Equine Veterinary Education

EQUINE VETERINARY EDUCATION
*Equine vet. Educ.* (2019) •• (••) ••-••
doi: 10.1111/eve.13124



*Case Report*

# Dental bridging as a treatment for large oral fistulae in two horses

***N. Storms**, A. Salciccia, G. de la Rebière de Pouyade, L. Evrard and S. Grulke***

*Clinique Equine, Université de Liège, Sart-Tilman Liege, Belgium*
**Corresponding author email: nazare.storms@uliege.be*

**Keywords:** horse; oral fistula; dental bridging; polymethylmethacrylate; cerclage wire

## Summary

**Chronic orocutaneous, oronasal, or orosinus fistulae can be challenging to repair. This report describes placement of a dental bridge as a treatment for oral fistulae and outcome in two horses. A 12-year-old, Westphalian gelding was presented for nasal discharge because of an oromaxillary fistula after dental repulsion of the Triadan 209 4 years earlier. The second case, a 5-year-old Oldenburg mare was presented for an orocutaneous fistula 7 weeks after dental repulsion of the Triadan 208. Both were treated by placing an 8-shaped cerclage wire, inserted through the rostral and caudal interdental spaces and crossing at the level of the missing tooth. Polymethylmethacrylate (PMMA) was then used to seal the fistula. No significant complications occurred during or after the surgery. In both cases clinical signs did not recur. In the first case the dental bridge is currently (5 years after the intervention) in place. In Case 2 the construction was removed after 1.5 years and the fistula had healed completely. This case report suggests that placing a dental bridge composed of cerclage wire and PMMA should be considered as an easy, noninvasive and efficient way to manage large oromaxillary or orocutaneous fistulae.**

## Introduction

Oromaxillary, orocutaneous and oronasal fistulae are a reported complication following maxillary cheek tooth repulsion (Orsini *et al*. 1992; Prichard *et al*. 1992; Lillich 1998; Barakzai and Dixon 2005; Brink 2006; Hawkes *et al*. 2008; Schumacher and Brink 2011; Earley *et al*. 2013). Conservative treatment includes removal of alveolar sequestra or dental tissue remnants (if present), transbuccal or transnasal debridement of the fistula and insertion of a temporary alveolar plug (Brink 2006; Tremaine 2006; Hawkes *et al*. 2008; Schumacher and Brink 2011; Earley *et al*. 2013; Nottrott *et al*. 2018). However, in large fistulae, plugs may be easily dislodged. To prevent or treat large (chronic) fistulae, several surgical options have been described, such as transposition of the levator nasolabialis muscle (Orsini *et al*. 1992), or of the levator labii superioris muscle (Brink 2006) and placement of a transmaxillary anchored silicone embedded gauze (Hevesi *et al*. 2018). A dental prosthesis was developed by Gangl and colleagues (2002) but this technique is a 2-step procedure and needs highly specialised material. Barakzai and Dixon (2005) proposed a sliding mucoperiosteal hard palate flap, and Easley and Freeman (2016) an alveolar bone flap to treat oronasal fistulae. To the authors' knowledge, the use of a dental bridge composed of a cerclage wire and polymethylmethacrylate (PMMA) has not been reported. This report describes a technique of simple dental bridging to treat oromaxillary/orocutaneous fistulae, and reports outcome in two horses.

## Case 1

### *Case history*

A 12-year-old Westphalian gelding (495 kg) was presented for bilateral purulent nasal discharge and halitosis of 3 weeks' duration. These signs occurred 4 years after a tooth repulsion in another clinic (Triadan 209) and placement of a temporary vinyl polysiloxane plug (VPS Hydro Putty)[1]in the empty alveolus. The referring veterinarian diagnosed sinusitis and loss of the dental plug causing an oromaxillary fistula. A new plug was placed, an antibiotic treatment was instituted and sinus trephination was realised but was complicated by a nasal septum perforation. As no improvement was noted, the horse was referred to the clinic.

