Resolving trapdoor phenomenon without secondary procedure after forehead flap on medial canthal region

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Abstract

Herein, we present a case of basal cell carcinoma in a 59-year-old woman. It presented with painless itchy, black, gradually enlarged patches which were easily bled under her left eye since three years ago. A dermatological examination of the left medial canthus region obtained hyperpigmented plaques (2x0.8x0.1 cm) with uneven skin texture, irregular borders, and erosion on the center of the lesion. We performed forehead flap technique surgery followed by eight-month monitoring, resulting in a satisfying outcome in both function and appearance. The thinning technique and adjusting the flap size from the forehead area to the medial canthus should be as thin as possible to avoid differences in skin thickness and post-reconstruction hypertrophic scars. A bulging appears on the surgical site a month after the procedure, known as the trapdoor phenomenon, on the 8th month of follow-up, the trapdoor phenomenon disappeared.

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Introduction

Basal cell carcinoma (BCC) is a non-melanoma skin tumor originating from the basal layer of the epidermis and non-keratinized cells. The World Health Organization defines BCC as a locally invasive, slow-growing tumor that rarely metastasis but can infiltrate tissues.[1,2] This skin cancer is commonly found in Europe, America, and Australia, with the highest incidence in Australia at 1 in 100,000 males and 7 in 100,000 females.[2,3] The definite etiopathogenesis of BCC has not been fully understood. Nevertheless, BCC can be influenced by genetics, Fitzpatrick skin types I-II, environment, and exposure to ultraviolet light.[3,4] Surgical excision techniques using flaps vary depending on the size and site of the tumor.[1] The medial canthal area is often affected by malignancies, including BCC, and usually extends to the dorsum of the nose.[5,6] A tumor on the medial cantal area is considered relatively difficult to excise because it has a complex anatomy, a little access skin, a thin subcutaneous layer, and a depression in the middle. Reconstruction in the medial canthal area is challenging due to obtaining the same texture and skin.[7]

The skin trapdoor phenomenon is a skin deformity in the form of elevated and bulging tissue with a U, C, or V shape on the scar. Trapdoor phenomenon is also called “pincushion scar”. Trapdoor phenomena can be found like wounds with a semicircular configuration, obtained either after trauma, skin grafts, or after U or V flap operations. Trapdoor phenomena due to surgery can be found 3 weeks to 6 months postoperatively.[8,9]

Prevalence was shown in 397 patients with 97% diagnosed BCC with 66.5% involving the middle canthus showing 15.6% having postoperative complications including graft failure, infection, acute bleeding/hematoma, graft hypertrophy, graft contracture, and trapdoor phenomenon. Another study on the *levator labii superioris alaeque nasi* flap showed that 5.3% of patients experienced postoperative trapdoor deformity complications.[10,11] Several articles explain theories related to the etiology of this phenomenon, one of which is lymphatic and venous obstruction, hypertrophy of the scar, excessive fat or excess tissue, slanted wound edges, and the formation of contractures in the scar. Previous studies have shown that contractures contribute to the main pathophysiology of the trapdoor phenomenon. The pathophysiology associated with the formation of the trapdoor phenomenon associated with venous and lymphatic obstruction can be explained by the presence of edema manifested by reduced venous and lymphatic circulation, although the degree of associated edema is controversial.

Regarding wound hypertrophy causing the trapdoor phenomenon, there is still no definite explanation. Hypertrophic wounds will appear red, raised, and stiff while the trapdoor phenomenon will appear lowered and indented. Histologically, in a healed wound the arrangement of collagen will appear wavy and parallel, in contrast to hypertrophic wounds where the collagen will appear like a tornado or nodular.[12-14]

The next cause is related to beveled skin wounds, a trapdoor phenomenon that often occurs in semicircular trauma wounds. The wound will basically contract according to its axis, if the edges of the wound are tilted then there is contraction towards the flap, the contracture of the wound will give an inward pull of the flap manifested in an increase in the surface of the skin above the slanted edges of the wound. The etiology is related to contractures, if the wound plane is vertical the risk of trapdoor phenomenon formation tends to be low, compared to horizontal or longitudinal wound planes. Researchers used a mechanical contracture model using elastic membranes and rubber bands and demonstrated by contracting a longitudinal plane semicircular wound, the resultant vector in the contracture area will be concentrated to form a semicircular ring which provides a force to buckle up the tissue resulting in a trapdoor phenomenon.[8-10]

