Standing transcutaneous surgical excision of a sialolith in an 11-year-old Thoroughbred mare

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Summary

An 11-year-old Thoroughbred mare was diagnosed with sialolithiasis of the right parotid salivary duct. A firm nonpainful subcutaneous mass was palpable in the right maxillary region adjacent to premolar 4 (tooth 108). Radiographic and ultrasonographic examinations identified a discrete mineralised ovoid mass that was hyperechoic and produced an acoustic shadow. Surgical excision of the mass was performed under standing sedation using a transcutaneous approach and the excised sialolith submitted for histopathological and mineral composition analyses. Histological examination found no evidence of a nidus at the sialolith's core. Mineral analysis of the sialolith revealed its composition to be 40% calcium phosphate (apatite) and 60% calcium carbonate. The mare recovered with no post-operative complications and was clinically unremarkable 2 years later.

Keywords: horse; sialolithiasis; parotid; salivary duct; excision; standing sedation

Introduction

Sialolithiasis is a rare condition in horses and has been infrequently reported in the veterinary literature (MacLean 2006; Barat and Rawlinson 2013; Kilcoyne *et al*. 2015) although there may be a higher incidence in donkeys (Misk and Nigam 1984; Kay 2006; Oreff *et al*. 2016).

Equine sialoliths are most commonly found in the parotid salivary duct (Bouayad *et al*. 1991; Rakestraw 2003; Kay 2006). Multiple sialoliths have been reported but are uncommon (Singh *et al*. 1987).

To the author's knowledge, there are no detailed reports of standing transcutaneous excision of sialoliths. This paper reports a confirmed case of chronic sialolithiasis in the parotid salivary gland duct in a horse, treated by surgical excision using a transcutaneous approach under standing sedation.

Case details

An 11-year-old Thoroughbred mare, kept as part of a university teaching herd, was presented to the Onderstepoort Veterinary Academic Teaching Hospital (OVAH) for routine dental evaluation and examination of a protruding facial mass in the right maxillary region

of approximately 12 months' duration. The teaching herd manager reported that the mass had gradually increased in size during this period and the mare had shown no evidence of dysphagia or difficulty drinking. The mare had not been used for ridden work so no information was available regarding acceptance of a bit or bridle during this time.

Clinical examination at presentation revealed the mare to have normal clinical parameters and mentation with no evidence of regional lymphadenopathy. An oral examination was unremarkable. Palpation of the right maxillofacial region revealed a firm elongated smooth subcutaneous mass of 8 cm length × 2 cm width. The mass was present under the skin in the right maxillary region in the proximity of and lateral to premolar 4 (tooth 108) (Floyd 1991). The mass was not adherent to the skin and no pain could be elicited on palpation (Fig 1). No other abnormalities were evident on a general physical or oral examination.

Figure 1. The firm subcutaneous mass of 8 cm length × 2 cm width, present under the skin in the right maxillary region in the region of premolar 4, at presentation.

Radiographic examination (Fig 2) of the right maxillary region revealed a discrete mineralised radio-opaque oval structure with smooth borders lateral to premolar 3 (tooth 107) and premolar 4 (tooth 108). A small radiolucent area was evident at the centre of the mass and oval concentric lines were present around it. An ultrasonographic evaluation of the right parotid salivary gland duct revealed a hyperechoic structure that cast a strong acoustic shadow and was located within the margins of the salivary duct.

Figure 2. A dorsoventral radiograph of the rostral aspect of the skull. A smooth bordered mineralised structure with concentric lines and a round central area of radiolucency is located in the region demarcated by the molars 107 and 108. Right is to the left of the image.

A provisional diagnosis of a single large sialolith in the rostral aspect of the right parotid salivary duct was made and the decision taken to perform a surgical excision via a transcutaneous approach using standing sedation. Peripheral venous blood samples were obtained for routine preoperative haematological and serum biochemical analyses with all parameters being within normal limits.

An intravenous catheter was aseptically placed in the left jugular vein. Preoperative medication included intramuscular procaine benzyl penicillin (25 mg/kg bodyweight (bwt): Benzyl penicillin[1]), intravenous gentamicin sulphate (6.6 mg/kg bwt: Genta 50[2]) and intravenous flunixin meglumine (1.1 mg/kg Finadyne[3]). Sedation using detomidine hydrochloride (10 µg/kg bwt; Domosedan[4]) and butorphanol tartrate (0.1 mg/kg bwt; Torbugesic[5]) were administered as a bolus before and during the procedure, as required to maintain a plane of sedation that allowed the procedure to be performed. Lignocaine hydrochloride (0.25 mg/kg bwt: 2% Lignocaine[6]) was instilled into the subcutaneous tissues

