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Case report

USE OF NASOLABIAL FLAP FOR RECONSTRUCTION OF THE SOFT TISSUES OVER THE ALVEOLAR RIDGE AFTER TRAUMA ON THE MANDIBLE: A CASE REPORT

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ABSTRACT

Nasolabial flap technique (NLF) is the one of the oldest methods for reconstructing orofacial soft tissue defects. It is recognized as a simple, effective, and relatively safe method, with a low risk of complications. NLF offer good mobility and is a functional and aesthetic satisfactory alternative to free tissue transfer.Òhe application of this method for reconstruction in young people may result in temporary disturbances in speech, nutrition, oral hygiene maintenance, and a short-term reduction in quality of life.

Aim: The purpose of this publication is to present a clinical case involving the use of a rotated nasolabial flap (NLF) for the repair of soft tissue defects in the oral cavity following trauma (fractura) and subsequently developed osteomyelitis of the mandible while also reviewing relevant dental literature on its efficacy and potential limitations in young people.

Material and methods: This publication presents a clinical case involving the two-stage reconstruction of a mandibular defect caused by fracture and traumatic soft tissue injury.

Results: The application of a rotated nasolabial flap demonstrates an effective alternative technique for the repair of small to medium-sized soft tissue defects in the oral cavity. However, in young patients without concomitant diseases, the two-stage reconstruction method in an unappropriate manner for soft tissue reconstruction in oral cavity. NLP may result in temporary disturbances in speech, nutrition, oral hygiene maintenance, and a short-term reduction in quality of life.

Conclusion: The choice of a treatment approach should not be guided solely by the technique's success rate, but factors such as the patient's age, the presence of comorbidities, and the treatment's impact on the patient's quality of life and duration must also be taken into account.

Keywords: nasolabial flap, intraoral reconstruction, quality of life, local flap,

INTRODUCTION

Reconstruction of facial and oral cavity tissues following trauma or small to medium-sized resections for oncological treatment often necessitates the use of autogenous soft tissue transfer. The pedicled nasolabial flap is a commonly used local facial flap, typically triangular in shape, that is laterally placed onto the nasolabial fold – the region between the nose and cheek where hair growth is minimal. It offers excellent prospects for restoring soft tissue defects in the oral cavity, with minimal associated pain and discomfort, while also achieving relatively favorable aesthetic outcomes. Additionally, it is particularly well-suited for reconstruction in edentulous areas, thereby mitigating chronic trauma during mastication. Although the technique was introduced into reconstructive surgery some time ago, it remains in clinical use, especially among elderly patients with comorbidities where extensive and prolonged surgical interventions pose significant risks.

The use of a nasolabial flap was described in ancient times by Sushura, and in 1868, Tiersch first applied it for the correction of defects in the oral cavity [1]. Later, nasolabial skin flap was used in two stages, and thus increased its durability [2]. Subsequently, many modifications have been developed and introduced. The specifics of its use to correct defects of the oral cavity floor and for closing palatal fistulas are described in detail by Morgan RF, et al. [3], Cohen IK et al. [4], Zarem HA. [5], etc. Other researchers have also reported successful outcomes after resections of neoplastic processes [6, 7]. The procedure can be performed in one or two surgical stages, depending on the goals and volume of reconstructive surgery. More recent publications describe the use of a nasolabial flap to restore the buccal mucosa [8].

The orientation and length of the pedicle are determined by the size and location of the defect, as well as the need for its movement and rotation to the repair site. The pedicled flap is categorized as superiorly or inferiorly based, depending on the direction of rotation of its base, the transbuccal tunnel, and its final positioning. In the reconstruction of defects in the floor of the oral cavity, the

lower border of the flap should align with the superior border of the mandible, while for defects of the palate and upper jaw, it should be projected toward the new oral commissure [9].

