

# PROSTHODONTIC APPLICATION OF ACRYLIC POLYMER AS DIASTEMA FILLER FOR MANAGEMENT OF BUCCAL FISTULA IN CAMELS

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## ABSTRACT

Buccal and buccal cum salivary fistula were diagnosed in four male adult dromedary camels of age between 12-18 years. In all cases fistulous wound was surgically repaired by debridement and suturing of wound edges with the interior and exterior application of rubber sheath as a wound protectant. In cases with buccal cum salivary fistula (2 cases), along with fistulous wound repair, Stenson's duct was ligated and parotid gland cauterised with retrograde infusion of Lugol's iodine. Surgery was performed in all cases under xylazine (0.4 mg/kg bwt.) and ketamine (2 mg/kg bwt.) administered intravenously. The fistula recurred in three cases after 6-8 weeks. Abnormal interdental gap between maxillary molar teeth (cheek teeth diastemata) against the buccal fistulous wound was present in these cases as evident by lateral radiograph of skull region. Coarse feed straw was found trapped in these gaps causing injury to the buccal mucosa. The interdental space in these 3 animals with recurring fistula and in a new case was filled with acrylic material under general anaesthesia after complete cleaning and drying the space. In a long term follow up of 2-3 months, the filling of interdental space with acrylic material remained in place and no recurrence of buccal fistula was seen in all the cases.

**Key words:** Buccal fistula, cheek teeth diastemata, polymethyl methacrylate (PMMA), salivary fistula

Salivary fistula is an abnormal tract that connects between the lumen of the Stenson's duct of the parotid salivary gland and the skin surface where as buccal fistula is an abnormal tract that connects between the oral cavity and the skin surface of the face mostly at the level of cheek tooth. In camels, penetrating wounds of buccal cavity due to trauma caused by accumulation of feed straw between cheeks and molars have been reported (Gharu and Gahlot, 2015; Gahlot, 2000 and Singh *et al*, 2020). The oral cavity fistulae are more common in horses due to accidental injury, following periodontal disease in which exfoliation of the affected teeth leads to oral fistula, cheek teeth diastemata, fractured cheek teeth and a central defect in a worn cheek tooth (Hawkes *et al*, 2008 and Misk and Misk, 2020).

Polymethyl methacrylate (PMMA) is commonly used for prosthetic dental applications, including the fabrication of artificial teeth, denture bases, dentures, obturators, orthodontic retainers, temporary or provisional crowns and for the repair of dental prostheses. Additional dental applications of PMMA include occlusal splints, printed or milled casts, for

treatment planning and the embedding of tooth specimens for research purposes (Zafar, 2020). The unique properties of PMMA, such as its low density, aesthetics, cost-effectiveness, ease of manipulation and tailorable physical and mechanical properties, make it a suitable and popular biomaterial for the dental applications.

Dental defect can be treated successfully by filling the diastema with PMMA after removing food and exudate from the sinuses or fistula. In case of fractured tooth PMMA alveolar packing can be done following dental extraction (Hawkes *et al*, 2008). In present clinical study the use of PMMA as filler of abnormal cheek teeth diastema in the treatment of buccal and buccal cum salivary fistula in dromedary camels is reported.

## Materials and Methods

In camels, buccal fistula (n=2) (bilateral in one) and buccal cum salivary fistula (n=2) were treated by using PMMA as cheek tooth diastemata filler along with surgical repair of fistulous wounds. DPI RR Cold Cure Acrylic (Fig 1) repair material (Dental Product of

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India) was used as a prosthodontic which contained powder (polymethyl acrylate) and liquid (methyl methacrylate monomer, cross linking agent- Ethylene glycol dimethacrylate).

**Camel I (C<sub>I</sub>)-** It was a male camel (aged 14 years) which had a fistulous opening on cheek just below the lower eyelid of left side and masticated feed straw was escaping out from this opening since last 2 months. An abscess was also present close to the fistulous opening (Fig 2) which was first drained by a criss-cross incision and treated with antiseptic fluid flushing and dressing.

**Camel II (C<sub>II</sub>)-** It was a male camel (aged 18 years) which had a bilateral fistulous opening on cheek below lower eyelid on either side with escape of feed straw and exudate.

