

A Successful Nodular Basal Cell Carcinoma Defect Closure On The Mid-Cheek Using Modified Mini Cheek Advancement Flap

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Abstract: Basal cell carcinoma (BCC) is the most common type of malignant skin tumour. This skin cancer is further divided into pigmented, morpheaform, superficial, and nodular BCC (nBCC), as well as fibroepithelioma of Pinkus. Despite its slow growth and very rare metastases, BCC might cause morbidity due to its tendency to relapse as well as its locally invasive nature, especially when located on the face. Wide local excision might be an effective treatment option for BCC and is usually followed by a surgical defect reconstruction procedure. We report a case of 61-year-old woman who presented with a superficially ulcerated, well-defined, hyperpigmented nodule with a rolled edge and frequent episodes of bleeding, as well as suppuration on the right mid-cheek in the past year before the consultation. The lesion was excised and the sample was sent for histopathological examination, revealing tumour mass in a palisading arrangement at the edges, forming solid islands, which is consistent with the diagnosis of nBCC with tumour-free edges. Defect closure with the mini cheek advancement flap (mini-CAF) technique yielded good results after eight months without any recurrence in one year. Skin flap techniques vary widely, among them is the cheek advancement flap technique which might be used for reconstructing defects on the mid-cheek. This flap technique can be modified as mini-CAF by placing a flap incision on the natural creases of the mid-cheek, namely the palpebromalar and nasojugal creases. Mini-CAF offer the advantage as its ability to camouflage the excision line by utilising the natural creases of the face, thus resulting in an aesthetically and functionally favourable result.

Keywords: basal cell carcinoma, defect closure, mini cheek advancement flap, nasojugal crease, palpebromalar crease

Introduction

Basal cell carcinoma (BCC) is the most common malignant skin tumour worldwide,^{1–10} originating from the stem cells within the epidermal basal layer, either interfollicular^{1–3,10,11} or of the hair follicle.^{1–4,12} It is a slow-growing, rarely-metastasizing, locally-infiltrating,^{2,4–6,13} and destructive epithelial tumour^{1,2,4,5} with basaloid differentiation.^{1,2,5,6,12} The main risk factors for BCC include ultraviolet (UV) exposure,^{1–4,6,8,14} advanced age of over 60 years old,^{2,5–7,14} long-term immunosuppression,^{2,3,5,8} a positive family or individual history,^{2,7,8} male gender,^{2–4,6,7,13,14} as well as Fitzpatrick skin types I and II (light skin).^{2,4,7,14,15} However, a study conducted on 68 patients with darker skin type in India by Thakurani et al,⁸ consisting of 58.8% females and 41.2% males, reported a significantly higher proportion of patients with facial BCC presenting with Fitzpatrick skin type IV in comparison to types III and V. It is commonly seen on skin that is frequently exposed to sunlight,¹¹ including the nose, forehead, cheek, scalp, and eyelids.⁵ Diverse clinical types of this skin tumour encompass pigmented,^{1–7,12,16,17} morpheaform,^{1,5–7,12,16,17} superficial, and nodular BCC (nBCC),^{1,3–7,11,12,16,17} as well as fibroepithelioma of Pinkus (FEP).^{1,6,12,16}

Basal cell carcinoma might be surgically treated with wide local excision (WLE),^{1,2,5,6,8,13,17} Mohs micrographic surgery (MMS),^{1,2,5,6,13,17} curettage,^{2,6,8} as well as electrodesiccation,^{2,6} and non-surgically-treated with either radiotherapy^{1,2,6,8,13} or chemotherapy.^{1,2,5,8,13} Although MMS has become a “gold standard” procedure for treating BCC,^{18–20} regarding its high cure rate, low recurrency,^{21–24} and favourable cosmetic outcomes,^{22–24} its application in Indonesia is limited due to the low access and lacking availability of specialized expert centers offering facilities for

MMS, the need for continued training and education among health-care professionals, as well as cost considerations for patients,^{24,25} notably in suburban area such as Subang. WLE with safety margins remains the most chosen treatment procedure for BCC in resource-constrained setting.^{8,17,26,27} As a consequence, the defects produced by this technique are generally larger than those produced by MMS.^{22,23} When primary closure cannot be achieved due to the surgical defect being too large, too stretched, or the defect might leave unwanted scars cosmetically, a tissue-movement procedure, such as a flap, should be considered.^{12,17}

