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Case Report

Surgical correction of bilateral soft palate hypoplasia using soft palate hinged-flap and bilateral buccal mucosal rotation flaps in a dog

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Abstract

A 3-month-old 13 kg intact female American pit bull dog was presented with a history of chronic sneezing, nasal discharge, oronasal reflux, and aspiration with food and water. Oral examination under general anesthesia revealed a shortened soft palate extended caudally from the hard palate. As a result, bilateral soft palate hypoplasia was diagnosed. The dog was operated upon by using soft palate hinged-flap combined with bilateral buccal mucosal rotation flaps techniques. Ten days after surgery, the dog was eating well and the nasal discharge was resolved. Oral examination showed that the new soft palate had healed well. A follow-up after six months indicated that the dog was in good health and showed no signs of nasal discharge and eating or drinking difficulties. Thus, this case report describes the successful surgical correction of bilateral soft palate hypoplasia in the case of a dog by using soft palate hinged-flap combined with bilateral buccal mucosal rotation flaps techniques.

Keywords: buccal mucosal flaps, dog, soft palate hinged-flap, soft palate hypoplasia

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Introduction

The palate consists of the primary palate (lip and incision bone) and the secondary palate (hard and soft palate). The secondary palate is a bony and soft tissue structure that separates the respiratory and digestive passages of the head by controlling the appropriate passage of food and liquid from the mouth to the esophagus. Therefore, defects of the secondary palate will cause critical effects on an animal's well-being. The soft palate disorders in dogs are congenital diseases that occur during the developmental and gestational processes. The sequence of abnormal embryologic events that lead to the formation of the condition remain unknown. Some reports suggest that the condition might result from a failure of the lateral palatine process to fuse with the tissues that form the tonsil, tonsillar crypt, and palatine tonsils (Warzee *et al.*, 2001; White *et al.*, 2009). Moreover, there was an absence of mesenchymal primordial necessary to form the soft palate resulting in the formation of a laterally unsupported and shortened soft palate (Henrick *et al.*, 2004). Predisposing causes could be hereditary, nutritional, hormonal, mechanical, and toxic factors (Sager and Nefen, 1988). The prevalence of soft palate disorder appears to be higher in brachycephalic dogs, Siamese cats, and Abyssinian cats (Henrick *et al.*, 2004; Nelson, 1993; Noden and De Lahunta, 1985; Sager and Nefen, 1988; Sinibaldi, 1979) Soft palate hypoplasia is divided into two types of defect: unilateral and bilateral. Unilateral soft palate defects show non-symmetrical remnants of soft palate and a lack of palatine musculature on the ipsilateral defect. Meanwhile, bilateral soft palate defects show central symmetrical remnants of soft palate (central pseudouvular). Clinical signs vary in each case, such as poor growth, chronic or intermittent upper respiratory congestion, sneezing, chronic rhinitis with nasal discharge, or aspiration pneumonia from food and water refluxed into the nasal cavity (Gregory, 2000; Henrick *et al.*, 2004; Mullins *et al.*, 2016; Sager and Nefen, 1988; Warzee *et al.*, 2001).

The diagnosis of soft palate hypoplasia is typically made by oral examination which revealed a shortened remnant of soft palate that appeared as a uvula-like projection extended caudally from the hard palate. Animals diagnosed with soft palate hypoplasia were previously given a poor prognosis and surgical repair is necessary and should be performed as early as possible to prevent secondary complications. The purpose of this report is to describe the surgical approach for bilateral soft palate hypoplasia reconstruction and to represent clinical success in dogs using soft palate hinged-flap with bilateral buccal mucosal rotation flaps techniques.

