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Case report

RECONSTRUCTION OF A LARGE LIP DEFECT USING ADVANCED BUCCAL FLAP

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This article describes the repair of a traumatic lesion on the upper lip of a 6 – year – old male mixed – breed dog using a full – thickness buccal advancement flap. The intact male was presented for examination by a rescue organization. The clinical assessment revealed that the dog was in good condition, though slightly dehydrated, with a temperature within normal limits and a good appetite. A significant defect on the upper right lip was identified, accompanied by discharge.

Comprehensive health evaluations, including blood tests, abdominal ultrasound, 4D testing, and head X – rays, indicated that the dog was otherwise healthy, without any concurrent diseases. Wound debridement and tooth extraction were performed, followed by wound reconstruction using a full – thickness buccal advancement flap. Post – surgery, the dog underwent polarized light therapy twice daily for 10 minutes over a 10 – day period to speed up the wound healing process.

In conclusion, the full – thickness buccal advancement flap procedure resulted in favorable functional and cosmetic outcomes. The dog resumed normal food and water intake, exhibiting only mild facial asymmetry during the 6 – month follow – up, with no other observed difficulties.

Keywords: full thickness buccal advancement flap, polarized light, trauma

INTRODUCTION

The reconstruction of facial defects poses considerable challenges, primarily due to the anatomy of the muzzle and the limited availability of local tissue [1-4]. Common instances necessitating surgical lip procedures for reconstruction include traumas, tumors, and congenital malformations. [5-7].

For uncomplicated, minor defects, closure can often be achieved through simple suturing, wedge conversion, or Y closure, depending on the size of the defect. On the

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contrary, addressing large defects typically requires the use of various flaps, such as rotation flap, advancement flap, buccal flap, or commissure rotation flap. Utilizing these flaps demands special care to safeguard vital nerves and blood vessels, minimizing the risk of flap rejection.

The primary focus of this article is to elucidate the buccal advancement flap technique, offering the means for a functional and cosmetic reconstruction of substantial upper lip defects resulting from trauma.

CASE PRESENTATION

A six – year – old male, mixed – breed dog was brought in for the treatment of a defect in the right upper lip. The dog had been rescued by an association seven days prior, with an unknown clinical history. During the clinical examination, a large full – thickness defect, approximately 10 cm in diameter, was observed on the right upper lip. The maxilla, gums, and teeth from P1 to M2 were visible from the outside, accompanied by a moderate amount of nasal discharge. Hematological parameters indicated leucocytosis (neutrophilia and monocytosis), while biochemical parameters were within the reference values. The 4D test was negative. X – rays revealed an advanced stage of periodontal disease (Figure 1), characterized by horizontal absorption of the alveolar bone in the premolar and molar regions. Abdominal ultrasound showed no pathological changes.

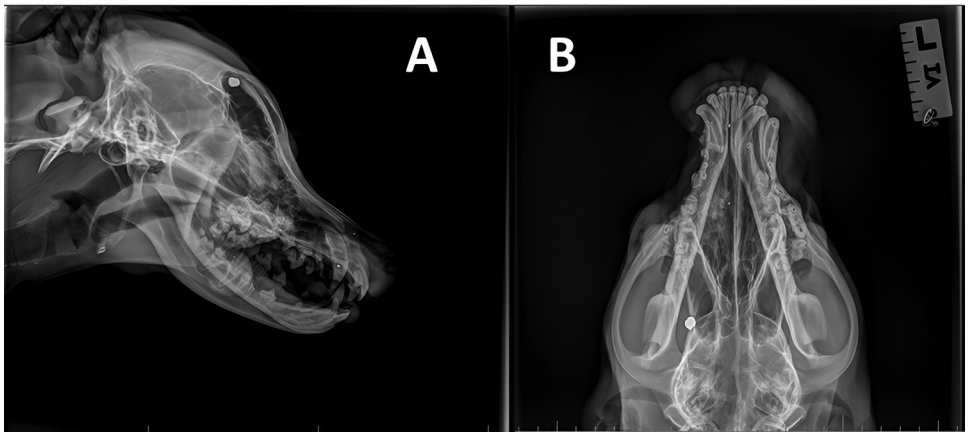

Figure 1. Picture **A** and **B**: In the soft tissues around the right frontal sinus, a diabolo – shaped metallic shadow is observed, without apparent alterations in the adjacent bone structures. Within the left nasal meatus, multiple smaller metallic shadows (1mm in diameter) are evident. Furthermore, a progressed stage of periodontal disease, characterized by horizontal absorption of the alveolar bone, is noted in the premolar and molar regions.