overlying the mass to provide surgical anaesthesia. The right maxillary region was aseptically prepared and draped. A skin incision was made over the long axis of the mass and the subcutaneous tissues were sharply divided to expose the wall of the parotid salivary duct. The lateral wall of the duct was sharply incised and the ovoid mass (Fig 3) retrieved from the duct lumen using a straight haemostat as previously described (Baskett *et al*. 1995). A swab for bacterial culture and sensitivity was obtained from the duct lumen and wall at the sialolith site. A (0) Nylon (Ethicon[7]) suture material was passed through the incision of the parotid salivary duct and advanced until it appeared through the buccal ostium into the oral cavity. The suture material was then tied onto the distal aspect of silastic tubing (10 gauge French urethral catheter[8]). By applying traction to the nylon suture material, the silastic tubing was advanced into the parotid salivary gland duct via the buccal ostium. Once the catheter reached the surgical site, the nylon suture was removed and the silastic tubing advanced 2 cm distal to the incision site (Fig 4). Catheterisation of the parotid duct was performed to allow saliva to bypass the incision site to reduce the risk of dehiscence. The rostral aspect of the catheter was withdrawn through the skin at a separate site through a stab incision 3 cm rostral to the parotid papilla and secured to the skin using 0 Nylon (Ethicon[7]) in a Chinese finger trap suture pattern (Olivier *et al*. 1998). The lateral parotid salivary gland wall was closed with 3-0 glycomer 631 (Biosyn[8]) in a simple interrupted suture pattern and the subcutaneous tissues were closed with 2-0 glycomer 631 (Biosyn[8]) in a simple continuous suture pattern. Prior to skin closure, saliva was visually confirmed to flow through the feeding tube.

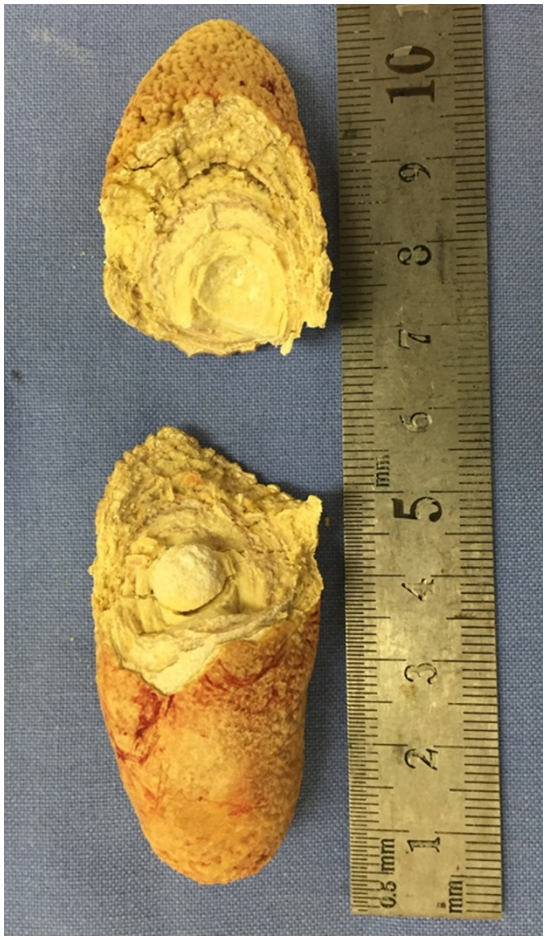

Figure 3. The removed sialolith after dissection to show the internal laminated appearance with a central spherical core.