### *Physical examination and diagnostic imaging*

On admission, the horse had bilateral purulent nasal discharge and enlarged mandibular lymph nodes. It presented with a facial wound/fistula draining purulent secretions from the left rostral maxillary sinus. Oral endoscopy revealed a very large, mobile vinyl polysiloxane plug in the alveolus of tooth 209 and overgrowth of the opposite 309. After removal of the plug a large oromaxillary fistula (2.5 × 3 cm) was found extending into the hard palate (**Fig 1**). Furthermore, nasal endoscopy showed a very large communication between the left rostral maxillary sinus and the left nasal cavity through a damaged enlarged nasomaxillary aditus. The left nasal cavity also communicated with the right nasal cavity through a perforation of the nasal septum, which was surrounded by purulent secretions, necrotic and mycotic tissues (confirmed by histopathological examination). Radiographs revealed a bilateral maxillary sinusitis and marked alveolar sclerosis at the level of the repulsed Triadan 209.

### *Diagnosis*

Oromaxillary-cutaneous fistula associated with chronic maxillary sinusitis and chronic maxillary osteitis. Traumatic nasomaxillary fistula and internasal perforation, associated with mycotic rhinitis.

## Case 2

### *Case history*

A 5-year-old Oldenburg mare (520 kg) was presented for halitosis and a cutaneous fistula 7 weeks after repulsion of Triadan 208 and placement of a temporary plug in the empty alveolus.

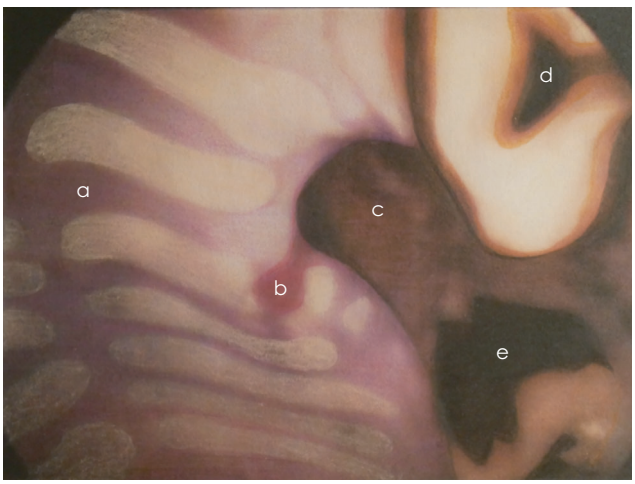


***Fig 1: Drawing of a buccal view with a 30° buccal endoscope showing an oromaxillary fistula (Case 1) extending into the hard palate causing food contamination and chronic sinusitis of the maxillary sinus. a) hard palate, (b) ulcer of the hard palate, (c) oromaxillary fistula, (d) Triadan 208, (e) Triadan 210.***

### *Physical examination and diagnostic imaging*

On admission, the horse presented with halitosis and purulent discharge draining from a fistula surrounded by swollen soft tissues rostral to the left facial crest. Buccal endoscopy revealed a very large vinyl polysiloxane plug in the alveolus of Triadan 208. Its removal exposed a 2.5 × 3.5 cm large defect through the maxillary bone, extending to the hard palate. Radiographs showed marked maxillary sclerosis and expansion of the alveolus of Triadan 208, containing a remaining dental fragment and amorphous radiopaque material (**Fig 2a**). The maxillary bone was disrupted at the lateral aspect of the alveolus, and communication with the cutaneous opening was confirmed on radiographs by introducing a probe through the draining tract.

### *Diagnosis*

Orocutaneous fistula and chronic maxillary osteitis at the level of the repulsed tooth 208.

