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COLUMELLAR NECROSIS FOLLOWING RHINOPLASTY: A CASE REPORT ASSOCIATED WITH NICOTINE EXPOSURE

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Background: Nasal columella reconstruction presents complexities due to the distinctive vascular supply of the region and the lack of adjacent tissue. This procedure is essential for preserving both the aesthetic and functional integrity of the nose. On this case report highlights the difficulties encountered in columella reconstruction, especially in patients with important comorbidities, including heavy smoking. A 59-year-old heavy smoker underwent rhinoplasty, resulting in postoperative columellar ischemia and necrosis, despite several reconstructive attempts utilizing forehead, buccal mucosa, and nasolabial flaps. Smoking adversely affects wound healing by diminishing oxygen supply, causing microvascular injury, and weakening immune responses, which increases the likelihood of tissue necrosis and infections. The application of tadalafil, a phosphodiesterase type 5 inhibitor, was investigated for its potential to improve blood flow and reduce ischemia in high-risk populations, such as smokers. Notwithstanding these interventions, the attainment of optimal vascularization continued to pose challenges. The efficacy of the nasolabial flap in this context emphasizes the necessity of choosing suitable reconstructive methods customized to the specific requirements of each patient. Nasolabial flaps offer superior color and texture compatibility while minimizing aesthetic disturbance. This case highlights the necessity of a comprehensive strategy in addressing complex rhinoplasty scenarios, particularly those involving impaired tissue perfusion. Recognizing smoking as a significant factor in wound healing is crucial for enhancing surgical outcomes. The research indicates that preoperative smoking cessation is an essential approach to minimize complications and improve recovery in plastic surgery procedures.

Keywords: Columella reconstruction; Smoking and wound healing; Nasolabial flap;Ischemia and necrosis; Tadalafil in tissue perfusion

INTRODUCTION

The columella significantly affects the aesthetic of the nose by determining the projection of the nasal tip and contouring the connection between the nasal base and the alar regions. Damage to this region may occur due to many factors, including particular surgical procedures in rhinoplasty, unintended trauma, infection, or neoplasms, rendering its restoration a meticulous endeavor.[1–3]

The reconstruction of the columella is regarded as a challenging process, mainly because of the scarce availability of adjacent tissue for repair and the intricate vascular supply of the region. A significant challenge arises from the unique shape and outline of the columella, necessitating precise methods to restore both functionality and beauty without detracting from the overall nasal appearance. Surgeons must frequently evaluate the advantages of various reconstructive techniques to choose the most suitable option for each patient, highlighting the necessity for treatments that reduce tissue density and donor site morbidity. [1,2,4]

Smoking is acknowledged as a significant modifiable factor that hinders normal wound healing by reducing oxygen supply, inducing microvascular damage, and compromising the immune response, all of which may result in tissue necrosis. In Plastic Surgergy, t he adverse effects of smoking are not limited to frequently conducted surgeries such as abdominoplasty, breast reduction, and breast reconstruction, but also involve rhinoplasty procedures. The columella's vascular architecture, a slender and fragile structure vital for the nose's beauty, can experience rapid ischemia and necrosis due to diminished blood supply from smoking. [1,2,5]

CASE REPORT

A 59-year-old woman presented for rhinoplasty, with no prior history of post-infectious complications associated with the nasal region. She was a heavy smoker, averaging one pack of cigarettes daily, and reported cessation approximately two months before surgery. On June 5, 2024, she underwent rhinoplasty utilizing a rib cartilage graft for structural enhancement, in conjunction with a four-lid blepharoplasty.

Postoperatively, the patient exhibited columellar discoloration, which manifested as black

five days post-surgery, with no indications of infection or purulent discharge. Debridement and columella repair were scheduled. On June 10, 2024, a forehead flap procedure was conducted to address the columellar issue. Despite thorough evaluation and strategic division to assess vascularization, the forehead flap did not sustain sufficient blood supply, leading to ongoing ischemia and necrosis three weeks after the procedure.