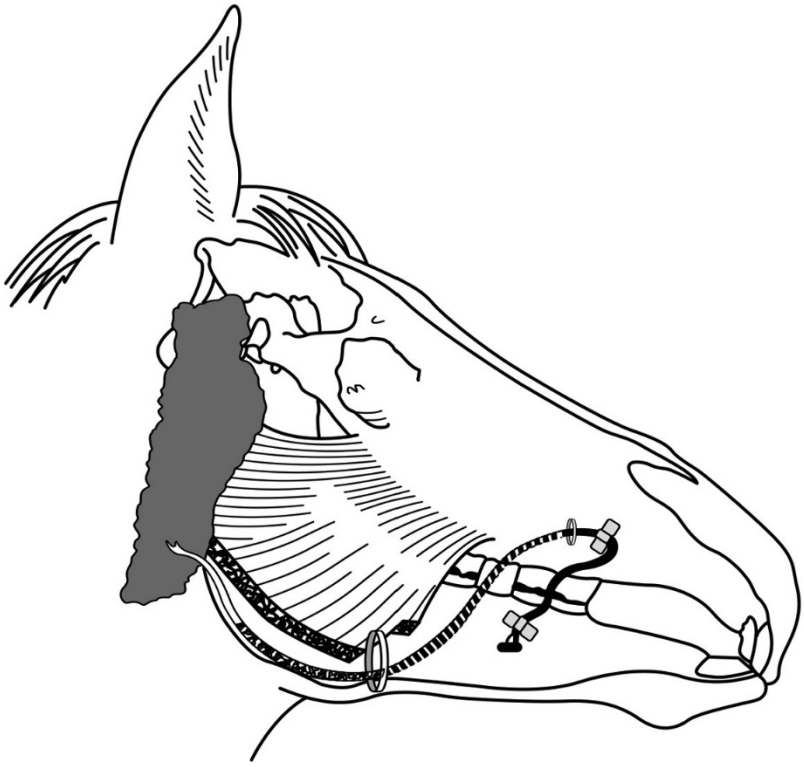

Figure 4. Silastic stent tubing in place within the parotid salivary duct and exiting from a separate skin incision.

The skin incision was closed with 2-0 nylon (Ethicon[7]) in a simple interrupted suture pattern. The excised mass was submitted for histopathological and mineral analyses.

Post-operative medication included six further days of twice daily procaine benzyl penicillin (25 mg/kg bwt: Benzyl penicillin[1]), once daily gentamicin sulphate (6.6 mg/kg bwt: Genta 50[2]) and once daily flunixin meglumine (1.1 mg/kg Finadyne[3]). No complications occurred during the post-operative period and the silastic tubing (10 French Catheter[8]) was removed 7 days post-operatively when the mare was discharged.

The mare was re-examined as an out-patient 14 days after surgery when the skin sutures were removed and was found to be clinically unremarkable and having no difficulty eating or drinking. There was no evidence of infection, fistula formation or swelling at the surgical site.

Two years later, the mare remained clinically unremarkable with no abnormality apparent of the right parotid salivary gland duct, no residual swelling or drainage and no abnormalities evident on an oral examination.

Histopathological analysis

Histopathological analysis was not possible due to the brittle, laminar, crumbling and purely mineralised nature of the sialolith, a sample of which dissolved in 8% formic acid normally used to decalcify bone to allow sectioning of the connective tissue matrix. There was no nidus present at the centre of the sialolith sample submitted for histology, although after surgical removal and prior to sample submission to the pathology laboratory, there appeared to be a central spherical core within which a nidus likely had been present (Fig 3).

Samples of the sialolith were assessed for mineral composition which revealed it to be a combination of 40% calcium phosphate and 60% calcium carbonate. This result is consistent with previous reports of mineral content of equine parotid gland sialoliths (Kay 2006; Oreff *et al*. 2016).

Bacterial culture and sensitivity analysis

Bacterial culture of the swab obtained from the parotid duct lining at the sialolith extraction site was positive for *Pasturella pneumotropica* and *Streptococcus viridans*. These bacterial populations had susceptibility to gentamicin sulphate and penicillin on antibiogram/sensitivity testing.

Discussion

The horse has three paired salivary glands, the parotid, mandibular and sublingual, with sialolithiasis most commonly affecting the rostral aspect of the parotid salivary gland (Baskett *et al*. 1995; Schumacher and Schumacher 1995; MacLean 2006; Kilcoyne *et al*. 2015).

The specific aetiology of sialolithiasis reported in horses is unknown (Baskett *et al*.1995; Kay 2006; MacLean 2006). It has been hypothesised that the close proximity of the buccal ostium to the parotid salivary gland duct and the buccal aspect of the maxillary teeth make entry of foreign material such as plant awns, ascending infection and trauma from sharp enamel points on the molars, more likely (Kilcoyne *et al*. 2015). Organic matter that enters the parotid salivary gland through the buccal ostium can act as a nidus around which calcium salts are deposited (Bouayad *et al*. 1991; Kay 2006). This organic matter has been identified as foreign bodies such as grain, plant awns or cellular debris and bacteria as a result of sialo-adenitis (Bouayad *et al*. 1991; Kay 2006; Kilcoyne *et al*. 2015). The presence of a nidus is a common finding when histological analysis of sialoliths is performed (Kay 2006; Oreff *et al*. 2016). No nidus was identified in this case although a central spherical core was present. This may have been due to the nidus being composed of cellular debris which has previously been reported (Kilcoyne *et al*. 2015; Carlson *et al*. 2015) or dissolution of the nidus due to the chronicity of the condition.

Differential diagnoses included a sialolith, chronic tooth root abscess, chronic fracture, buccal tumours, sialo-adenitis, metaplasia, ductal or skin associated neoplasia, granulomatous lesions of skin or subcutis and dystrophic calcification (Baskett *et al*. 1995; Kay 2006; Oreff *et al*. 2016).