### *Treatment*

Both horses were administered perioperative antibiotics and anti-inflammatory drugs and were treated surgically under general anaesthesia (maintained by isoflurane in oxygen or oxygen/air mixture). In Case 1, due to extensive nasal damage, a tracheotomy was performed for placement of the tracheal tube whereas a nasotracheal intubation was performed in Case 2. The horse was placed in dorsal (Case 1) or right lateral (Case 2) recumbency.

The alveolus was debrided and necrotic bone was removed with a curette using an oral access. The remaining dental fragment was extracted in Case 2.

A stab incision was made through the cheek at the gingival level of the caudal interdental space of the tooth caudal to the missing tooth. Care was taken to avoid the branches of the facial nerve. A 2.5 mm diameter drill bit protected by a sleeve was inserted through the stab incision and placed over the interdental space, and a 2.5 mm hole was drilled between the teeth at the gingival margin. The same procedure was performed at the level of the rostral

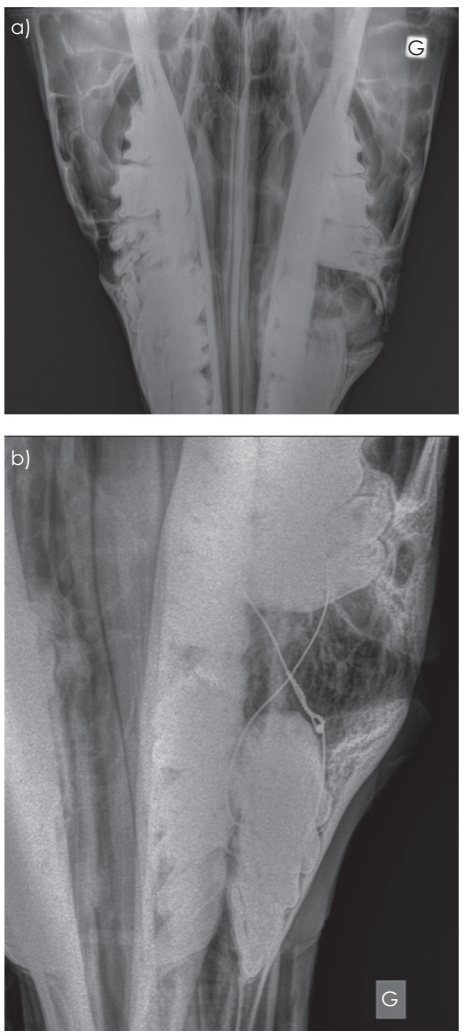


***Fig 2: a) Preoperative dorsoventral radiograph showing a dental fragment in the alveolus of Triadan 208. Note the expansion of the alveolus and lateral disruption of the maxillary bone corresponding to the previously diagnosed fistula. b) Post-operative right dorso15°lateral - left ventrolateral oblique radiograph confirming removal of the dental fragment and correct placement of the dental bridge.***

interdental space of the tooth rostral to the fistula. After insertion of a cerclage wire (1 mm diameter) in the caudal drilled hole (**Fig 3a**), both ends of the wire were pulled into the mouth and crossed at the level of the missing tooth. One end of the wire was then looped around the tooth rostral to the fistula (**Fig 3b**) resulting in an '8-shaped' construction. Through a third cheek incision created at the level of the missing tooth, both wire ends were exteriorised and twisted to tighten the construction (**Fig 3c**). After cutting the wire ends to a length of about 1 cm, the knot was replaced into the mouth in a horizontal plane. The alveolus was rinsed and dried. Using an oral access, a PMMA mixture (Vertex)[2]was applied in order to seal the oral part of the fistula (**Fig 3d**). Care was taken to incorporate the knot of the cerclage wire and to avoid PMMA penetration deep into the fistula to ease tissue healing. However, in Case 2, some excess PMMA had to be taken out using a rongeur forceps inserted through the cutaneous fistula into the alveolus.

The skin was closed using a 0-polypropylene suture (Prolene)[3] in a simple interrupted pattern.