Case description

A 3-month-old 13 kg intact female American pit bull dog was presented with a history of respiratory distress and dyspnea for one week at Kasetsart University Veterinary Teaching Hospital (KUVTH) Nong-Pho. The chief complaints were chronic sneezing with nasal discharge, oronasal reflux, and aspiration with food particles and water. On physical examination, the dog was alert and responsive. A mucous nasal discharge was presented and the bilateral submandibular lymph nodes were enlarged. Thoracic radiography revealed no evidence of lung lesions. Complete blood count showed leukocytosis (21. 22×10^6/ml, reference range 6-17$\times10^6$/ml) and creatinine was 1.0 mg/dL [reference range: 0.5-1.3 mg/dL, (IDEXX Catalyst Chemistry Analyzer)]. The oral examination was performed under general anesthesia. Oral examination revealed a shortened soft palate that appeared as a uvula-like projection extended caudally from the hard palate (Fig. 1). Bilaterally, the tonsils were symmetrically enlarged. The hard palate was normal. Based on the oral examination findings, the diagnosis was bilateral soft palate hypoplasia and the dog was referred to KUVTH Hua Hin for surgical reconstruction of the soft palate one week later.

Preoperatively, the dog was given morphine (0.5 mg/kg, IM, MORPHINE SULFATE; M&H Manufacturing for Food and Drug Administration, Thailand) and diazepam (0.2 mg/kg, IV, ROPAM; L.B.S. Laboratory, Thailand) for pain management and premedication. This was followed by alfaxalone (2 mg/kg, IV, ALFAXAN; Jurox Animal Health, Australia) for induction and cephazolin (22 mg/kg, IV, CEFABEN; L.B.S. Laboratory, Thailand) as a preoperative antibiotic prophylaxis. The anesthesia was maintained throughout the surgery by using 1% isofurane. The dog was placed in dorsal recumbency with the head stabilized and mouth held open. The oral cavity was prepped with 1% povidone iodine and the pharynx was packed with sterile gauze to prevent exudates reflux from the esophagus to the surgical area. A transverse incision was made by scalpel blade at the proximal soft palates, whereby the length of the incision (length of the flap) was determined by the width of the base of the soft palate (approximately 2 cm in length). Then, two parallel incisions were made by scalpel blade from both lateral edges of the transverse incision to the palatoglossal arches, which were undermined and elevated by blunt dissection to make a hinged flap with the base of the flap at the caudal margin of the soft palate. The flap was flipped 180° in the caudal direction (Fig. 2) and secured along both lateral margins to the pharyngeal wall with 4-0 monofilament absorbable suture (MAXON; Covidien, USA) using a simple interrupted suture pattern. Then, an incision in the buccal mucosa is made bilaterally to make inverted U-shaped rotation flaps on the left and right sides. The flap is then rotated from both sides medially to cover the wound bed of the hinged flap (Fig. 3), and the length and width of the flap should be greater than the measured length and width of the hinged flap to prevent tension on the suture line (2-3 mm were added to the length and width of the harvest flap). The apex of each buccal mucosal flap was sutured together at the midline of the wound bed of the hinged flap with 4-0 monofilament absorbable suture using simple interrupted sutures. The lateral buccal mucosal flaps

were sutured at the proximal and caudal sites of the hinged flap with 4-0 monofilament absorbable suture using simple interrupted sutures. The buccal mucosal flap will cover the whole of the hinged flap to create a new soft palate with longer length (Fig. 4). The buccal donor sites were closed with 4- 0 monofilament absorbable suture using simple interrupted sutures. Dexamethasone phosphate (0.25 mg/kg, IV, DEXTON; T.P. Drug Laboratories, Thailand) was administered intraoperatively to reduce swelling at the reconstructed palate and pharyngeal tissues after surgery.