Sialolithiasis has been diagnosed in horses using a combination of anamnesis, clinical examination, radiographic examination, ultrasonographic evaluation and histopathological analysis (Kay 2006; MacLean 2006; Carlson *et al*. 2015; Oreff *et al*. 2016). Sialoliths are typically described as hard, nonpainful masses rostral to the facial crest at the level of the fourth premolar (Teeth 108 and 208) (Baskett *et al*. 1995; MacLean 2006; Carlson *et al*. 2015), which is a finding consistent with this case. Radiographic examination aids in the diagnosis of sialolithiasis in equids. This mare's radiographic findings matched the typical radiographic description of a discrete mineral opacity within the soft tissue structures in the

region of the fourth premolar (tooth 108) (Baskett *et al*. 1995; MacLean 2006; Kilcoyne *et al*. 2015). Radiographic evaluations of the skull are also useful to rule out apical infection of the adjacent cheek teeth (Isgren and Townsend 2016). Ultrasonographic evaluation of the parotid salivary glands and ducts can confirm the diagnosis with the characteristic findings of a hyperechoic structure with acoustic shadows and can also identify septic sialodenitis (Kilcoyne *et al*. 2015; Carlson *et al*. 2015).

The sialolith evaluation findings in this case were consistent with the clinical history and the results of the radiographic and ultrasonographic examinations. There was no indication to suggest a neoplastic process at the site of the sialolith within the parotid salivary gland.

Bacterial culture and sensitivity evaluation has been performed rarely during surgical treatment of sialolithiasis, although the growth of *Streptococcus viridans* has been previously reported (Kilcoyne *et al*. 2015). We consider correct prophylactic antibiotic therapy to be essential in avoiding complications associated with the transcutaneous approach to sialolith removal.

Successful treatment of sialolithiasis in horses has been reported with surgical excision of the sialolith using transoral and percutaneous approaches (MacLean 2006; Carlson *et al*. 2015). Complications of a transoral approach include difficulty in accessing the sialolith, infection at the unsutured surgical site, fistula formation at the surgical site and granulation tissue causing an obstruction at the buccal ostium (Kilcoyne *et al*. 2015). Complications of a transcutaneous approach include fistula formation if closure of the parotid salivary duct fails, and damage to the dorsal branch of the facial nerve (MacLean 2006; Carlson *et al*. 2015). A transoral approach instead of a transcutaneous approach has been recommended by numerous authors (Baskett *et al*. 1995; Kay 2006; MacLean 2006; Kilcoyne *et al*. 2015; Oreff *et al*. 2016).

We consider a transcutaneous approach using a standing sedation protocol to have several advantages over a transoral approach in the treatment of sialolithiasis in the horse. These include superior exposure of the parotid salivary duct surgical site, correct silastic tubing placement within the parotid salivary duct, precise suture placement with accurate repair of the lateral wall of the parotid salivary gland, decreased risk of infection compared to an oral incision and increased comfort for the horse during mastication in the immediate post-operative period. In this case a transcutaneous approach allowed a large sialolith to be removed from the rostral parotid duct which would not have been possible using a transoral approach. Additionally, performing the procedure under standing sedation eliminates the requirement for a general anaesthetic. The use of silastic tubing to ensure patency of the buccal ostium ensured adequate drainage of saliva from the ostium and reduced pressure from saliva at the surgical site (Fig 4). The silastic tubing was also useful during reconstruction of the duct lumen during closure.

Surgical excision of a large sialolith via a transcutaneous approach was used to successfully treat chronic sialolithiasis in this case and resulted in a return to normal function and structure of the right parotid salivary gland.

Clinical relevance

To our knowledge, there are no previous detailed reports of a transcutaneous approach for sialolith removal in horses under a standing sedation protocol. Several authors have reported a transcutaneous approach to the parotid salivary gland under general anaesthesia (Baskett *et al*. 1995; Kilcoyne *et al*. 2015; Carlson *et al*. 2015). Two reports discuss a transcutaneous approach in the standing horse without detail (Ramey 1987; Kay 2006). Surgical excision of the large sialolith in this case report enabled a full resolution of the clinical signs in the follow-up period and is recommended in the treatment of sialolithiasis in horses when a transoral approach is not possible.

Author's declaration of interests

No conflicts of interest have been declared.

Ethical animal research

No ethical review was required as this is a case study. The owners of the mare described in the present case, the University of Pretoria, gave their consent for publication.

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Antimicrobial stewardship policy

The mare in this case report did not receive quinolones, extended spectrum beta lactam antimicrobials or macrolides.

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Authorship

L. Poore, Y. Smit and G. Steenkamp were responsible for the surgical procedure. J. Williams was responsible for the histological assessment of the excised sialolith. All authors were involved in preparation of the manuscript and approved the final manuscript.

Manufacturers' addresses

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[3]MSD Animal Health, Kempton Park, South Africa.

[4]Pfizer Animal Health, Sandton, South Africa.

[5]Fort Dodge Animal Health, Midrand, South Africa.

[6]Bayer, Isando, South Africa.

[7]Ethicon, Cincinnati, USA.

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