Considering the appearance of the wound (Figure 2), clinical signs, and X – ray imageing, a decision was made to close the defect with full – thickness buccal advancement flap.

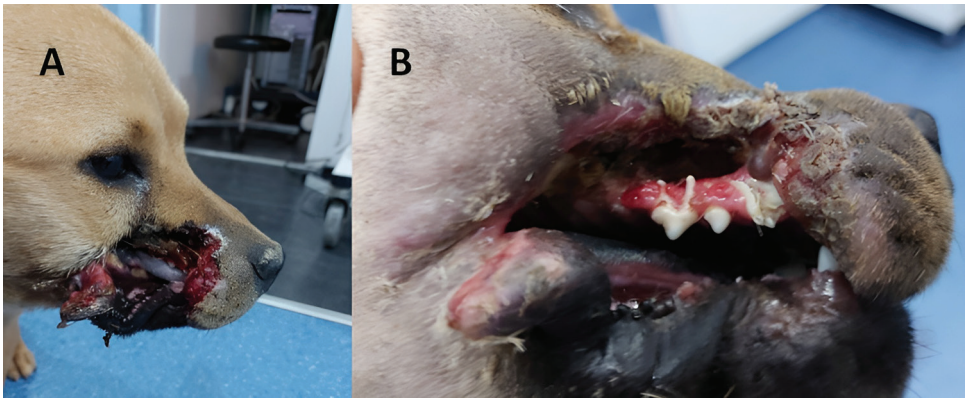

Figure 2. Picture **A**: Dog at the first clinical examination. Picture **B**: Enlarged image of the wound, after clipping hair and cleaning the wound.

The dog was sedated with butorphanol (Alvegesic vet. 10 mg/ml V. M. D. b.v Hoge Mauw 900 2370 Arendonk Belgium) (0,2 mg/kg) and medetomidin (Domitor® 10 mg/ml Orion, Finland) (10 μg/kg); general anestesia was induced with propofol (4 mg/kg) and maintined with sevofluran (1,8 %). Saline solution 0,9 % was administred i.v. at the rate 4ml/kg/h during surgery. The dog was positioned in left recumbency. The nose and the upper lip were clipped and aseptically prepared for the procedure. Wound debridment was performed before the flap was made.

The flap was obtained from the lower lip, including the remainder of the upper lip, the oral commissure, and part of the lower lip, along with the buccal skin. To advance the flap, a portion of the mucosa from the caudal part of the lower jaw had to be released. Three rhomboid – shaped skin incisions were made over the skin covering the masseter muscle (Figure 3). The gap created by the tooth extraction and the open right nostril were covered with buccal mucosa. The skin was used to cover the dorsal part of the nose. The mucosa edge of the flap was sutured to remain part of the muzzle with simple interrupted pattern using 3 – 0 PDS monofilament suture. The skin was sutured with non – absorbable 3 – 0 nylon suture (Figure 3).