On the bright side, the trapdoor phenomenon will get better with time. This deformity can be prevented by wide subdermal undermining of the margins of the primary defect and using a flap with the same thickness as the depth of the recipient site. In skin defects caused by sebaceous gland hypertrophy, it is advisable to pay attention to the bevel of the defect resulting from micrographic surgery or to create one and counter-bevel the edge of the flap. Intralesional administration of triamcinolone actinide (TCA) can also be performed at a dose of 0.1-1 mL TCA (10 mg/mL). Injections were started in the 4th postoperative week and repeated 2-3x at 6-week intervals. The injection is done in the area of the deformity, deep into the subcutaneous fat, and not directly under the dermis. Even though it heals over time, if the trapdoor phenomenon does not improve after 8 months, scar revision must be carried out by making an incision through a portion of the scar surrounding the flap, dissecting beneath the flap, and removing excessive subcutaneous fat and scar followed by wound closures. For mild to moderate degrees of trapdoor deformity correction, multiple small Z plastics can be performed in the peripheral area of the flap or W-plasties. Other studies have also shown the success of treatment using a carbon dioxide laser or Erbium-doped Yttrium Aluminum Garnet laser.[8-15]

Case Report

Our patient is a farmer and thus was often exposed to the sun daily. Before her visit, she had sought help in primary health care and received antibiotic ointment, but there was no improvement, so she went to our hospital. In our dermatovenereology outpatient clinic, she looked mildly ill. She reported that she had had black patches on her nose since three years ago, which gradually enlarged the area under her left eye. We performed a dermatological examination on the left medial canthus region, obtaining hyperpigmented plaques of 2x0.8x0.1 cm with uneven skin texture, irregular borders, and erosion on the center of the lesion (Figure 1). A dermoscopy examination showed arborizing vessels, blue-grey dots, ovoid nests, and erosions. Based on history taking, dermatological examination, and dermoscopic findings, we diagnosed this patient with pigmented BCC. A week after her initial visit to our outpatient clinic, we performed a forehead flap surgeon on the tumor site (Figure 2). She was discharged from our hospital after three days of admission in good condition. She was asked to have routine visits on day 3 and day 7 followed by every month. On day 7 of the follow-up, we removed the suture on the surgical site. There were no signs of infection, indicating a good healing process. However, a bulging appeared on the surgical site (Figure 3A), known as the trapdoor phenomenon. The patient said this bulging did not bother her as it does not affect its function. Thus, we only monitored it for any unexpected complications. Over time the bulging reduced in size, and by month 8 of follow-up, it disappeared (Figure 3B).

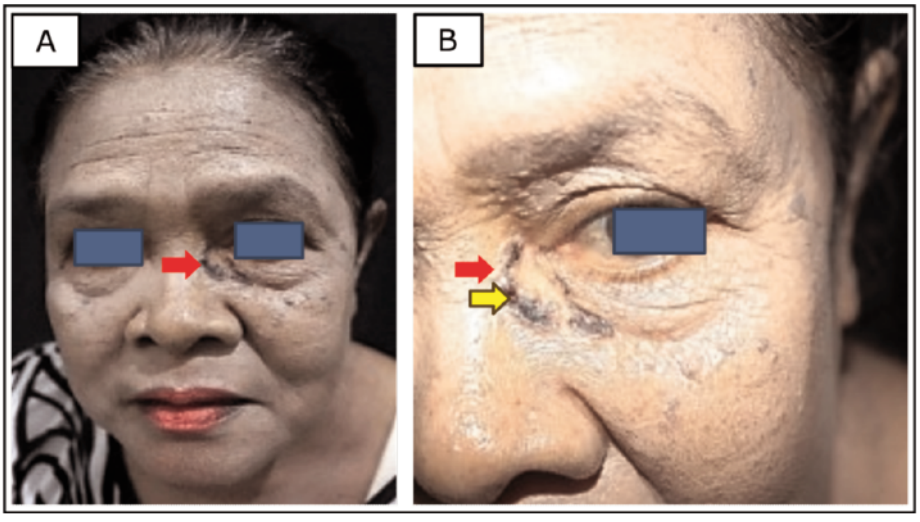

Figure 1. A-B) Hyperpigmented plaques with 2×0.8×0.1 cm size are seen in the left medial canthal region. The surface is uneven, the boundaries are not well defined, and irregular (red arrows) with erosion in the center of the lesion (yellow arrows).

Discussion

Basal cell carcinoma is the most common type of non-melanoma cancer (75-80%), and commonly occurs in the elderly (50-80 years).[16,17] The most common predilection site of BCC was the midface area (76.7%), with farmers as the most frequent people affected (53.3%).[2,3,18] Our patient has a high risk of BCC because she works outdoors every day, which makes her exposed to the sun. The medial canthal area comprises the upper eyelid, lower eyelid, eyebrows, and top of the nose united. Each area has a different color, texture, and skin thickness.