After the unsuccessful forehead flap, the patient received a buccal mucosa flap procedure to enhance vascularization and tissue coverage. This intervention did not succeed in achieving adequate vascularization, and indications of ischemia remained present. The buccal mucosa flap, designed to ensure a dependable blood supply, ultimately failed to meet expectations, underscoring the difficulties associated with the patient's impaired tissue perfusion.

Due to the unsuccessful outcomes of both the forehead and buccal mucosa flaps, the patient was scheduled for a nasolabial flap procedure as last resort. The surgery occurred on August 16, 2024. An auricular graft was employed to repair the tissue loss in the columella resulting from necrosis. A nasolabial flap was utilized on the left side to decrease the raw surface area and promote wound closure. The flap, measuring approximately 1.5 cm in length, was intended to cover the defect and improve tissue viability.

Following the nasolabial flap surgery, a comprehensive assessment of blood perfusion was performed to confirm the viability of the flap. Three weeks after the surgery, a strangulation test was conducted utilizing a Foley catheter for pediatrics, with the clamp maintained for one hour. The test initially indicated persistent ischemia, requiring the postponement of flap division until the subsequent week. Reassessment of the test one week later revealed better perfusion and the absence of ischemia, which allowed the continuation to flap division surgery the subsequent day. During the perioperative period, spanning three days prior to surgery and three days following the procedure, the patient received tadalafil 10 mg daily. This regimen was selected to improve tissue perfusion, especially in heavy smokers, as impaired blood flow can adversely affect wound healing. The detailed follow up images from pre operative to post flap division surgery will be presented on supplementary files.

Figure 1. (a) Pre nasolabial flap procedure; (b) Post nasolabial flap procedure day 0; (c) Post nasolabial flap procedure day 19; (d) Post flap division surgery

DISCUSSIONS

The management of complex cases in rhinoplasty, particularly in patients with significant comorbidities such as heavy smoking, presents unique challenges and necessitates a multifaceted approach. This case of a 59-year-old woman illustrates the intricate interplay between surgical technique, tissue viability, and the impact of pre-existing health conditions on postoperative outcomes. Despite undergoing multiple reconstructive procedures including forehead, buccal mucosa, and nasolabial flaps persistent ischemia highlighted the difficulties in achieving optimal vascularization.

Smoking significantly impairs wound healing through multiple biochemical mechanisms. Toxic components such as nicotine, carbon monoxide, and hydrogen cyanide disrupt cellular function essential for tissue repair. Nicotine induces vasoconstriction, reducing oxygen delivery and inhibiting fibroblast and macrophage activity, while carbon monoxide binds to hemoglobin, exacerbating tissue hypoxia. Hydrogen cyanide impairs cellular respiration, and prolonged exposure to cigarette smoke depletes nitric oxide, diminishing vascular dilation and increasing oxidative stress. These factors collectively hinder collagen synthesis, weaken immune response, and elevate infection risk. Consequently, smoking is associated with delayed healing, increased postoperative complications, and poorer surgical outcomes, underscoring the importance of preoperative smoking cessation.[6,7]

Rhinoplasty is a commonly performed surgery, with an overall complication rate documented between 8% and 15%, according to the studies by Mrad et al. (2019) and Rettinger et al. (2007). Although numerous complications are minor, including temporary swelling or bruising, severe issues may arise, such as infections occurring in fewer than 1% of cases, functional breathing impairments—particularly in revision surgeries where the incidence could rise to 70%—and postoperative deformities leading to secondary interventions in 5% to 15% of cases. Complications associated with implants exhibit

considerable variability, with Rettinger et al. (2007) reporting silicone implants having complication rates reaching 20%, whereas Gore-Tex needed removal in about 3.2% of instances. Pollybeak is the most prevalent deformity, constituting approximately fifty percent of all revision procedures.[8–12]