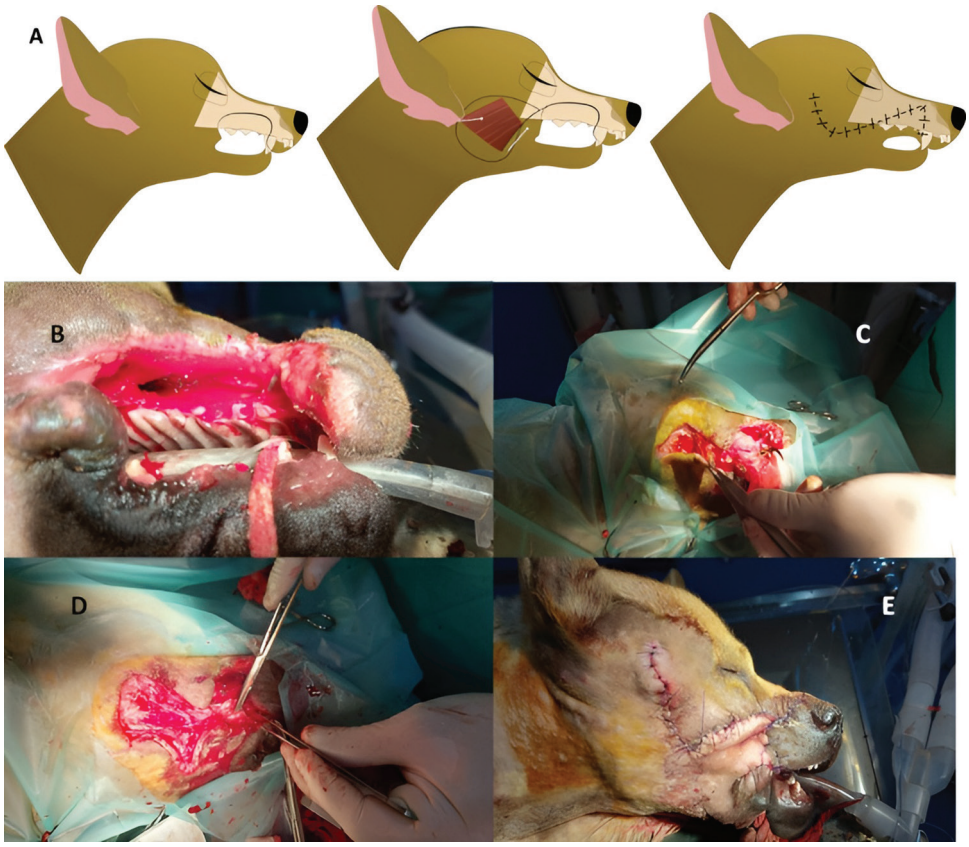

Figure 3. Picture **A**: An illustrated presentation of the reconstruction of the upper lip defect; Picture **B**: Wound appearance after debridement and after tooth removal; Picture **C,D**: These images show the cutting of the skin and the creation of flaps for reconstruction; Picture **E**: Lateral view of the closed lip defect. It is observed that the nasal muzzle is moved laterally.

Pain was medicated once a day with metadone (0,3 mg/kg) for several days. Cefaleksin 25 mg/kg 2 times per day, and meloxicam were administrated for 7 days post surgery. The dog was discharged 14 days postoperatively, after the wound healing process was complete (Figure 4).

During the recovery phase, the dog was exposed to polarized light (Bioptron lamp, Cepter) for 10 minutes from 10 cm distance, two times per day in order to make the healing time as short as possible. A polarized light source has following technical characteristics: wavelength: 400 – 2000nm; degree of polarization: >95 %; power density: 40 mWcm – 2; light energy: 2.4 Jcm – 2. Polarized light rays penetrate the tissue 2,5 cm in depth, depending on the exposure time (Simic, 2001). The phototherapy was stopped when the wound had completely healed.

Figure 4. Picture **A**: Appearance of the wound 7 days after surgery; Picture **B**: Appearance of the wound 14 days after surgery; Picture **C**: Appearance of the wound 18 days after surgery; Picture **D, E**: Appearance of the dog 4 months after surgery

DISCUSSION

The utilization of polarized light in conjunction with surgical procedures in our case aimed to reduce the risk of secondary infection and facilitate a safer and faster wound healing process. Full – thickness labial flap procedures, such as lip to lid or lip to lip, have demonstrated notable success in various reports [1,2]. The loose abundance of skin on the lips, especially in dogs, as opposed to cats, allows for different approaches in repairing defects based on their size.

For minor defects such as lesions, small defects, or small tumors, a wedge – shaped resection is commonly employed, providing narrower margins. A square cut resection, on the other hand, offers wider margins, and the lips are aligned using a Y – shaped closure [2,5,8].

In the case of larger wounds, several advanced techniques, including prefabricated mucosalized flap, full – thickness labial advancement flap, full – thickness buccal rotation flap, and inverted local transposition flap, are recommended [5,8,9].

The full – thickness labial advancement flap is indicated for large defects in both upper and lower lips. This approach may lead to temporary unilateral deformation but typically resolves within two weeks. Preserving the labial artery and vein is crucial during this procedure [9].

The full – thickness buccal rotation flap, recommended for large upper lid defects, can move the labial commissure cranially or rostrally, resulting in facial asymmetry [1,9]. A modification of this technique was employed in our case due to the size of the upper lip defect. This modified technique allows the preservation and use of buccal mucosa, which would be challenging with a skin flap transposition.