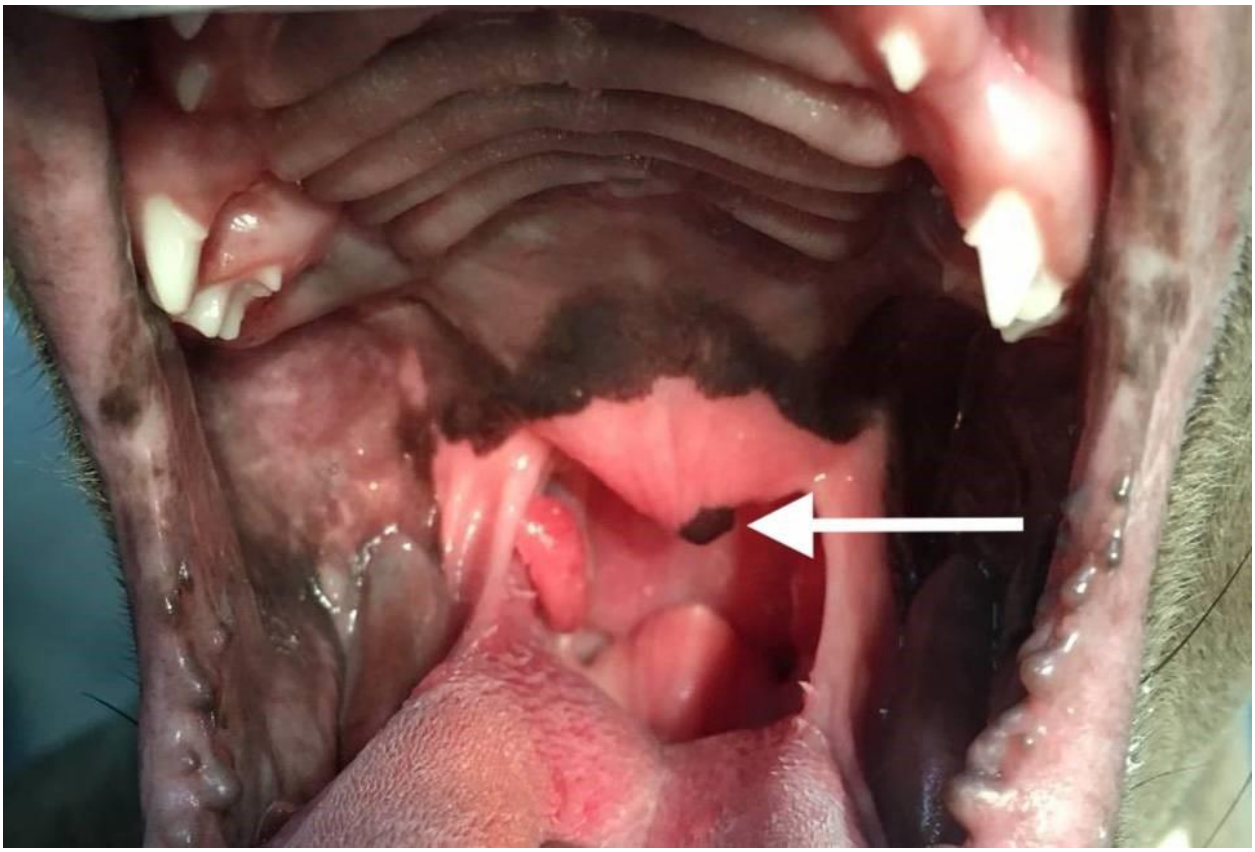

Figure 1 Intraoral view of a 3-month-old female intact American pit bull dog which had a shortened soft palate that appeared as a uvula-like projection (pseudouvula) (white arrow).

