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Minimally Invasive Transbuccal Surgery and Screw Extraction

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Take Home Message

An oral extraction of cheek teeth has its limits if the clinical crown of a tooth is broken. Minimally invasive transbuccal surgery is a useful approach to continue oral extraction and allows the screw extraction (acc. to Stoll)\textsuperscript{10} in these difficult cases.

Introduction

Minimally invasive transbuccal surgery was developed to provide a direct approach to difficult accessible areas in the mouth, for example alveoli with a fractured crown or retained roots. The transbuccal approach allows the use of instruments and endoscopes through a hole in the cheek. The use of straight instruments allows for better movement of instruments and application of increased force on the tips of the instruments. The transbuccal approach may be used in the standing horse and in lateral recumbency as well. Screw extraction (acc. to Stoll) was developed to extract teeth which are not extractable with forceps in oral extraction procedure. Drilling via transbuccal approach into the reserve crowns of fractured teeth gives the chance to extract these teeth with a screw. Thus, minimally invasive transbuccal surgery is an alternative to trephination and repulsion in cases of fractured crowns and other cases of impossible oral extractions.

Materials and Methods

Minimally invasive transbuccal surgery and screw extraction is recommended for certain teeth, i.e. fractured crowns, absent crowns, malformed and dislocated teeth not allowing the for the use of spreaders and forceps (Fig. 1).

Standing Sedation

Transbuccal surgery can be performed routinely in horses with a combination of sedation and local anaesthesia. An IV catheter is placed and detomidine\textsuperscript{a} (0.01 – 0.02 mg/kg BW) is used for sedation. After this initial dose, the horse can be connected to a detomidine drip (60 mg detomidine + 1000 ml saline) at 1 drop per second depending on effect. To increase the analgesic effect of the sedation and possibly slow tongue movement, butorphanol\textsuperscript{b} (1mg/100 kg BW) can be added. If there is still too much tongue movement, diazepam (0.5-1 mg/100 kg BW) can be given as well. Beside the relaxation of the tongue the whole horse becomes more relaxed and ataxic. So this drug combination should be used carefully or preferably in stocks. The duration of the effect of diazepam is short, lasting about 10 to 15 minutes. To desensitize the mucous membranes of the mouth, one can spray lidocaine into the oral cavity. This procedure often makes the horse more tolerant to oral manipulation. Subgingival infiltration of 2 ml 2%
mepivicaine buccal and palatal or lingual of the affected tooth desensitizes the gingiva very effectively. In cases vital pulp is expected the apical nerve supply can be anesthetized by nerve blocks. For extractions of maxillary cheek teeth the maxillary foramen block is used (Extraperiorbital fat body injection, EFBI Staszyk et al 2008). 10-15 ml 2% mepivicaine are injected into the extraperiorbital fat body. Mandibular cheek teeth become anesthetized with the mandibular foramen block. 20 ml 2% mepivicaine are injected close to the mandibular foramen.

Minimally Invasive Transbuccal Approach

On the side where the transbuccal approach will be performed, the skin of the cheek is clipped, shaved and aseptically prepared. After shaving, it is very important to identify the branches of the facial nerve and the facial artery and vein. In horses with thin skin these structures are easy to find. If the nerves and vessels are not visible, one must try to palpate them. It is also important to avoid damaging the parotid duct. The easiest way to identify the parotid duct under the skin is to put a catheter (diameter 2 mm, length 50 cm) into the duct through the oral papilla (Fig. 2). To prevent damaging these sensitive structures it is helpful to mark their position with a pen (Fig. 3). In most cases the transbuccal approach is made between the dorsal and the ventral buccal branches of the facial nerve. Depending on the affected tooth the approach can be made either rostral or caudal to the facial artery. To desensitize the skin and the muscles of the cheek, 2 ml 2% lidocaine are injected subcutaneously and 3 ml are infiltrated into the deeper tissue of the incision area.

After 5 minutes a 4 mm superficial incision will be made only through the skin with a scalpel. The transbuccal approach is made by penetration of the cheek with an 8 mm trocar system (Fig. 4). The trocar stays in place during the complete transbuccal surgery (Fig. 5). All instruments are used through the trocar to keep the tissue of the cheek protected and clean. To target the spot for the approach, a mouth speculum is used and the spot is marked from the oral cavity through the cheek with a fingertip. After the dental procedure is finished, the skin is closed by 1-3 simple interrupted sutures or staples. In cases in which the approach goes through the masseter muscle, additional closure of the oral mucous membrane is recommended. To prevent wound infection,
the horses are kept on antibiotics for 6 days. After 10 to 14 days the sutures or staples can be removed.

Figure 2. Catheter is placed in the parotid duct for better palpation.

Figure 3. (a) Dorsal and (b) ventral buccal branches of the facial nerve, (c) parotid duct, (d) facial artery and vein.

Figure 4. Trocar in pushed through the cheek.