Reconstruction defects in the proximal nasal side and medial canthus present difficulty for the surgeon. The skin of the medial canthus is thicker than the upper and lower eyelids but thinner than the nose and the glabella.[19] There are other complex parts in the medial canthal region, notably the medial canthal ligament and the lacrimal duct, with depression in the middle. Reconstruction of the medial cantal area must consider several factors, such as maintaining the aesthetics and contours of each subunit in the nasal wall and eye area and avoiding distortion of the surrounding structural areas such as the ala nasi and eyelids.[20] Forehead and glabellar areas have a thicker skin structure. When each part is combined with the flap from the other without proper transfer or thinning, it will cause a trapdoor phenomenon or pancake-like bulging. Several things must be considered before surgical excisions, such as the tumor's location, size, and subtype. Various flaps can be used to cover post-surgical excision defects depending on the location and size of those tumors excised earlier.[21] The glabellar area is more suitable for flaps reconstructing the medial cantus defect than the forehead area.[6] The glabellar flap was first performed to cover the area of the medial canthal ligament and the periosteum of the dorsum of the nose. The forehead flap provides additional tissue over the broader medial cantal defect area, which is insufficient for the glabellar flap alone. Attention should be paid to the esthetic subunit with a maximum thinning process before rotation and suturing for the forehead and glabellar flaps to obtain a contour that matches the

Figure 2. Forehead flap technique. **A**) Marking of the initial operating area; **B**) Excision of the tumor following the margin of the incision 3 mm from the outer boundary of the lesion; **C**) Result of tumor excision; **D**) Marking the forehead areas using a sterile marker after evaluation of tumor-free frozen sections; **E**) An incision was made on the forehead area and trimming and undermining were subsequently performed; **F**) The results of the flap and triangular sutures were sutured.

medial canthal area.[22] The combined semicircular rotational flap reconstruction with forehead and glabellar flaps can be performed in the medial cantal area to avoid lower eyelid and ectropion defects.

In this case, we used a combination of a semicircular rotational flap with a forehead and a glabellar flap to cover a large area of the defect after cutting the edges of the lesion, which was declared tumor-free on frozen section examination and to cover the residual area. An appropriate flap technique will provide perfect outcomes in reconstructing soft-tissue deficiencies and soft tissue repairment with minimal side effects. The vascularization of blood vessels is one of the elements that aid wound healing from skin flaps. Several internal and external factors can influence the success or failure of a flap. Internal factors are vascularization to surrounding tissues, while external factors are pressure, anastomosis, or thrombosis.[22] Aesthetic factors can also be considered the basis for selecting flap techniques, especially in areas with different skin structures and thicknesses, like in this patient. We used the forehead flap considering its skin is thicker than the medial canthal region. The thinning of the donor area must be adjusted and sutured as thinly as possible.[17] The wound healing was good in the fourth postoperative week without any infection. However, her medial canthus was slightly bulging because the skin structure of the forehead area was thicker than the medial canthus. In the eighth postoperative month, the bulging disappeared, leaving no defect, and the patient was really satisfied with the outcome. We can learn from this case that the reconstruction of the defect in the medial canthal area is a challenge for dermatologists because it is difficult to obtain a homogeneous skin thickness and the patient's outcome is unpredictable. The forehead flap technique may be considered in patients with a significant defect in the medial canthal region.

Figure 3. A) Follow-up photograph of the patient after one month post-surgery from the front and left view. There was a hypertrophic scar and slight bulging (trapdoor phenomenon) on the base of the nose and left medial canthal region; **B**) Follow-up photograph of the patient on eighth month after the surgery front and left side view. There was a minimal hypertrophic scar on the base of the nose and left medial canthal region. The bulging and trapdoor phenomenon was resolved without any secondary procedure.

Conclusions

In conclusion, in this case report we found pigmented BCC in the medial canthal region. The diagnosis is based on history, physical examination, dermoscopy, and histopathological examination. The medial canthal region is relatively complex because there are ligaments and lacrimal ducts, and the skin's thickness differs from the surrounding area. Reconstruction of the forehead flap in the medial canthal region should be thinned and sized to obtain an excellent final result. In this case, wound healing was found, and there was no interference with the lacrimal duct. The forehead flap can be considered in large tumors in the medial canthal region. However, attention must be paid to the skin thinning procedure at the time of the procedure to get the outcome.

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