In Case 1 trephination of the left and right rostral and caudal maxillary sinuses was performed during the surgical procedure and a Foley catheter was left in place for subsequent sinus lavages. The overgrowth of the tooth 309 was corrected.

In Case 2 the cutaneous part of the fistula was debrided, rinsed and filled with antiseptic dressing roll gauze.

### *Post-operative management and outcome*

The dental bridge was evaluated by control buccoscopies during hospitalisation. In Case 2, post-operative radiographs were also performed (**Fig 2b**).

In Case 1, the tracheotomy tube was left in place for 3 days then the wound was left to heal by second intention. The internasal defect was debrided under endoscopic guidance and infected sinuses were lavaged twice daily using an isotonic saline solution and enilconazole until nasal discharge decreased significantly (Day 12). This horse developed a minor infection in the cheek at the entry point of the cerclage wire, which resolved rapidly after drainage of the secretions. The horse was discharged from the hospital 19 days after the intervention. Sinusitis resolved progressively thereafter. Five years later, the owner confirmed that the dental bridge was still in place and the horse was eating normally. Nasal discharge never recurred.

In Case 2, the antiseptic dressing roll gauze placed in the cutaneous fistula was changed regularly. No complication occurred and the horse was discharged at Day 6. Buccal endoscopy 1.5 years after the surgery confirmed that the dental bridge was still in place (**Fig 4**). The prosthesis was removed on request of the owner before selling the horse. The fistula had healed completely. The facial swelling had disappeared and the horse exhibited a normal eating behaviour.

Both owners were satisfied with the outcome.

***Fig 4: Control buccoscopy of Case 2 showing that the dental PMMA bridge is still solidly fixed and not causing soft tissue inflammation after 1.5 years. Note the slight wear of the PMMA in the centre.***

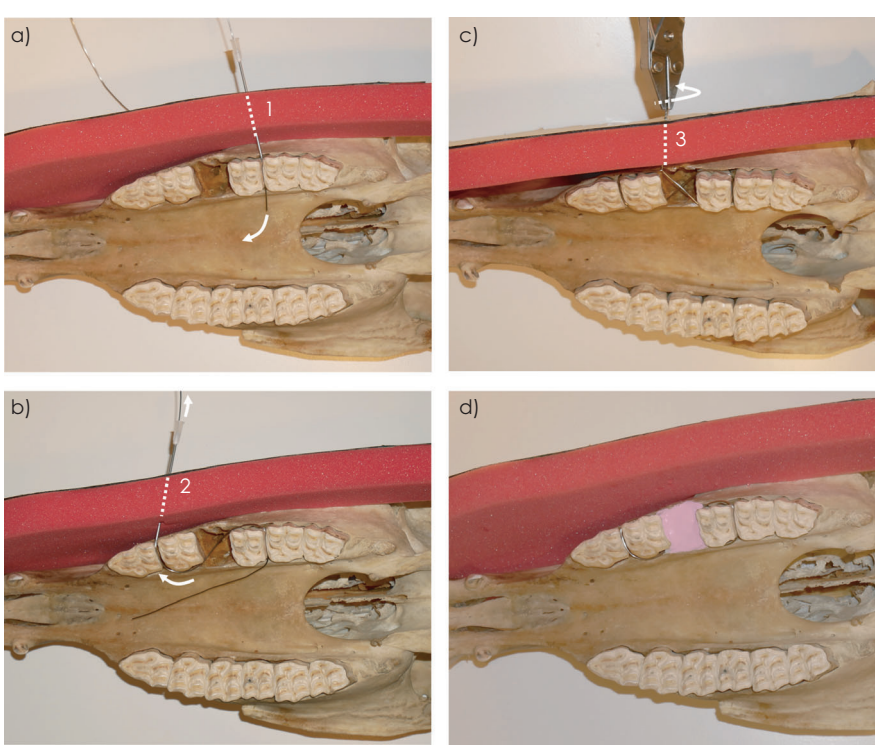


***Fig 3: Schematic presentation of the surgical technique: a) A 1 mm diameter cerclage wire is threaded through the cheek and the caudal drilled hole using a 14-gauge needle as a guide. b) One end of the wire is then looped around the tooth rostral to the fistula by threading the wire through a 14-gauge needle placed in the rostral drilled hole. c) Both ends are exteriorised through a 1 cm skin incision in the jaw at the level of the missing tooth and then twisted to tighten the construction. d) The construct is stabilised and the fistula is sealed with PMMA.***

