

## Case Reports

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Received on: 22/06/2017

Approved on: 21/09/2017

This study was performed at the  
Faculdade de Medicina do ABC,  
Santo André (SP), Brazil.

**Financial support:** None.

**Conflict of interests:** None.



# Necrosis of skin graft entailed by smoking habits

*Necrose cutânea do tecido enxertado decorrente de tabagismo*

DOI: <http://www.dx.doi.org/10.5935/scd1984-8773.20181021034>

## ABSTRACT

Adequate healing of surgical wounds is influenced by the operative technique, the presence of postoperative complications and the patient's life habits. We report the case of a patient submitted to excision of basal cell carcinoma by Mohs micrographic surgery and reconstruction with palpebral cutaneous grafting. In the postoperative period there was graft necrosis due to poor perfusion of the surgical bed imputed to smoking. Smoking interferes with plasma embolization and graft neovascularization, as well as promoting oxidative stress and endothelial dysfunction. The surgeon should counsel the cessation of smoking for at least four weeks prior to the procedure in order to avoid further risks of complications.

**Keywords:** Carcinoma, basal cell; Graft survival; Mohs surgery; Necrosis; Smoking

## RESUMO

*A cicatrização adequada das feridas cirúrgicas é influenciada pela técnica operatória, pela presença de intercorrências pós-cirúrgicas e pelos hábitos de vida do paciente. Relatamos caso de paciente submetido a excisão de carcinoma basocelular por cirurgia micrográfica de Mohs e reconstrução com enxertia cutânea palpebral. No pós-operatório houve necrose do enxerto devido má perfusão do leito cirúrgico imputada ao tabagismo. O tabagismo interfere na embebição plasmática e neovascularização do enxerto, além de promover estresse oxidativo e disfunção endotelial. O cirurgião deve orientar a suspensão do tabagismo por pelo menos quatro semanas antes do procedimento, a fim de evitar maiores riscos de complicações.*

**Palavras-Chave:** Carcinoma basocelular; Cirurgia de mohs; Hábito de fumar; Sobrevivência de enxerto; Necrose

## INTRODUCTION

Cutaneous tumors located in periorificial regions – peri-orbital, perioral, nasal tip and ala – should be treated with redoubled attention. Tissue retraction becomes more critical in areas of free borders and, consequently, there is a greater probability of functional impairment as a result from inadequate reconstructions.<sup>1,2</sup> Flaps and grafts can be used in these locations to close surgical defects, aiming at preserving function and aesthetics.

Adequate healing of surgical wounds is influenced by the technique performed by the surgeon, operative and postoperative complications, in addition to patient-specific factors and life style habits.

The authors of the present article describe and discuss the case of a patient who underwent palpebral cutaneous grafting, whose result was unsatisfactory in the immediate postoperative period due to poor tissue perfusion attributed to smoking habits.

## CASE REPORT

A 78-year-old man reported the onset of an asymptomatic, slow-growing lesion in the right upper eyelid ten years before. The patient was a smoker (three packs per day for 63 years), hypertensive (under use of 10mg enalapril 12/12 hours) and had had a CVA 9 years before. Also, he had been recently diagnosed with chronic obstructive pulmonary disease, due to the high smoking load, however was not using specific medications.

At the dermatological examination, the patient had a 1.6 cm x 1 cm perlaceous nodule with a depressed center and inaccurate limits, located in the canthus of the right eye affecting both the upper and lower eyelids (Figure 1). Under dermoscopy, the lesion presented arboriform telangiectasias on the surface. The patient's nails and beard had a yellowish tone.

The patient underwent Mohs micrographic surgery, with two phases for complete removal of the tumor. The final surgical size was 2.3cm x 1.8cm, and the surgical wound affected the inner canthus of the right eye, upper and lower eyelid as well as the right (proximal) nasal lateral (Figure 2). A solid and adenoid basal cell carcinoma was evidenced.

Due to the involvement of three aesthetic units in an area of free edge and little local availability of tissue that could be mobilized without interfering with the ocular opening, the authors made a decision for closing the surgical wound using a full-thickness skin graft. The chosen donor area was the contralateral upper eyelid, due to the presence of redundant tissue with similar characteristics to that of the recipient area. A thin graft containing epidermis and dermis was sutured to the wound's edges with 6-0 nylon thread. Aimed at increasing the adhesion to the bed, a Brown's dressing was applied on the graft.