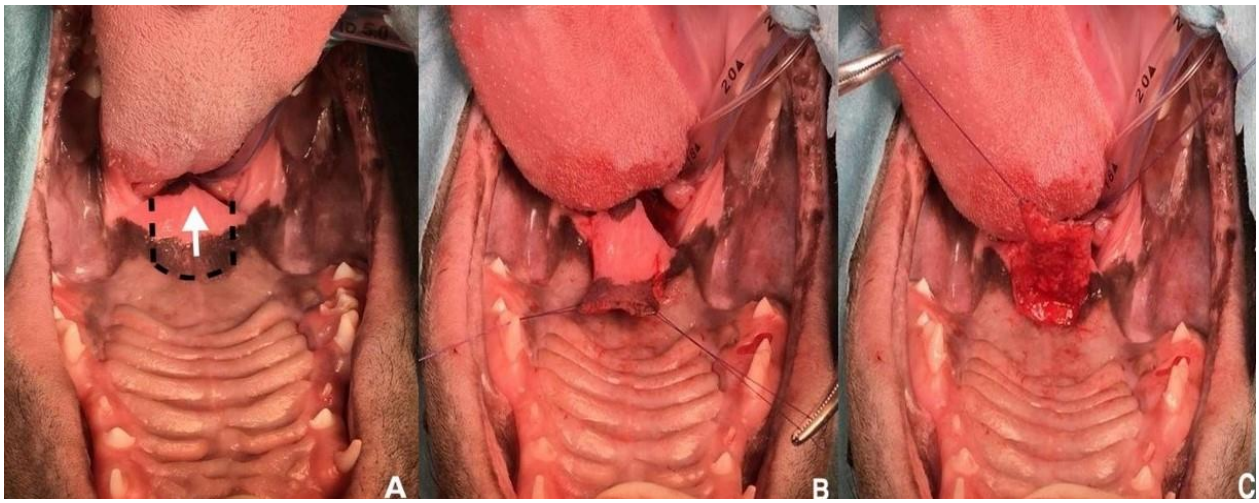

Figure 2 Perioperative pictures. The incision line (dotted line) and the direction of flap (white arrow) (A). Making the stay suture at the edge of the hinged flap (B). Illustration of the flap flipped 180° caudally (C).

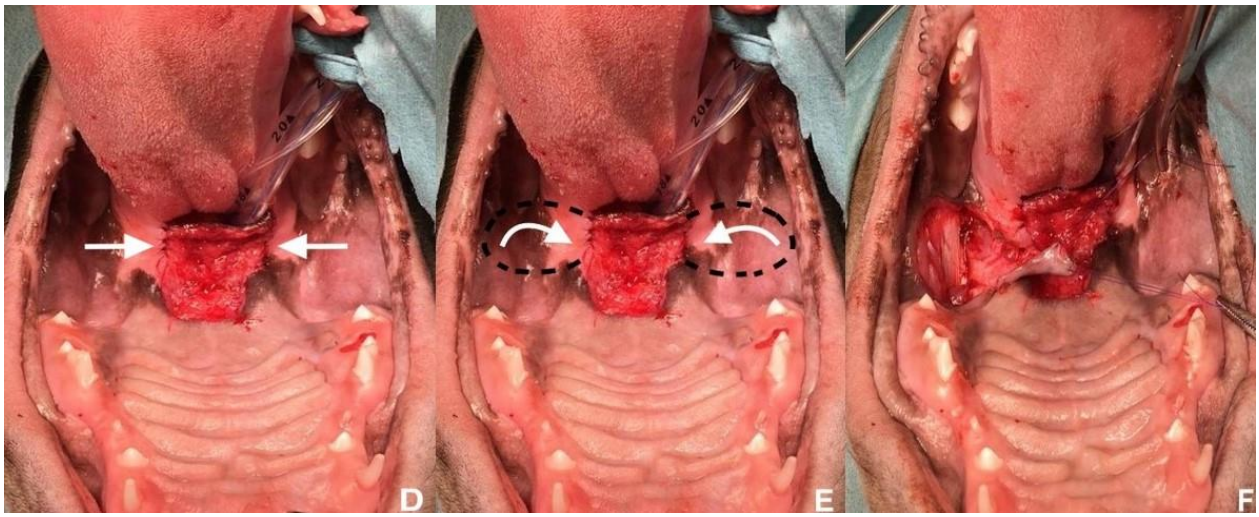

Figure 3 Perioperative pictures. The flap was secured along its lateral margins to both sides of the pharyngeal wall (white arrow) (D). Bilaterally inverted U-shaped flaps of buccal mucosa were created (dotted line) and flaps were rotated on to the hinged flap (arrow) (E, F).