## Discussion

Large oromaxillary and orocutaneous fistulae, a complication of dental repulsion, are known to be challenging to repair (Prichard *et al*. 1992; Easley and Freeman 2016). This paper describes a simple minimally invasive procedure to treat large, chronic oromaxillary or orocutaneous fistulae, without the need of specialised dental material.

Placement of a PMMA bridge stabilised by a supportive cerclage wire was found to be an easy one-step procedure, avoiding the need of intensive follow-up. This technique resulted in a well-sealed alveolus and a stable implant even though the defects were large and permitted a short hospitalisation period in Case 2. Hospitalisation was prolonged in Case 1 because of extensive nasal damage.

The PMMA bridge resisted the physical and chemical stresses of mastication and no cerclage wire rupture neither soft tissue damage was observed. The bridge was removed at the owner's request in Case 2 after 1.5 years but was still in place after 5 years in Case 1, suggesting its use could be a long-term solution, even though some wear of the PMMA could be expected. Because of the hardness of the PMMA, the bridge counteracts the drift of the adjacent teeth. Diastemata formation might therefore be avoided while the bridge is in place. However, regular reduction of the opposing tooth is necessary.

The present technique was associated with only few minor intraoperative complications. In Case 1, holes were drilled manually. Due to excessive force, one drill bit broke but was easily removed and replaced. When using a power drill this complication did not occur in the second case. During the surgery of Case 2, the PMMA went too deep into the alveolus (because of its liquid state before polymerisation) and needed to be partially removed. The plug should not extend into the apical one-half of the alveolus since this positioning restricts healing or allows for migration of the plug into the sinus (Earley *et al*. 2013). Hawkes and colleagues (2008) suggested the placement of a dental punch in the alveoli via the maxillary sinus to avoid deep penetration of the PMMA in the alveolus. This technique could be used through a cutaneous fistula as well. The use of a less liquid material should also be considered for future cases. Dental wax, while softer and less durable could be used as a replacement for PMMA.

No facial paralysis appeared as the branches of the facial nerve were spared during surgery. However, the creation of three different incisions in the cheeks does carry the risk of damaging the parotid duct and the facial vasculature and nerves. To prevent this complication, these structures could be palpated and drawn on the skin prior to incision making. To ease palpation of the parotid duct, retrograde catheterisation can be performed via the buccal ostium at the level of the 108 (or 208). The only encountered post-operative complication was a minor infection in the cheek at the entry point of the cerclage wire in Case 1.

The principle disadvantage of the technique is that healing of the fistula can only be monitored after removal of the bridge. Furthermore, because of the need of rostral and caudal interdental anchorage, the technique is most suitable for fistulae at the level of teeth '08 and '09. In case of a more rostral located fistula, fixation in the bony surface rostral to the '06 might be considered. Diastemata at the level of wire anchorage could also cause instability of the construct.

Dental repulsion leads to the destruction of the alveolar bone and the creation of communication between the oral cavity and the sinuses or the cutaneous tissues (Earley *et al*. 2013; Easley and Freeman 2013). This communication needs to be occluded by a temporary plug/implant. Failure to seat the implant correctly, premature loss or leakage around the implant, entrapment of food beneath the implant, presence of sequestra and infection can lead to formation of a fistula (Tremaine 2006). Furthermore, our Case 1 illustrates that symptoms can occur several years after having placed an excessively large implant too deeply. Therefore, in the author's opinion, an oral dental extraction approach should be performed whenever possible in order to reduce these types of complications.