Figure 5. Trocar stays in place during complete transbuccal surgery and screw extraction.

Transbuccal Extraction, Screw Extraction

Loosening

Similar to oral extractions, the procedure begins with interdental spreading. Dental elevators through the transbuccal trocar are inserted alternately into the mesial and distal interproximal spaces until loosening is achieved (Fig. 6).

Drilling

To mark the position of the affected tooth, radiographs are taken with skin staples placed near the transbuccal approach and in the area the roots are expected.
It is recommended to start drilling with a 3 mm drill before using the 5 mm drill. The 3 mm hole can be made with a 90° oral drilling unit or with a long drill through the transbuccal approach. A 5 mm hole is drilled through a drill sleeve to protect the trocar (Fig. 7). In small teeth the complete length of the reserve crown is used, in long teeth the hole is drilled about 40 mm deep. Because of the inclined approach through the cheek the drill is usually directed palatal. Therefore drilling through the transbuccal approach should start at the buccal aspect of the tooth. The drilling hole is flushed to remove tooth chips. A 6 mm tap is inserted through the trochar and screwed into the hole to create an accurate thread for the extraction screw (Fig. 8).

Screw Extraction

In the direction as the tap a 6 mm pin with a thread on one side and a stopper on the other side is screwed into the tooth (Fig. 9). A slotted hammer is slipped along the pin and pushed to the stopper many times to extract the tooth or a retained part of a tooth (Figs. 10 & 11).
Figure 9. Extraction screw (6 mm) in place.

Figure 10. Slotted hammer pulls the tooth by many strokes to the stopper at the extraction screw.

Figure 11. Extracted tooth.

If the tooth is moldered it can happen that the thread is not strong enough to pull the tooth out of the alveolus. The screw can pull out of the thread. In these cases a new hole can be drilled beside the first one to start screw extraction again. If the tooth is too weak for screw extraction, more holes can be drilled into the tooth in order to fracture the tooth into small pieces. Subsequently, these pieces can be easily extracted with a dental elevator through the transbuccal trochar (Fig.
12). After water flush and endoscopic check, the alveolus is half filled by crystallised honey and covered by iodoform gaze.

![Figure 12. Extracted fragments.](image)

![Buccotomy trocar system.](image)

**Results**

From 100 horses presented for oral extraction 22 horses needed transbuccal surgery. Twenty-six teeth or fragments from teeth were extracted with transbuccal surgery. 1 horse had transbuccal surgery on both sides and 3 horses had 2 extractions at one side.

The disposition of teeth was: Maxillary 09th 14 cases (53,84%), upper 10th 5 cases (19,23%), mandibular 08th 3 cases (11,54%), lower 09th 2 cases (7,69%), upper 07th 1 case (3,85%), upper 08th 1 case (3,85%). Eight teeth/fragments were extracted by transbuccal surgery with dental picks without screw extraction.

18 teeth were extracted by transbuccal surgery and screw extraction.
10 teeth were extracted with drilling 1 hole.
4 teeth needed a second hole.
4 teeth with successful screw extraction had at least one root fragment that had to be extracted by dental picks through the transbuccal trocar.
4 teeth were broken in parts or had to be dissected in parts for extraction.
In 4 cases a dental pick or a drill penetrated the maxillary sinus.
All 26 teeth were completely extracted after transbuccal surgery.

**Complications**

In 7 cases, facial nerve paralysis persisted for several hours after local infiltration of lidocaine into the cheek.

Mild wound edema occurred in 18 cases for several days. One horse had swelling and purulent wound discharge for 1 week at the transbuccal incision. One horse where the drill penetrated the maxillary sinus had mild mucous nasal discharge for 7 days after surgery. No further treatment was required.
Discussion

Cheek teeth with a fractured or missing crown are a challenge for oral extraction.\textsuperscript{2-6} If a crown is fractured to the gingival level it is impossible to use a molar separator to loosen the tooth.\textsuperscript{8,9} The alternative use of 90 degree dental picks for extraction procedures is limited due the restricted range of the mouth.

The described transbuccal surgery facilitates different dental procedures by allowing the use of straight instruments through the cheek. One of the most common situations in which transbuccal surgery is used is a retained root fragment or a retained piece of the reserve crown. Access to the tooth is very direct and creates a lot of extra work space beside the intraoral cavity. It becomes easier to extract fractured cheek teeth and root fragments because of increased mobility and force on the tip of a straight elevator. The progress of dental treatments and surgeries is hard to anticipate, even if a thorough exam has been performed and high quality radiographs have been taken. It is therefore very important to know alternative ways to perform dental procedures. If necessary, transbuccal surgery can be performed in the field or in a clinic. The main risk of this procedure is the possibility of damaging the facial nerve, blood vessels or the parotid duct. Therefore anatomical orientation is very important to minimize the risk of injuring important structures.

References and Footnotes

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