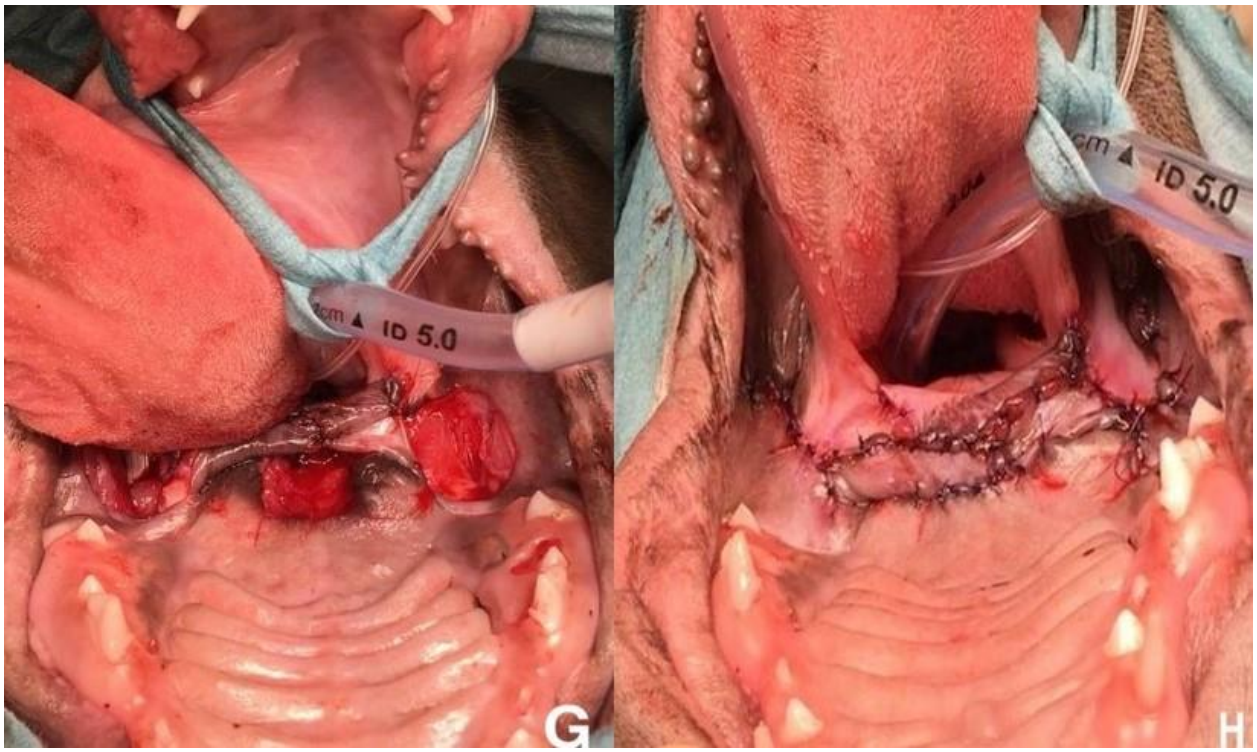

Figure 4 The apex of each buccal mucosal flap was sutured together at the midline at the wound bed of the hinged flap (G). Postoperative image of the dog, after the soft palate was reconstructed (H).

Postoperatively, the dog recovered well from the anesthesia and was discharged. The dog was given oral antibiotics with amoxy-clavulanic acid (15 mg/kg) every 12 hours for 14 days and oral anti-inflammatory was carprofen (4.4 mg/kg, RIMADYL; Inovat Industria Farmaceutica, Brazil) once a day for four days. Soft food was given for two weeks with the avoidance of chewing hard objects. Ten days after surgery, the clinical signs were improved. The dog was eating well and the nasal discharge was resolved. Oral examination under sedation showed that the new soft palate had healed. Six months after their first visit, telephone follow-up was carried out, indicating that the dog was doing well and showed no nasal discharge, coughing, or any eating or drinking difficulties.

