entry of the foreign body into the salivary gland has not been heavily discussed in previous case reports on canine patients. In this case, it is assumed that the foreign material migrated along the mandibular duct into the gland, which is likely to be much less common than migration of foreign material through the parotid duct, given its smaller lumen and less exposed opening at the sublingual caruncle.^{11,25} Migration of foreign material via the skin and mandibular salivary gland capsule into the glandular parenchyma is a possible alternative aetiology, as has been described in a previous publication,¹⁰ though this is considered less likely here given the rostro-caudal orientation of the foreign material within the gland on imaging and the multiple tissue planes that would have to be traversed to reach this location.

Existing publications reporting foreign bodies within salivary structures have described chronic inflammation (sialadenitis) and/or sialocoele sequelae.^{20–22} In this case, ranula formation had occurred, which is presumed to be the result of trauma to the sublingual salivary glands and/or duct during migration of the foreign material through the mandibular duct. Obstruction of the duct by foreign material is also a potential cause for sialocoele formation, though this was not observed in the case presented here.^{4,13,20} Imaging of the salivary glands can help differentiate other causes of sialocoele, including sialoliths and neoplasia, with many cases being

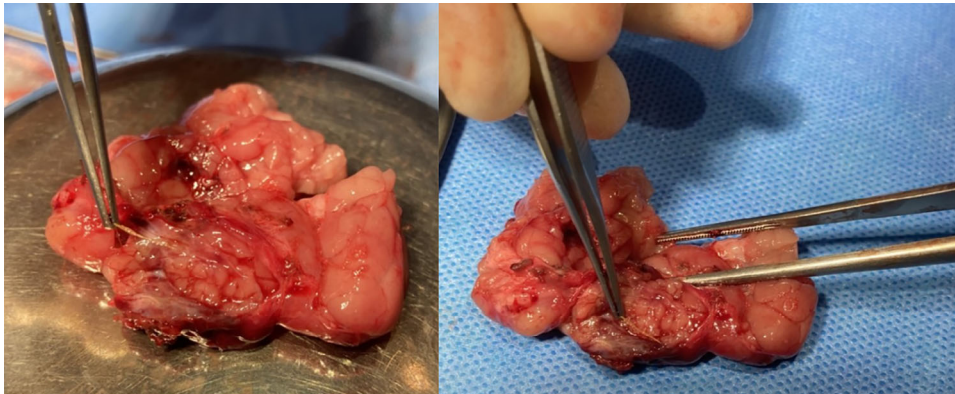
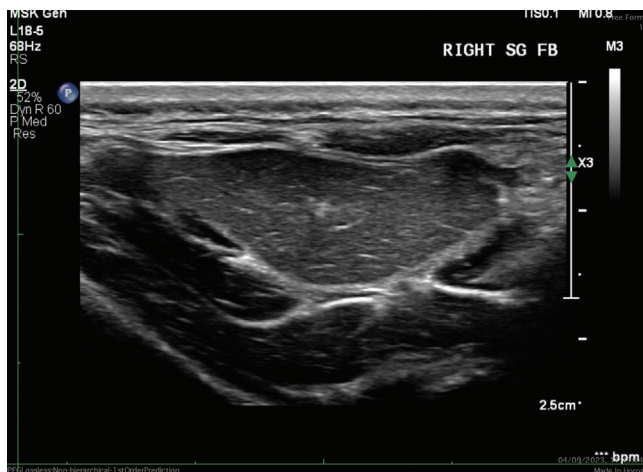


FIGURE 3 Surgical images of the vegetative material (held by Adson thumb forceps) located within the mandibular salivary gland.