In both C<sub>I</sub> and C<sub>II</sub> cases the fistulous tract was cleaned and flushed with light potassium permanganate (P.P.) solution. The feed straw in the interdental space close to the external fistulous opening was removed.

**Camel III (C<sub>III</sub>)-** It was a male camel (aged 16 years) which was presented with a history of wound on cheek below lower left eyelid alongwith painful swelling near to the wound since 4 weeks.

**Camel IV (C<sub>IV</sub>)-** It was a male camel (aged 14 years) which was presented with a history of wound on cheek below lower right eyelid alongwith engorged parotid salivary duct (Stenson's duct) (Fig 3).

In these cases (C<sub>III</sub> & C<sub>IV</sub>) the feed mixed with saliva exuded from the external fistulous opening and wetting of hairs below the skin wound was evident. These were diagnosed as buccal cum salivary fistula.

In all cases primary antiseptic dressing of fistulous wound alongwith parenteral administration of antibiotic\* and anti-inflammatory\*\* drugs was done for 3 days. The surgery was planned under general anaesthesia using xylazine (0.4 mg/kg body weight) and ketamine (2 mg/kg body weight) intravenously. The surgery was performed in lateral recumbency with affected side up in 3 camels (C<sub>I</sub>, C<sub>III</sub> and C<sub>IV</sub>) and sternal recumbency in 1 camel (C<sub>I</sub>). The buccal fistula and oral cavity were flushed with light P.P. solution in head down position, after that fistulous wound was cleaned and debrided. Two pieces of smooth edged rubber sheath (3 mm thickness) were cut in a circular manner of diameter slightly greater than that of fistulous wound for

\* Oxytetracycline @ 10mg/kg, intramuscularly.

\*\* Meloxicam@ 1mg/kg, intramuscularly

applying on oral and dermal side of wound as protectant. The rubber pieces were secured on either side of surgically repaired buccal fistula using non-absorbable (silk or polyester) suture material passing through the centre of both rubber sheets and the suture knots were kept on external side of skin side rubber sheet (Fig 4). Buccal mucosa and muscles of fistulous wound were apposed by polyglactin 910 suture (vicryl no.1) and skin edges were sutured using silk or nylon no.1 and pattern used in both the layers was simple interrupted. After complete surgical repair of wound, the preplaced internal and external rubber sheets were apposed against the buccal mucosa and skin by pulling the ends of suture material and applying the knot externally.

In C<sub>III</sub> and C<sub>IV</sub> camels with buccal cum salivary fistula, an oblique skin incision was placed on masseter muscle region rostral to angle of jaw and subcutaneous tissue was dissected out to exteriorise the stenson's duct which was engorged in C<sub>IV</sub> (Fig 5A). Exploratory aspiration of saliva was done to ensure the presence of Stenson's duct. Lugol's iodine (10 ml) was injected into the duct in retrograde manner to destroy the secretory activity of parotid gland (Fig 5B) and the duct was immediately ligated with a preplaced non-absorbable silk suture material. The skin wound was closed in a routine manner. The buccal fistula wound was surgically repaired as described previously.

Postoperatively, camels were offered soft feed material for at least 2 weeks. Antibiotic and anti-inflammatory drug administration was done for 7 and 3 days, respectively. Surgically repaired wounds got healed at 2 week postoperative period. At 6-8 week postoperative period, recurrence of buccal fistula was seen in 3 animals which was evidenced by a small wound exuding saliva/feed material. Clinical and radiographic examination revealed presence of coarse feed material trapped in the interdental space between the maxillary cheek teeth opposite to the fistulous wound and cheek teeth diastema (Fig 6). The continuous trauma caused by this trapped feed material resulted in recurrence of the fistula.

It was planned to fill that space with PMMA. After initial treatment of cleansing the wounds and fistulous tract with light PP the interdental filling was performed under general anesthesia as described earlier. The accumulated feed material in the cheek teeth diastema was manually removed, flushed with light P.P. solution and dried (Fig 7). For prosthodontic applications of acrylic polymer (Polymethyl



Fig 1. DPI RR cold cure acrylic material.



Fig 2. Buccal fistula and abscess in C<sub>1</sub>.



Fig 3. Buccal cum salivary fistula and engorged Stenson's duct.