Technique

The technique involves a medial incision along the nasolabial fold, extending cranially to no more than 7 mm from the ipsilateral medial canthus to prevent ectropion and a lateral incision, the extent of which is determined by the size of the defect to be repaired. The flap's base should measure between 1.5 and 2.5 cm in width. A base that is too wide may hinder rotation, while a narrower base risks compromising vascular support, potentially necessitating further dissection if the tissue proves insufficient for reconstruction. This predetermined width ensures that the donor site can be initially closed without excessive traction or tension. The lower margin of the flap and its base should be planned at the level of the oral commissure. When used to repair defects in the lateral third of the palate, alveolar ridge, floor of the mouth, or retromolar trigone, a single-stage technique is indicated. However, if the defect is located in the central third, such as the mid-palate, the floor of the mouth, the alveolar ridges of the maxilla or mandible, or the anterior tongue, a two-stage procedure is required, as bilateral dissection may be necessary. The flap is dissected in a supramuscular plane, with the goal of covering a thicker tissue layer. To rotate the dissected flap into the oral cavity, it must pass through a transbuccal tunnel. A crucial step is the de-epithelialization of the lower portion of the flap (approximately 1- 1.5 cm), which will be in contact with the buccal tissues, to ensure proper aesthetic closure and prevent functional impairments [2]. This removal of the epithelial layer also targets hair follicles, sebaceous glands, and sweat glands in the deeper layers, as their presence may result in the formation of an epidermal inclusion cyst [10]. This occurs when the epithelial layer is implanted into deeper mesenchymal tissues during the transbuccal passage of the flap.

The transbuccal tunnel should be sufficiently wide—approximately 1 to 2 cm—to allow passage of the tissue into the oral cavity without tension or constriction of the pedicle. An incision is made through the buccal muscle layer and oral mucosa at the level of the inferior alveolar ridge, then widened manually to minimize the risk of damage to surrounding vascular structures. The flap is then passed through, adjusted, and sutured over the defect [11]. In cases involving a two-stage reconstruction, the second stage, which involves repositioning, dividing, and adapting the nasolabial flap, can be performed as early as three weeks after the initial dissection and repositioning in the oral cavity [2]. For patients with natural dentition, the use of a temporary bite block on the affected side is recommended to prevent damage to the flap [11]. Closure of the donor site is achieved initially by approximating the edges, using either a running subcuticular suture or interrupted simple sutures. If excessive traction is noted, the skin around the defect should be undermined laterally to reduce tension. Lazaridis N, et al. [8] classifies nasolabial flaps into superiorly and inferiorly based, depending on the level of passage through the transbuccal tunnel. If the flap passes at the level of the nasal ala, it is considered superiorly based, while passage at the level of the lip commissure indicates an inferiorly based flap. The choice between a superiorly or inferiorly based nasolabial flap is determined by the location of the defect in relation to the occlusal plane.

CASE PRESENTATION

In May 2024, a patient identified as N.I.E., with an apparent age of 20-25 years, sought dental care at the University Medical Centre of the Faculty of Dental Medicine at the Medical University of Varna, Bulgaria, for ,, the removal of tissue '' in the oral cavity. This tissue had been previously formed during a surgical procedure known as a "tubular skin pedicle" with bilateral vascular support anchored in the left oral mucosa. According to the patient, the soft tissue transfer was intended for future augmentation of the mandibular soft tissue over the alveolar ridge in preparation for prostheses.

The patient's medical history indicated that she had sustained a domestic accident two years prior, involving facial trauma from a hard object. This resulted in a mandibular body fracture in the region of teeth #35 and #36, as well as a laceration-contusion wound in the chin area. Following the trauma, the patient experienced a loss of consciousness and retained no recollection of subsequent events. As she was residing in the Netherlands at the time, initial emergency care and subsequent basic treatment were administered there. Repositioning and fixation of the fractured fragments were initially managed with dental splinting and elastic intermaxillary fixation. However, during a follow-up radiographic examination prior to the removal of the dental splints, the patient was informed that a chronic osteomyelitis was detected, likely caused by a tooth that had fallen into the fracture line. Consequently, all molars and premolars on the left mandible were extracted, and a sequestrectomy was performed. Unfortunately, the patient was unable to provide any radiographic or medical documentation from this stage of treatment. It was explained to the patient that, due to the resulting bone defect, an autogenous graft would be required from the iliac bone. This surgical procedure was performed approximately six months after the initial trauma, in February 2023. Following its harvest, the autogenous graft from the right iliac bone was transplanted to the affected region of the mandible and secured bilaterally with three screws on each side. According to the patient, the postoperative period was uneventful. A subsequent follow-up examination confirmed proper healing of the mandible and successful integration of the graft. The patient did not report any neurological

deficits associated with the inferior alveolar nerve on the affected side.