VIDEO 1 Ultrasound scan through the right mandibular salivary gland.

deemed idiopathic when no inciting cause is identified.^{26–28} The dog in this report presented with a non-painful, firm, soft tissue swelling in the location of the affected salivary gland, which failed to respond to antibiotic and anti-inflammatory medications. It is important to recognise that this presentation is different to the classic presentation of sialadenitis or necrotising salivary gland disease, where pain on palpation of the affected salivary gland and vomiting tend to feature and medical management is indicated and tends to be successful without surgical intervention.^{29,30}

The ultrasonographic findings described here are similar to previous reports of vegetative foreign body appearance, describing a hyperechoic structure associated with varying degrees of acoustic shadowing.^{2,9,10,13,17,18} In this case, there was an absence of any distal acoustic shadowing, which from the authors' experience is more likely to be associated with vegetative material such as grass blades or awns. In some cases, such as this, a hypoechoic tract can be traced to the hyperechoic foreign body structure. The presence of local soft tissue changes surrounding the foreign body aid its identification by ultrasound.¹⁷

This report further highlights the value of ultrasonography as a diagnostic tool in assessing cervical anatomy and detecting vegetative foreign bodies.^{15,16} It is often widely available in first opinion practice, and is more cost-effective than cross-sectional imaging modalities such as CT and magnetic resonance imaging (MRI). Acknowledged limitations of ultrasound are that it is operator dependent, and foreign bodies

can be difficult to detect if they are not highlighted by surrounding hypoechoic to anechoic fluid and if they do not demonstrate distal acoustic shadowing.^{11,17,18} CT and MRI with the aid of positive-contrast studies can help with assessment of the extent of cervical pathology and identification of foreign materials in some cases.^{4,10,11,19,31} The accuracy of different imaging modalities for foreign body detection is dependent on the consistency of the foreign body, for example, one paper describes wooden foreign bodies to be more sensitive to detection on CT, when compared to ultrasound and MRI.¹⁹ However, as demonstrated in this case report and the current veterinary literature, ultrasonography can be considered as an alternative or adjunctive tool to advanced imaging.^{2,10,13,17,18}

In some cases, foreign material can be removed using ultrasound guidance at the time of scanning.¹⁷ This was not considered possible in the case reported here due to the location of the foreign body within the mandibular gland, and the considered risks such as sialocele formation, haemorrhage or nerve damage.³

In conclusion, this case report describes the investigation and treatment of a dog with a ventral neck mass of unusual aetiology, and highlights the utility of ultrasound as a sensitive, first-line, diagnostic imaging modality. Migrating vegetative foreign material within the mandibular salivary gland may cause sialadenitis, cellulitis of the adjacent soft tissues and ranula formation, and can be successfully treated by mandibular and sublingual sialadenectomy.³

AUTHOR CONTRIBUTIONS

Katherine Phillips collated the data and wrote the paper, with input from Bethany Guy, Sebastian Prior and Julia Riggs. Julia Riggs and Sebastian Prior were involved in the surgical aspect of the case and Bethany Guy was involved in the diagnostic imaging aspect of the case.

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CONFLICT OF INTEREST STATEMENT

The authors declare they have no conflicts of interest.

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ETHICS STATEMENT

Retrospective case report. No ethics statement required.

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MULTIPLE-CHOICE QUESTION

What is the most likely diagnosis from the following ultrasound description: Within the medial aspect of the right mandibular salivary gland, there was a hyperechoic linear structure measuring 1.1 cm with no evidence of acoustic shadowing, surrounded by a very small pocket of anechoic fluid. The hyperechoic linear structure was straight and sharply marginated, tapering at the medial aspect. A thin hypoechoic tract (consistent with fluid) was traced from the linear structure to the subcutaneous tissue surrounding the medial aspect of the right salivary gland and the mandibular lymph nodes.

POSSIBLE ANSWERS TO MULTIPLE-CHOICE QUESTION

- Mandibular sialocoele.
- Sublingual salivary gland vegetative foreign body.
- Mandibular salivary gland vegetative foreign body and focal sialadenitis.
- Abscessating mandibular lymphadenitis.

CORRECT ANSWER

c. Mandibular salivary gland vegetative foreign body and focal sialadenitis.