## Conclusion

Dental bridging composed of PMMA and cerclage wire is a relatively simple technique to repair very large orocutaneous or oromaxillary fistulae as demonstrated in these two cases.

## Authors' declaration of interests

No conflicts of interest have been declared.

## Ethical animal research

Not applicable to this case report describing successful treatment of two horses.

## Authorship

N. Storms and A. Salciccia contributed to study design, study execution, data analysis and interpretation, and preparation of the manuscript. G. de la Rebière de Pouyade, L. Evrard and S. Grulke contributed to study design, study execution and data analysis and interpretation. All authors gave their final approval of the manuscript.

## Manufacturers' addresses

[1]Verdifarm, Esneux, Belgium.
[2]Depôt dentaire Humblet, Liège, Belgium.
[3]Ecuphar Nv, Oostkamp, Belgium.

## References

Barakzai, S.Z. and Dixon, P.M. (2005) Sliding mucoperiosteal hard palate flap for treatment of a persistent oronasal fistula. *Equine Vet. Educ.* **17**, 287-292.

Brink, P. (2006) Levator labii superioris muscle transposition to treat oromaxillary sinus fistula in three horses. *Vet. Surg.* **35**, 596-600.

Earley, E.T., Rawlinson, J.E. and Baratt, R.M. (2013) Complications associated with cheek tooth extraction in the horse. *J. Vet. Dent.* **30**, 220-235.

Easley, J.T. and Freeman, D.E. (2013) New ways to diagnose and treat equine dental-related sinus disease. *Vet. Clin. North Am. Equine Pract.* **29**, 467-485.

Easley, J.T. and Freeman, D.E. (2016) Surgical repair of a chronic, oronasal fistula in a horse using an alveolar bone flap. *Equine Vet. Educ.* **28**, 550-555.

Gangl, M., Bradfer, J.-F., Grulke, S., Caudron, I. and Serteyn, D. (2002) Placing of a dental prothesis after cheek tooth repulsion in horses. In: *Proceedings of the 11th ECVS Congress*, Vienna. pp 221-223.

Hawkes, C.S., Easley, J., Barakzai, S.Z. and Dixon, P.M. (2008) Treatment of oromaxillary fistulae in nine standing horses (2002-2006). *Equine Vet. J.* **40**, 546-551.

Hevesi, A.T., Uto, D., Takacs, N., Lorincz, V. and Simhofer, H. (2018) Transmaxillary anchored silicon embedded gauze plug in the post-operative treatment of a large oromaxillary fistula caused by a supernumerary cheek tooth. *Equine Vet. Educ*. Epub ahead of print; https://doi.org/10.1111/eve.12897

Lillich, J.D. (1998) Complications of dental surgery. *Vet. Clin. North Am. Equine Pract.* **14**, 399-410.

Nottrott, K., De Guio, C. and Schramme, M. (2018) Successful treatment of a persistent oroantral fistula via transbuccal and transnasal endoscopic debridement in a horse. *J. Vet. Dent.* **35**, 28-34.

Orsini, P.G., Ross, M.W. and Hamir, A.N. (1992) Levator nasolabialis muscle transposition to prevent an orosinus fistula after tooth extraction in horses. *Vet. Surg.* **21**, 150-156.

Prichard, M.A., Hackett, R.P. and Erb, H.N. (1992) Long-term outcome of tooth repulsion in horses a retrospective study of 61 cases. *Vet. Surg.* **21**, 145-149.

Schumacher, J. and Brink, P. (2011) Treatment of horses for a facial or oral fistula: treatment for a facial or oral fistula. *Equine Vet. Educ.* **23**, 242-248.

Tremaine, W.H. (2006) Complications associated with dental and paranasal sinus surgery. In: *Proceedings of the AAEP Focus Meeting*, Indianapolis. pp 141-147.