Due to the complexity of the trauma, it was decided that the soft tissues covering the bone would be restored intraorally using a full-thickness adjacent tissue graft. The graft, a "nasolabial tubular flap," was harvested and shaped from the area of the nasolabial fold. It consisted of skin, subcutaneous tissue, adipose tissue, and muscle fibers, and was passed through a tunnel into the oral cavity, where it was fixed vestibularly to the mucosa of the mandible in the area of teeth #34 and #35. The facial wound was closed by layered tissue adaptation and suturing, resulting in a Y-shaped scar that aligned with the nasolabial fold. According to the patient, the intended goal was for the tissues of the flap to integrate into the oral cavity and be fixed in the edentulous area. However, during this period, the patient experienced significant discomfort due to the presence of the bridge-like graft in her mouth. In addition to the sensation of a foreign body, the graft caused difficulties with eating, maintaining oral hygiene, and articulating speech, severely affecting her quality of life. Due to these unpleasant sensations, the patient expressed a desire to discontinue the planned treatment and requested the immediate removal of the transferred soft tissues from the oral cavity.

Upon objective clinical examination, an extraoral Y-shaped linear scar was observed on the left cheek, corresponding to the nasolabial fold's projection. The patient exhibited limited mouth opening, and during speech, a prominent flesh-colored mass became visible, impairing articulation. Intraoral examination revealed a nasolabial-type, bridge-like soft-tissue flap within the oral cavity, extending vestibularly to the lower jaw in the region of teeth #34 and #35, and attaching intraorally to the cheek in the area corresponding to the maxillary premolars. The mobile and attached mucosa covering the alveolar ridges, tooth cervices, cheeks, and palate appeared normal in color and consistency. Between teeth #33 and #34, a portion of a plate was protruding, likely due to osteosynthesis. A panoramic radiograph (OPG) was ordered by our team, revealing plate osteosynthesis of the mandible with two plates. One plate extended along the mandibular border from teeth #38 to #41, while the other was positioned closer to the alveolar ridge, reaching the apices of the anterior teeth but interrupted in the middle. Both plates were bilaterally fixed using three-point fixation. The treatment plan involved the removal of the soft-tissue autogenous graft under local anesthesia and sedation, followed by plastic closure of the soft-tissue defect in the oral cavity, without removing the existing plates.

Surgical intervention to remove the graft from the patient's oral cavity was carried out at the University Medical Centre under local anesthesia and sedation. The procedure involved detaching the soft tissue graft from its attachment sites at the buccal mucosa and alveolar crest. A histological examination was conducted, revealing the tissue to be lined with stratified squamous epithelium with keratinization, with underlying dermis containing abundant appendages. At the dermis-hypodermis level, an unencapsulated nodular structure of collagen bundles, fibroblasts, capillaries, and lymphoplasmacytes were observed, confirming that facial tissue had been transplanted into the oral cavity.

The patient was scheduled for follow-up examinations on the 7th day and one month postoperatively. Sutures were removed on the 7th day, and the patient reported an uneventful postoperative course with no pain or discomfort. She noted a significant improvement following the removal of the tunnel flap from the oral cavity, which enabled her to eat normally, smile broadly without restriction in mouth opening, and, most importantly, maintain a lifestyle appropriate for her age. She further plans to restore the distally edentulous defect on the right side, possibly with the placement of dental implants.