On the 7<sup>th</sup> postoperative day, the Brown's dressing and stitches were removed. The graft was violet in color, with areas of loss of the epidermis and covered by fibrinoid tissue. Only local cleansing was carried out in order to keep the site wet (Figure 3).

By day 14, the entire thickness of the graft was black and hardened (full-thickness necrosis). Debridement was performed



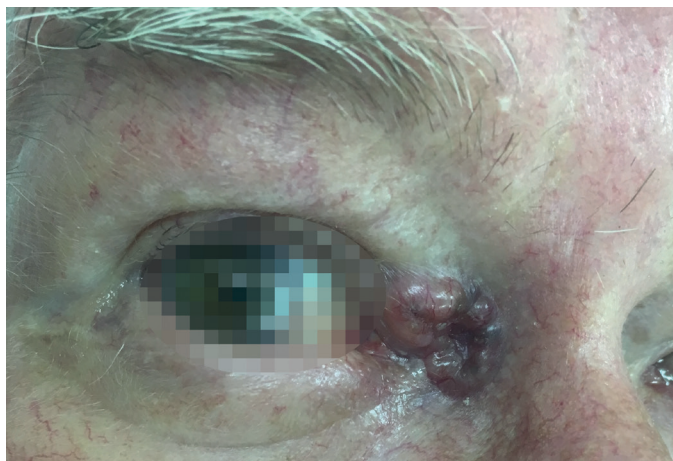
**FIGURE 2:** Operative wound after Mohs micrographic surgery, with involvement of the right inner canthus, upper and lower eyelids, as well as right (proximal)

with a blade, and the occlusive dressing was kept in place to ensure wetness of the wound bed (Figure 4-A). On day 21, the patient had an ulcer secondary to the loss of the graft due to necrosis (Figure 4-B).

In the 4<sup>th</sup> postoperative week, the second intention healing process ensured the complete closure of the surgical defect (Figure 5).

## DISCUSSION

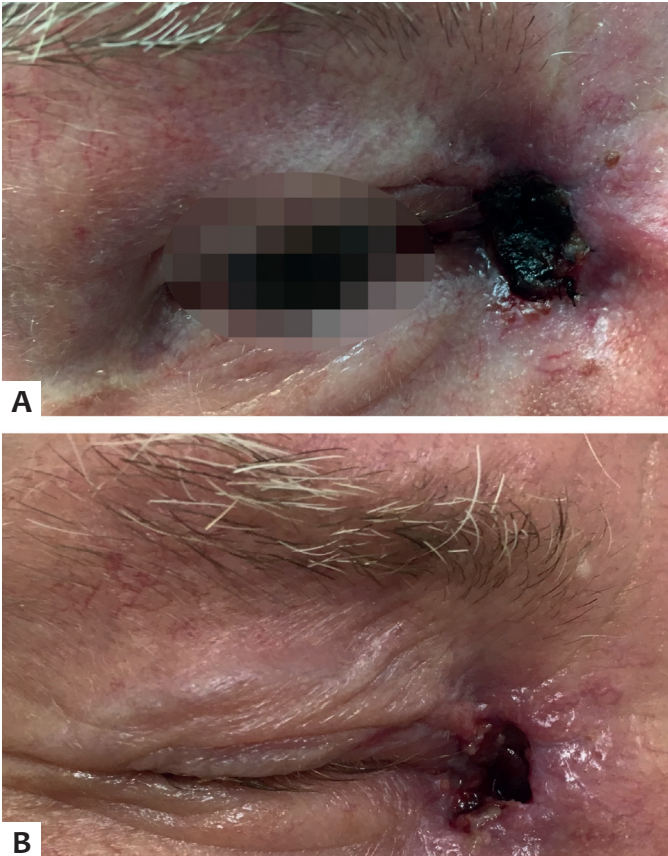
The most frequently used graft donor areas for the reconstruction of facial surgical defects are the retroauricular, preauricular and upper palpebral regions. The palpebral region offers reduced thickness of the epidermis and dermis, which facilitates adherence to the surgical bed and nutrition.<sup>2</sup> With the aging process, there is accumulation of skin in this region, and its use as a graft donor area in fact generates a cosmetic gain to the patient.<sup>2</sup>