Skin necrosis, however infrequent, has been repeatedly recognised in research as a significant consequence resulting in extended recovery and possible deformity. Mrad et al. (2019) reported two instances of nasal dorsum necrosis, measuring up to 0.7 × 0.4 cm, identifying smoking and revision surgery as significant risk factors. According to the findings of Nemati et al. (2012), the prevalence of necrosis were 0.35% recorded among 1,336 patients, frequently linked to extensive dorsal dissection and constrictive external splints. The research conducted by Eskitascioglu et al. (2010) supported the risks associating necrosis with excessive compression from substantial cartilage transplants and dressings. Further evidence by Bilgen et al. (2020) demonstrated that severe defatting, external compression, and impaired vascularity in revision instances might lead to more significant soft tissue abnormalities, occasionally measuring up to 2 × 3 cm.[8–12]

Extensive evidence supports the association between smoking and increased postoperative complications. A cohort study by Chiang et al. revealed that smokers face significantly higher risks of surgical site infections (~30%) and wound dehiscence (~65%) compared to non-smokers, alongside elevated pulmonary complications, in-hospital mortality, and prolonged hospitalization. These outcomes are primarily driven by smoking-induced tissue hypoxia due to carbon monoxide's affinity for hemoglobin and nicotine-mediated vasoconstriction, both of which impair oxygen and nutrient delivery to wounds. Similarly, a meta-analysis by Theocharidis et al. demonstrated heightened complication rates in plastic surgery patients who smoke, with notably increased odds of flap necrosis, wound infection, and skin necrosis—particularly following abdominoplasty and breast reduction. While facelifts showed no significant increase in overall complications, the risk of localized epidermolysis remained markedly elevated. These findings underscore the systemic and localized risks of smoking in surgical contexts.[4, 13]

The findings highlight a consistent trend among various surgical techniques, supporting the conclusion that smoking negatively impacts postoperative outcomes. The analysis of over 13,000 facelift patients and more than 21,000 breast reconstruction patients underscores the necessity for healthcare providers to inform patients about associated risks. The study supports preoperative smoking cessation as an essential strategy to improve healing and minimize complications, highlighting that tackling this issue may result in markedly better surgical outcomes for patients undergoing plastic surgery.[4]

A meta-analysis by Bouhadana et al., encompassing 82 studies, demonstrated that smoking significantly elevates the risk of postoperative complications across various cosmetic procedures. In body contouring surgeries such as abdominoplasty, smokers exhibited higher rates of overall complications (OR 1.64), infections (OR 3.26), and wound dehiscence (OR 2.74). Similar trends were observed in breast reduction procedures, with increased risks of overall complications (OR 2.03) and infections (OR 2.01). For facial surgeries like rhytidectomy, the risk of skin necrosis was particularly pronounced (OR 10.29), although no significant rise in complications was noted for rhinoplasty. In contrast, a study by Yazici et al. on septoplasty found no significant differences in outcomes between smokers and non-smokers, based on NOSE scores and complication rates such as septal perforation and synechiae. These findings suggest that while smoking generally compromises wound healing and surgical outcomes, its impact may vary depending on the procedure's complexity and vascular demands, reinforcing the importance of individualized surgical assessment.[5, 14]

Matin et al. reported that low-dose tadalafil (5 mg/day for three days) may improve blood flow in surgical flaps, particularly in high-risk patients such as smokers. As a PDE5 inhibitor, tadalafil enhances perfusion by preventing cGMP degradation, reducing the risk of ischemia and necrosis. While the findings suggest its potential as an adjuvant therapy in flap surgery, further research is needed to validate its efficacy and safety.[15]

CONCLUSION

This case illustrates the complexities of nasal columella reconstruction, particularly in heavy smokers. Multiple approaches—including forehead and buccal mucosa flaps—were attempted, but vascularization remained inadequate. Ultimately, the nasolabial flap yielded the most favorable outcome, providing good color match and discreet scarring. Smoking clearly affected healing by reducing tissue oxygenation and increasing the risk of necrosis. While not a perfect solution, the flap's success highlights the importance of tailoring reconstruction to each patient's vascular condition. This case also underlines the need to address modifiable risk factors like smoking, which can significantly compromise surgical outcomes despite technically sound procedures.

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CONFLICT OF INTEREST

None

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