Fig. 1. Orthopantomography before removal of the ,,tubular'' nasolabial flap

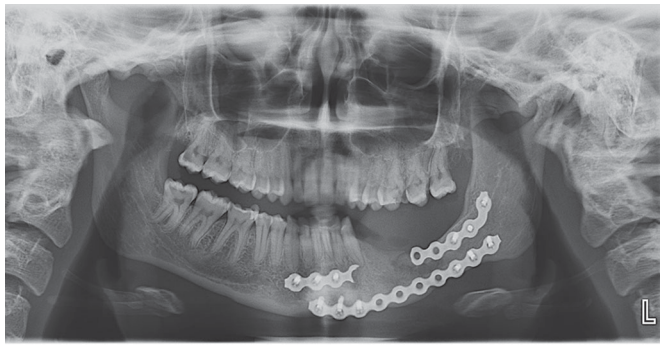

Fig. 2. Intraoral view before removàl of the soft tissue graft

Fig. 3. Intraoral view before removal of the soft tissue graft

Fig. 4. Intraoral view after removal of the soft tissue graft

DISCUSSION

The nasolabial skin flap (NLF) is a dermatocutaneous flap with a random-pattern vascular supply supported by a rich network of subcutaneous and dermal vessels. These vessels include branches of the angular, infraorbital, transverse facial, and dorsal nasal arteries. The vascular network is further strengthened by contributions from the contralateral superior and inferior labial arteries [12]. The NLF provides an effective option for repairing small oral cavity defects, such as widening the mandibulolingual sulcus and improving tongue mobility following resection. This procedure is typically associated with minimal pain and discomfort while achieving relatively good aesthetic outcomes [1]. NLF is a viable alternative for the plastic reconstruction of mucosal defects in the oral cavity, which often arise from neoplastic resections or acute and chronic diseases that lead to significant functional and aesthetic impairments. The flap is primarily used in adults or medically compromised patients, allowing for a single-stage surgical procedure to close defects after tissue resection. In such patients, prolonged surgeries under general anesthesia pose considerable risks, particularly in cases with reduced or compromised blood supply, such as after radical neck dissection [13, 14]. Superiorly and inferiorly based nasolabial flaps are also employed in the reconstruction of defects in the nose, lower eyelid, cheek, lips, and oral commissure. The NLF can be designed as an axial flap, random flap, or islanded flap [8], with varying thicknesses depending on the specific reconstructive needs.

Depending on the size and location of the defect, either a one-stage or two-stage method is employed. For larger defects, the use of two flaps may be necessary. Defects up to 3 cm in diameter can be covered with a unilateral nasolabial flap, whereas bilateral rotation flaps are recommended for defects measuring 5 - 7 cm [. When repairing defects of the mandibular alveolar ridge, floor of the mouth, or buccal mucosa, the inferiorly based flap rotates more easily and is less likely to create folds [15, 16].

Nasolabial flaps are primarily indicated for limited defects of the floor of the mouth, tongue, palate, and alveolar ridges, typically ranging from 2 - 4 cm in size, as well as for moderately large defects of 4 - 6 cm, which are often the result of neoplastic resections [1]. The nasolabial flap is also utilized to close palatal fistulas, cover bone defects in orthognathic surgery, or address complications from osteoradionecrosis. Resections and osteonecrosis are typically associated with soft tissue deficiencies, making defect closure challenging due to traction and tension at the wound edges, which also limit the mobility of surrounding tissues.

Indications for the use of nasolabial flaps (NLFs) in soft tissue reconstruction of the oral cavity arise when free tissue transplantation is considered risky or when other local or distant flaps, such as the radial forearm flap or anterolateral thigh flap, are not feasible [16].

The nasolabial flap is considered one of the oldest techniques for plastic reconstruction of the face and oral cavity [9]. It is recognized as a simple, effective, and relatively safe method, with a low risk of complications when used for small to moderate-sized lesions that are limited

in length and width [17] and for such do not cross the midline of the mandible. This technique provides an adequate amount of tissue in close proximity to the defect. Its advantages include the rich vascular support for both the flap and the recipient site, the versatility in flap design, the ease of dissection, and the close proximity between the donor and recipient sites. Additionally, NLFs offer good mobility and result in a nearly imperceptible scar that aligns with the nasolabial fold. It may also concluded that the NLF is a functional and aesthetically satisfactory alternative to free tissue transfer [1].

Despite the numerous advantages of nasolabial flaps (NLFs), certain complications have been reported, including necrosis, infection, and wound dehiscence [6] and impaired healing in 11% of cases [1]. Asymmetry in the nasolabial fold and oral commissure may also occur, particularly in cases of unilateral tissue correction [2]. Rökenes HK, et al. further noted patient complaints regarding the cosmetic outcomes of the procedure [11].

Other, albeit rarer, complications following plastic restorative reconstructions after neoplastic excisions include soft tissue cysts, such as inclusion cysts with inflammation and epidermoid cysts that develop within the scar of the nasolabial flap [18]. Additionally, a few instances of orocutaneous fistulas have been described, likely due to poor adaptation and tension during donor site closure [19].

The use of the nasolabial flap (NLF) may also result in functional disturbances, including difficulty in chewing, particularly solid foods, unwanted food retention, challenges in maintaining oral hygiene, impaired swallowing, and involuntary saliva flow from the mouth, which may be attributed to sensory deficits.

Additional complications included intraoral hair transfer with the flap and obstructive sialadenopathy. The bulkiness of the inferiorly based NLF was also identified as a potential drawback that contributed to functional challenges (20).