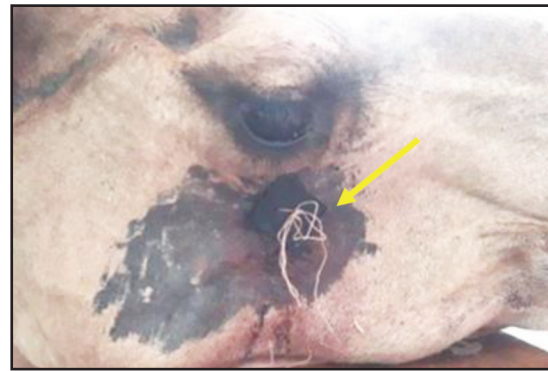


Fig 4. Repair of buccal fistula with rubber sheet application.



Fig 5. (A) Engorged salivary duct. (B) Lugol's iodine injection.

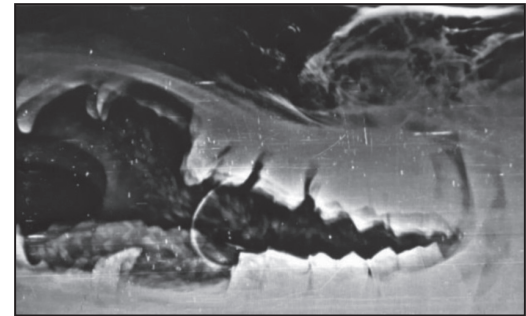


Fig 6. Radiographic evidence of interdental space (cheek teeth diastemata).

Methacrylate) its powder was mixed with provided liquid till it took semisolid form (Fig 8) and it was applied immediately in the interdental space (Fig 9) up to the alveolar border along with bridging between rostral and caudal teeth (Fig 10). The acrylic material was ensured not to protrude below the occlusal surface. *In situ* chemical exothermic heat generation was felt during the acrylic polymer application and the material got hardened within few minutes. The extra hardened acrylic polymer was removed to prevent soft tissue trauma to the buccal mucosa and tongue. Postoperatively, soft feed diet was offered for at least 2 week period.

## Results and Discussion

In present study buccal fistula and buccal cum salivary fistula in adult dromedary camels were recorded and treated (Table 1). The history provided by animal owners could not ascertain the etiology of this condition. However, on the basis of clinical and radiographic examination the common etiological factor noticed in all cases was presence of abnormal interdental space between maxillary cheek teeth against the fistulous wound. Similarly, Hawkes *et al* (2008) also reported cheek teeth diastema as a common etiology leading to oromaxillary fistula in





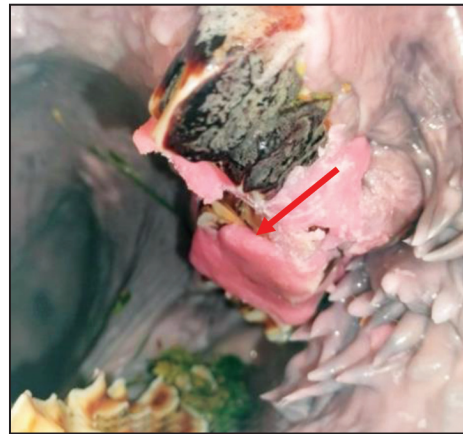
**Fig 7.** Manually evacuation of accumulated feed material at cheek teeth diastemata, with mouth gag in position.



**Fig 8.** Acrylic powder mixing with liquid.



**Fig 9.** Manual application of semisolid acrylic material at cheek teeth diastemata.



**Fig 10.** Acrylic material filled interdental space at occlusion level surface.

horses. However, in previous reported cases causes of buccal fistula in camels were traumatic injury (Purohit *et al*, 2011), accumulation of feed between cheek and

molars (Gharu and Gahlot, 2015) and feed straw lodgement at interdental space between maxillary cheek teeth and entry of feed into opening of parotid salivary duct leading to concurrence of buccal and salivary fistula (Gahlot, 2000).