Discussion

Bilateral soft palate hypoplasia in small animals has been sporadically reported in the veterinary literature and surgical reconstructions in dogs and cats have been performed since 1972 (Mullins *et al.*, 2016), albeit often unsuccessfully. The purpose of all surgery was to create a new soft palate with a greater length and width by selecting tissue flaps from various sites such as the nasopharyngeal mucosa, palatal musculature, oral mucosa, mucoperiosteal tissue, or combinations in order to restore normal function during swallowing

and breathing. In cats, soft palate hypoplasia usually contains very small sized soft palate remnants. The size and its elastic fibrotic characteristics would prevent it from extending to the pharyngeal wall. Generally, the buccal mucosa flap would not be suitable in cats due to the thinness of oral mucosa and the small size of the rotation flap which would compromise circulation of the flap causing wound dehiscence (Henrick *et al*., 2004). There was a publication reporting reconstruction of bilateral hypoplastic soft palate in a cat by using two pattern flaps developed from the hard palate mucoperiosteal flap and mucosal tissue on the right and left pharyngeal walls (Henrick *et al.*, 2004). These flaps contain sufficient length to be sutured together across the nasopharynx in an H-plasty configuration to form a new soft palate. The postoperative oral examination revealed small amounts of necrotic tissue around the cranial border of the flap with the suspected cause being either from tension or vascular compromise in that part of the suture line. There was a case report in 1998 about correction of soft palate defects in three dogs by using buccal mucosal rotation flaps (Sager and Nefen, 1988). The buccal mucosal flap was rotated from both sides of the pharyngeal walls to form complete oral and nasal mucosal surfaces. After the operation, partial dehiscence of the pharyngeal wall suture line was found in one dog.

The most common complication observed after soft palate surgical reconstruction is wound dehiscence resulting from excessive tension. This was subsequently observed from contraction during the healing process along with immoderate shrinkage of the newly constructed palate. Thus, a combined technique between soft palate hinged flap and bilateral buccal mucosal rotation flap which has been used in this study would provide an alternative method for repairing bilateral soft palate hypoplasia in dogs with minimal tension suture lines. Using a hinged flap would provide a new length and width of soft palate which could be adjusted and made suitable for each dog. Furthermore, combination with the bilateral buccal mucosal flap technique would further reduce the tension and ameliorate the strength of the reconstructed soft palate as the base of the buccal mucosal flaps were adjacent to the hinged flap allowing rotation through approximately 180° without tension into their new location.

To minimize the possibility of postoperative complications, various points should be considered. For instance, during the buccal mucosal flap incision, the length and width of the flap from both sides should be slightly greater than the prepared soft palate hinged flap bed. The purposes were to allow the shortening of the flap during rotation and to prevent tension on the suture line. The buccal mucosal flap incision should be made with a scalpel blade rather than scissors to prevent tissue injury at the edge of the flap. Moreover, it is recommended to suture and cover all reconstruction sites in the oral and pharyngeal areas with mucosal tissue, both dorsal and ventral aspects, to accommodate primary intention wound healing (Nelson, 1993). Preservation of the flap tissue vasculature by elevating adequate underlying connective tissue and avoiding using electrocautery are very important. While suturing flap tissues, it is necessary to gently bite the tissue to diminish interference from the blood supply at the wound edge. In some cases, ipsilateral tonsillectomy might be required, especially in conditions of bilateral soft palate hypoplasia to reduce excessive wound tension laterally. The author decided not to perform tonsillectomy in this case due to there being no tension alteration across the buccal mucosal flaps. Tonsils left uncut will preserve their functions as secondary lymphoid tissues capturing respiratory tract pathogens.

In conclusion, this report would provide additional clinical evidence supporting the use of soft palate hinged-flap and bilateral buccal mucosal rotation flap for bilateral soft palate hypoplasia correction in dogs. These two techniques combined to offer an excellent outcome by minimizing tension which is the main cause of reconstruction failure. The dog which underwent surgical reconstruction in this study is no longer suffering from the disease, thus reversing its poor prognosis previously given.

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