**FIGURE 1:** Perlaceous nodule with arboriform telangiectasias, located in the right canthus, affecting both eyelids



**FIGURE 3:** Seventh postoperative day - violaceous graft with areas of epidermal loss

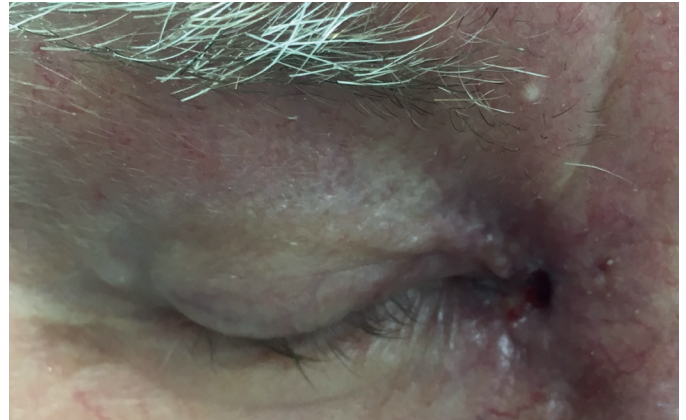


**FIGURE 4 - A** - Full-thickness necrosis of the graft on the 14<sup>th</sup> postoperative day **B** - Ulcer secondary to graft loss (21<sup>st</sup> postoperative day)

Graft integration involves adherence to the bed, adequate perfusion, and donor skin viability. In the first 24 hours, its nutrition and fixation occurs by transudation from the bed, with the formation of a fibrin mesh. The second phase, termed inosculation, sees the anastomosis of small capillaries communicating the graft's surface to the recipient bed. From the 5<sup>th</sup> to the 7<sup>th</sup> postoperative day there is true blood flow, resulting from the emergence and proliferation of new vessels.<sup>3</sup>

Of the total skin grafts, 20% have some degree of necrosis. Most of the time, there are alterations only in the granulosum, lucidum and corneum layers (partial necrosis). When the basal and spinosum layers are affected, there is total necrosis of the graft.<sup>4</sup>

Roughly 12% of the patients who undergo Mohs micrographic surgery have postoperative complications, with graft loss accounting for one-third of the total.<sup>5</sup> Factors that may trigger necrosis include hematoma or seroma formation, infection, poorly vascularized bed, poor adhesion of the graft to the bed, excessively thick graft and with subcutaneous cellular tissue. Infection rates, even when adjusted for the type of the surgery, size of the incision and tissular trauma, increase according to a linear ratio *vis à vis* longer surgical times.<sup>6,7</sup> Cutaneous surgeries involving grafting are generally procedures of longer duration and complexity, which might result in a risk of postoperative



**FIGURE 5:** Complete healing by second intention on the 28<sup>th</sup> postoperative day

infection. Total thickness skin grafts are more resistant to infection than those of partial thickness, and loss of the graft resulting from infection is more common in grafts implanted in the lower extremities or in those performed in multiple sites in the same surgical time.<sup>8</sup>

Characteristics of patients, such as obesity, malnutrition, anemia, immunosuppression, use of medicaments and comorbidities also greatly alter the healing process.<sup>9,10</sup>

Pérez-Guisado et al. found that 18% of smokers had graft necrosis.<sup>11</sup> This risk is linked to the number of cigarette packets consumed per day: patients who experience necrosis smoke significantly more than those who are also smokers however do not experience necrosis after undergoing a grafting procedure.<sup>12</sup> Smoking induces a decrease in the number of macrophages and neutrophils, and an increase in platelet aggregation, which stimulates the formation of microcoagulants.<sup>13</sup> Nicotine causes vasoconstriction, which lasts up to 10 minutes after smoking cessation, facilitating the occurrence of acute microvascular occlusion and tissue necrosis.<sup>12</sup>