Potential complications associated with the reconstruction of large lip defects using the advanced buccal flap technique include wound infection, flap necrosis, feeding and drinking difficulties, facial asymmetry, excessive bleeding, scar formation, wound dehiscence, and muscle or nerve dysfunction. Due to the bacterial presence in the oral cavity, the risk of infection is high, potentially leading to inflammation, pus formation, and delayed healing. Flap necrosis may occur if blood supply is insufficient, necessitating additional corrective procedures. Poor flap positioning can result in difficulty eating and drinking, which may lead to dehydration or malnutrition. Furthermore, facial asymmetry, either temporary or permanent, can arise due to changes in lip contour or commissure positioning. Bleeding is another possible complication, particularly if blood vessels are damaged during flap preparation or fixation. Irregular or excessive scarring may lead to aesthetic concerns, while inadequate healing could result in wound dehiscence, requiring further intervention. Additionally, damage to muscles or nerves during surgery may cause functional impairments, such as restricted movement or loss of sensation in the affected area. These risks highlight the importance of precise surgical planning, careful intraoperative handling, and diligent postoperative management to ensure optimal outcomes.

The extended follow – up period showed only mild facial asymmetry, with no other discomforts observed.

For massive defects that cannot be closed by previously described techniques, transposition skin flap and buccal replacement are recommended [9]. However, this technique has the disadvantage of replacing skin but not mucosa, making it reserved for the largest defects where other reconstructive techniques are not viable [9].

Studies on humans have indicated that the use of polarized light significantly enhances wound healing, accelerates epithelization, and improves the quality of formed scar tissue [10,11]. Polarized light mechanism of action involves affecting regenerative processes within the cell, enhancing hydration and oxygenation. It stimulates fibroblasts to produce new collagen fibers and repair existing collagen, restoring elasticity to the skin [12 – 14]. Macrophages, critical for wound repair, are stimulated by polarized light to release growth and chemotactic factors, primarily growth factors that stimulate fibroblast proliferative activity. Additionally, polarized light activates both cellular and humoral defense mechanisms in a process called "photomodulation" [11,15].

The results in veterinary practice remains uncertain due to the lack of similar studies in veterinary medicine as well as the absence of a control group in this case. Without a direct comparison, it is challenging to determine whether the observed healing effects were solely due to polarized light therapy or influenced by other factors such as natural

tissue regeneration or additional treatments. Furthermore, physiological differences between humans and animals necessitate species – specific research to validate these findings in veterinary medicine. While polarized light shows promise, further controlled studies are needed to confirm its efficacy in accelerating wound healing in animals.

Considering the non – sterile environment of the oral cavity and the heightened risk of wound infection, especially in this specific case with a sizable wound, the use of polarized light is designed to speed up wound healing, providing antibacterial and antiviral effects [14]. It also positively influences angiogenesis, leading to reduced scar tissue formation [12,14]. With a penetrative depth reaching 2.5 cm into the tissue [16], depending on exposure length, polarized light proves beneficial in injuries affecting the jaw, eye, and snout, directly impacting the quality of life for animals by facilitating their ability to navigate, orient themselves in space, and consume food and water. Therefore, appropriate reconstruction and prompt repair of resulting defects become crucial for the well – being of the animal.

The application of this surgical technique, coupled with the use of polarized light, yielded excellent results in repairing a substantial lip defect. Over the 6 – month follow – up period post – surgery, the dog exhibited only mild facial asymmetry, with no other observed complications.

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Authors' contributions

DM, MM, DD did the diagnostic and surgery procedure. MMN, KV did the postoperative procedure. DM, DD, MMN, KV prepared the manuscript. All co – authors read and approved the final version of the manuscript.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Statement of Informed Consent

The owner understood procedure and agrees that results related to investigation or treatment of their companion animals, could be published in Scientific Journal Acta Veterinaria-Beograd.