One of the main limitations of NLFs is the restricted amount of tissue that can be harvested, with a maximum flap size of approximately 8 cm and a width-to-length ratio of no more than 1:4 [21]. The procedure is typically performed under general anesthesia, necessitating hospitalization and associated costs. When bilateral NLFs are used for larger defects, such as those on the floor of the mouth or tongue, edema can occur, posing additional risks to the patient. Another disadvantage is the need for a second-stage procedure in certain cases, as highlighted in the present study. Risk factors for flap survival in its new environment include chronic trauma during eating, tension at the intraoral fixation site, smoking, and hematoma formation.

In some cases, additional devices, such as a flap protector appliance, are required to shield the wound during eating [22]. These removable appliances, made of ligature wire and acrylic, push the flap buccally but take up space in the oral cavity, causing discomfort, especially for patients unaccustomed to wearing removable prostheses.

A recent study explored the histological changes that occur when the nasolabial skin flap is used to repair intraoral defects. The findings indicated that the flap retained many of the characteristics of a skin graft, although the thickness of the stratum corneum and the number of skin appendages decreased over time [12]. The color of the flap in the oral cavity remained similar to that of the donor site [22].

In most publications, the choice of the nasolabial flap (NLF) reconstruction method is primarily determined by the size of the defect, the patient's overall condition, and the presence of comorbidities. It is evident that the majority of patients undergoing this procedure are elderly, with multiple comorbidities, often on polypharmacy, and presenting a high operative risk. The defects typically addressed are relatively small and result from oral mucosal carcinomas, osteoradionecrosis, chronic osteomyelitis, or bisphosphonate-related osteonecrosis [9, 13, 17, 18].

The nasolabial flap (NLF) technique is one of the oldest methods for reconstructing orofacial soft tissue defects [9]. Although it is relatively simple to perform and suitable for repairing small defects in adult patients with comorbidities, its use remains controversial. Modern reconstructive techniques now offer more advanced and effective alternatives for the plastic reconstruction of the tongue, palate, buccal mucosa, and alveolar mucosa compared to the NLF.

In the case described in this study, the hospitalized patient was a 23-year-old female, with no significant medical history, leading an active lifestyle and possessing high aesthetic expectations for facial reconstructive surgery. Her primary complaints were the sensation of a foreign body in the oral cavity, difficulties with speech and eating, challenges in maintaining proper oral hygiene, altered taste, and restricted mouth opening—all of which negatively impacted her social interactions. The extraoral cicatrix was barely visible, aligning with the nasolabial fold, and did not cause any cosmetic concerns for the patient. However, the choice of NLF reconstruction in this case raised questions among Bulgarian dental professionals, especially since this method is typically reserved for elderly patients with high operative risk, multiple comorbidities, and edentulous jaws, usually intended for subsequent removable prosthetic rehabilitation. The decision to use this particular type of plastic tissue reconstruction in this case was likely influenced by the limited soft tissue coverage of the mandibular alveolar ridge on the left, resulting from the transplantation of the autogenous graft from the iliac bone and was not consistent with the age,

active lifestyle of the patient and the absence of concomitant diseases.

Modern trends in soft tissue reconstruction for the oral cavity increasingly favor the use of allogeneic and xenogeneic grafts, as well as tissue-engineered mucosal grafts. Several innovative techniques for both soft and hard tissue reconstruction of the mandible have also been described [23].

The NLF technique, while a viable alternative for addressing tissue defects in the maxillofacial region, is primarily suited for elderly patients with systemic diseases such as cardiovascular conditions, diabetes, or other disorders that impair tissue blood supply or oxygen and nutrient transport, which can complicate wound healing [9]. NLFs provide adequate closure for relatively small facial and oral defects when used alone. This method is particularly suitable when minimal pain at both donor and recipient sites is desired and in edentulous patients with facial skin laxity, where aesthetic outcomes are less critical [24].

CONCLUSION

Although free tissue transfer is a widely accepted technique in reconstructive plastic surgery, the nasolabial flap continues to play a role in cases where there is a risk of complications associated with free tissue transfer, such as impaired blood supply at the recipient site, challenges in tissue nourishment, and a heightened risk of infection due to comorbidities. In the clinical case presented in this publication, however, these risk factors are absent, making the choice of an NFL treatment method for restoration of soft tissues and dentition rehabilitation open to debate. Despite this, the nasolabial skin rotational flap remains the preferred option for certain small defects within the oral cavity. Treatment decisions must be highly individualized, considering not only the success rate of the technique but also the patient's age, the presence or absence of concurrent diseases, and the impact on the patient's quality of life throughout the treatment and its duration.

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