**Table 1.** Details of camels affected with buccal and buccal cum salivary fistula.

Case	Age (Years)	Surgical disorder	Affected side	Chronicity of fistula	Site of cheek teeth diastemata
C <sub>I</sub>	14	Buccal fistula	Unilateral (Left)	2 months	P3-M1
C <sub>II</sub>	18	Buccal fistula	Bilateral	4 months	M1-M2 (Rt.) P3-M1 & M1-M2 (Lt.)
C <sub>III</sub>	16	Buccal cum-salivary fistula	Unilateral (Left)	4 weeks	P3-M1
C <sub>IV</sub>	14	Buccal cum-salivary fistula	Unilateral (Right)	2 weeks	P3-M1

C- Camel; Rt.- Right; Lt.- Left; P- Premolar; M- Molar

In all cases feed straw protruded out from the opening of fistula exteriorly at skin wound and was mixed with exudate. In a previously reported clinical case, chronic wound (3 cm diameter) was found about 2 cm below the lower eye lid on right side and partially masticated feed and saliva exuded through that opening (Kaswan *et al*, 2016). In C<sub>III</sub> and C<sub>IV</sub> cases of present study the hairy area below the fistula opening was moist with drooling saliva. In the clinical case study of Gharu and Gahlot (2015), the buccal fistulous wounds were 1-3 cm in diameter and found 1-2 inches below the lower eyelid on the cheek. Concurrence of salivary and buccal fistula was observed, in cases where the Stenson's duct was also involved; the saliva leaked through the

wound during mastication. In salivary fistula cases, saliva exuded in large amounts which may lead to dehydration and indigestion, if treatment is delayed (Singh *et al*, 2020).

In C<sub>III</sub> camel, the fibrosis was observed at surgical site and Stenson's duct was not engorged whereas in C<sub>IV</sub> camel the duct was engorged and filled with cloudy coloured salivary fluid alongwith flakes. The parotid duct arises on the ventral, rostral border of parotid gland and then traverses towards the side of the face medial to platysmas muscle, approximately 1-1.5 cm dorsal to the facial vein. It empties into the oral cavity through an orifice on a flattened papilla that is located 1 cm dorsal to the gingival border opposite the 4th maxillary cheek tooth (Fowler, 2000).

In the initially treated 3 cases, surgical repair of buccal fistula was done with application of internal and external rubber sheaths as a wound protectant. Gharu and Gahlot (2015) and Kaswan *et al* (2016) also used rubber sheets for the management of buccal fistula in camels. Rubber sheets got dislodged within 1 week postoperative period in C<sub>I</sub> and C<sub>III</sub> camels and after two weeks in C<sub>II</sub> camel. In C<sub>IV</sub> camel rubber sheets were not applied because there was a simultaneous cheek teeth diastema filling and repair of fistula was performed. In C<sub>I</sub>, C<sub>II</sub> and C<sub>III</sub> camels recurrence of fistula was recorded following straw feeding. Presence of unusual interdental space due to absence of maxillary tooth at this location was root cause of fistula and filling of that space with PMMA helped healing the fistula.

In the presence of a healthy alveolus, an acrylic plug could firmly retain in place for 4-6 weeks which prevents alveolar food contamination and thus allows granulation tissue to close the apical aspect of the alveoli and thus allows buccal fistula to heal. The prosthodontic application of acrylic material as an interdental space filler has its inability to stay firmly in position for this length of time. After the initial period, the normal rostral and caudal dental drift of adjacent teeth into the tooth extraction space compresses the sides of the acrylic plug and usually keeps it firmly in place, sometimes for many years (Dixon, 2019).

In present clinical study, long term follow up was done in all cases and found that acrylic plug was retained between adjoining teeth till a follow up of 4 to 6 weeks post-application. The fistulae got completely healed and no recurrence was observed after prosthodontic application. Hawkes *et al* (2008)

observed a similar case of oro-nasal and oro-maxillary fistula in equine treated with application of acrylic material, where PMMA got dislodged when the horse masticated as it was protruding below the occlusal surface. Any loose pieces of PMMA protruding buccally or palatally should be removed as they later cause soft tissue trauma when hardened. If the PMMA becomes too hard and does not attach firmly, it should immediately be replaced (Dixon, 2019). Prostheses should be regularly examined up to 2 or 3 months following their initial application and then at least annually.

Presence of cheek teeth diastemata facilitates the entry of hard fibres of feed straw which can repeatedly cause trauma to the duct and buccal wall hence, diastema space should be filled at an earliest by prosthodontic application of acrylic polymer PMMA, as done in the present study. It was inferred that prosthodontic application of Acrylic polymer (PMMA) and its retaining at diastemata for longer duration can promote the granulation tissue formation and subsequent healing of buccal fistula wounds.

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