Cigarette smoke contains carbon monoxide and hydrogen cyanide. The former has 220 times more affinity for hemoglobin than oxygen, reducing the ability of oxygen conveyance to the tissues. On its turn, hydrogen cyanide is able to inhibit cellular respiration, resulting in lactic acidosis and cytotoxic hypoxia.<sup>12</sup> Cavichio et al. have identified ten studies that show that cessation of smoking for a minimum period of four weeks is beneficial in reducing healing complications in surgical wounds.<sup>14</sup>

In periocular graft surgeries, 15% of patients experience complications. Of this total, graft loss corresponds to 10%.<sup>15</sup> In the present clinical case, the donor area (contralateral upper eyelid), as well as the execution of the surgical technique, were adequate. There was no postoperative infection, graft displacement or even hematoma formation. Reconstructive failure was attributed to poor bed perfusion induced by long-term smoking, which was also responsible for the yellowing of the nails and beard hairs, as well as for the development of chronic obstructive pulmonary disease.

## CONCLUSION

Smoking is a complication factor for the healing process, as it interferes with the process of plasma soaking and graft neovascularization. The inflammatory stimulus, the oxidative stress and the endothelial dysfunction caused by the cigarette are promoters of necrosis of the grafted tissue.

The surgeon should be aware of the increased risk of complications in patients with smoking habits and needs to advise him or her to cease smoking for at least four weeks before the procedure. ●

## REFERENCES

1. Koh KS, Choi JW, Kim H. Minimal paring of skin flaps for primary repair of incomplete unilateral cleft lip. *Plast Reconstr Surg.* 2008;121(4):1382-5.
2. Lima EVA. Palpebral tissue grafting in the reconstruction of cutaneous tumors. *Surg Cosmet Dermatol.* 2010;2(4):333-5.
3. Lofego Filho JÁ, Dadalti P, de Souza DC, de Souza PR, da Silva MAL, Takiya CM. Skin grafts in cutaneous oncology. *An Bras Dermatol.* 2006;(5):465-72.
4. da Costa Gonçalves A, Barbieri CH, Mazzer N, Garcia SB, Thomazini JA. Can therapeutic ultrasound influence the integration of skin grafts? *Ultrasound Med Biol.* 2007;33(9):1406-12.
5. Leibovitch I, Huilgol SC, Richards S, Paver R, Selva D. The Australian Mohs database: short-term recipient-site complications in full-thickness skin grafts. *Dermatol Surg.* 2006;32(11):1364-8.
6. Robson MC. Wound infection: a failure of wound healing caused by an imbalance of bacteria. *Surg Clin North Am.* 1997;77(3):637-50.
7. Burke JF. The effective period of preventive antibiotic action in experimental incisions and dermal lesions. *Surgery.* 1961;50:161-8.
8. Unal S, Ersoz G, Demirkan F, Arslan E, Tütüncü N, Sari A. Analysis of skin-graft loss due to infection: infection-related graft loss. *Ann Plast Surg.* 2005;55(1):102-6.
9. Senchenkov A, Petty PM, Knoetgen J 3rd, Moran SL, Johnson CH, Clay RP. Outcomes of skin graft reconstructions with the use of Vacuum Assisted Closure (VAC®) dressing for irradiated extremity sarcoma defects. *World J Surg Oncol.* 2007;5:138.
10. Chmell MJ, Schwartz HS. Analysis of variables affecting wound healing after musculoskeletal sarcoma resections. *J Surg Oncol.* 1996;61(3):185-9.
11. Pérez-Guisado J, Fidalgo-Rodríguez FT, Gaston KL, Rioja LF, Thomas SJ. Skin graft, smoking and diabetes mellitus type 2. *MEDICINA (Buenos Aires).* 2012;72:467-70.
12. Goldminz D, Bennett RG. Cigarette smoking and flap and full-thickness graft necrosis. *Arch Dermatol.* 1991;127(7):1012-5.
13. Guo S, DiPietro LA. Factors affecting wound healing. *J Dent Res.* 2010;89(3):219-29.
14. Cavichio BV, Pompeo DA, Oller GASAO, Rossi LA. Duration of smoking cessation for the prevention of surgical wound healing complications. *Rev Esc Enferm USP.* 2014;48(1):174-80.
15. Leibovitch I, Huilgol SC, Hsuan JD, Selva D. Incidence of host site complications in periocular full thickness skin grafts. *Br J Ophthalmol.* 2005;89(2):219-22.

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