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REFERENCES

1. Pavletic MM: Reconstructive Surgery of the Lips and Cheek. Vet Clin N Am 1990, 20(1):201 – 226.
2. Pavletic MM: Full – thickness labial flaps to reconstruct facial defects in four dogs. Vet Surg 2021, 50(6):1338 – 1349.
3. Ter Haar G, Buiks SC, Kirpensteijn: Cosmetic reconstruction of a nasal plane and rostral nasal skin defect using a modified nasal rotation flap in a dog. Vet Surg 2013, 42(2):176 – 179.
4. Massari F, Chiti LE, Lisi MLP, Drudi D, Montinaro V, Sommaruga P: Lip – to – nose flap for reconstruction of the nasal planum after curative intent excision of squamous cell carcinoma in cats: Description of technique and outcome in seven cases. Vet Surg 2020, 49(2):339 – 346.
5. Pavletic MM: Skin Flaps in Reconstructive Surgery. Vet Clin N Am 1990, 20(1): 81 – 103.
6. Chiti LE, Montinaro V, Lisi MLP, Asta AG, Marches S, Sommaruga P, Massari F: Lip – to – nose flap for nasal plane reconstruction in dogs: A cadaveric and in vivo feasibility study. Vet Surg 2018, 47(8):1101 – 1105.
7. Zhang G, Langova V, Havlicek M: Nasal planum reconstruction after tumour resection using a lip – to – nose flap in a dog. J Small Anim Pract 2020, 61(10):648 – 652.
8. Degner DA: Facial reconstructive surgery. Clin Tech Small Anim Pract 2007, 22(2):82 – 88.
9. Kirpenstejn J and Ter Haar G: Reconstructive Surgery and Wound Management of the Dog and Cat. CRC press 2013, 1st edition, doi.org/10.1201/b15201.
10. Stäcker, AD: Förderung der Wundheilung durch Bestrahlung mit polarisiertem Licht. Medwelt 1986, 37:1419 – 1423.
11. Monstrey S, Hoeksema H, Depuydt K, Van Maele G, Van Landuyt K, Blondeel R: The effect of polarized light on wound healing. Eur J Plast Surg 2002, 24: 377 – 82.
12. Monstrey S, Hoeksema H, Saelens H, Depuydt K, Hamdi M, Van Landuyt K, Blondeel P: A conservative approach for deep dermal burn wounds using polarised – light therapy. Br J Plast Surg 2002, 55(5):420 – 426.
13. Bolton P, Dyson M, Young S: The effect of polarized light on the release of growth factors from the U – 937 macrophage – like cell line. Laser Ther 1992, 2:33 – 42.
14. Colić MM, Vidojković N, Jovanović M, Lazović G: The use of polarized light in aesthetic surgery. Aesthetic Plast Surg 2004, 28(5):324 – 7.
15. Fenyo M: Theoretical and experimental basis of bio stimulation. Opt Laser Technol 1984, I6:209 – 15.
16. Simic A: Importance of Bioptron light therapy in the treatment of surgical incisions. Second Balkan Congress for PRAS and Bioptron Satellite Symposium, Belgrade, 2001, May 24–26.

REKONSTRUKCIJA VELIKOG DEFEKTA USNE KORIŠĆENJEM BUKALNOG REŽNJA POMERENOG UNAPRED

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Ovaj članak opisuje sanaciju traumatske lezije na gornjoj usni mužjaka mešanca starog 6 godina, korišćenjem bukalnog režnja pune debljine pomerenog unapred. Nekastriranog mužjaka je na pregled dovela organizacija za spasavanje životinja. Kliničkim pregledom utvrđeno je da je pas u dobrom opštem stanju, blago dehidriran, sa telesnom temperaturom u granicama normale i dobrim apetitom. Na gornjoj desnoj usni identifikovan je značajan defekt, pokriven eksudatom.

Sveobuhvatna dijagnostika, uključujući analize krvi, ultrazvuk abdomena, 4D test i rendgensko snimanje glave, pokazala je da je pas zdrav. Izvršena je obrada rane i ekstrakcija zuba, nakon čega je sprovedena rekonstrukcija rane korišćenjem bukalnog režnja pune debljine pomerenog unapred.

Nakon operacije, pas je dva puta dnevno tokom 10 dana bio podvrgnut terapiji polarizovanom svetlošću u trajanju od 10 minuta, kako bi se ubrzao proces zarastanja rane.

Zaključno, procedura sa bukalnim režnjem pune debljine pomerenim unapred rezultirala je povoljnim funkcionalnim i estetskim ishodom. Pas je nastavio sa normalnim uzimanjem hrane i vode, uz prisutnu blagu asimetriju lica tokom kontrolnog perioda od 6 meseci.