A skin flap is a full-thickness portion of skin-to-subcutaneous-tissue transferred from an adjacent donor site into the surgical defect.^{4,17,26} The flap maintains its blood supply via a vascular pedicle that remains connected to the donor site.^{4,26} Based on the transfer method, it is classified into distant flaps and local flaps. Distant flaps consist of tissues that have been moved away from the defects.^{26,27} Local flaps, on the other hand, consist of tissues that have been moved adjacent to the area of the defect, and can be categorized into advancement, rotation,^{4,8,26,27} and transposition flaps.^{4,26} The advancement flap is a linear transfer of skin tissue to the adjacent defect area. It is a flap with a direct forward movement along the linear axis to close the defect without any lateral movement.^{17,26} The cheek advancement flap (CAF), traditionally known as a cervico-facial-rotation-advancement flap, has undergone several modifications over time, and remains the technique of choice to reconstruct defects of the mid-cheek.^{28,29} The mid-cheek area can be subdivided into eyelid-cheek, malar, and nasolabial segments.^{30,31} The eyelid-cheek and malar segments are separated by the palpebromalar crease (PMC), while the nasojugal crease (NJC) separates the eyelid-cheek and nasolabial segments.^{32,33} Placing flap incisions parallel to the relaxed skin tone lines (RSTL), skin fold, or skin creases is recommended to achieve minimal scarring and favourable aesthetic results.^{33–35} The modified mini-CAF described in this report has been developed to provide an additional and simple technique to reconstruct defects on the mid-cheek, utilising the PMC and the NJC. This case report describes the mini-CAF technique and its surgical outcomes.

Clinical Case

A 61-year-old female presented to the outpatient clinic in the Department of Dermatology and Venereology of a Secondary Health Care Facility in Subang, West Java, Indonesia, with an enlarged black lump on her right medial cheek, which not only bleeds but also secretes pus one year before admission. Initially, the lump appeared as a black mole and persisted as such for the past ten years. Five years prior to admission, the mole enlarged and became an itchy black lump. Three years before admission, it subsequently became a bleeding wound after the patient scratched the lump. It started to produce pus occasionally since a year before admission. The patient's deceased father had a history of numerous moles on his skin, one of which became a non-healing wound.

Dermatological examination revealed a well-defined hyperpigmented nodule measuring 1.5×1.5×0.3 cm with a superficial central ulcer and rolled edge on the right mid-cheek (Figure 1A and B). The patient had Fitzpatrick skin type IV. Based on the patient's history and clinical findings, the working diagnosis was BCC, with possible differential diagnoses of squamous cell carcinoma and malignant melanoma. The patient's complete blood count, liver function, kidney function, blood glucose, electrolyte, bleeding time, and clotting time were within normal limits.

Wide local excision of the lesion was performed, followed by defect closure using the mini-CAF technique after all margins had been confirmed to be tumour-free. A WLE procedure was done on the patient in the supine position. A marking was made surrounding the lesion with a margin of 0.5 cm and the flap design along the projection line of the right PMC and NJC (Figure 1C). The surgical field was disinfected using 10% povidone-iodine and covered with a sterile drape. We used a tumescent technique for local anaesthesia and a No. 15 blade to perform the skin incision. An incision was then performed along the marking. Periprocedural bleeding was controlled by applying pressure and electrocoagulation. Tumour excision left an approximately 2.5×2.5 cm subcutis-based defect (Figure 1D). We took the flap donors from the lateral adjacent skin to cover the post-excisional defect. An elongated incision was done towards the projection line of the right PMC and NJC along the pre-designed marking. This was followed by undermining the underlying tissue a few millimetres below the dermis. The undermined tissue was then shifted medially with the advancement flap technique towards the primary defect for closure. A simple interrupted suture technique was performed using 5/0 nylon thread (Figure 1E). A sample of the lesion was sent for histopathology examination (Figure 1F). Histopathology report at 10× objective magnification revealed an ulcerated epidermis with a tumour mass consisting solid islands extending widely



Figure 1 Cutaneous lesion before and after surgical procedure. **(A)** The patient's skin lesion, a hyperpigmented nodule on the right mid-cheek. **(B)** Clinical findings of the case showed a well-defined hyperpigmented nodule with a superficial central ulcer and rolled edge. **(C)** The tumour and skin marking for mini-CAF. The black arrows show the shifting direction of the undermined donor flap to cover the defect medially with the advancement flap. **(D)** Post-surgical defect after total excision of the tumour. **(E)** Surgical defect closure with mini-CAF. **(F)** Biopsy sample.

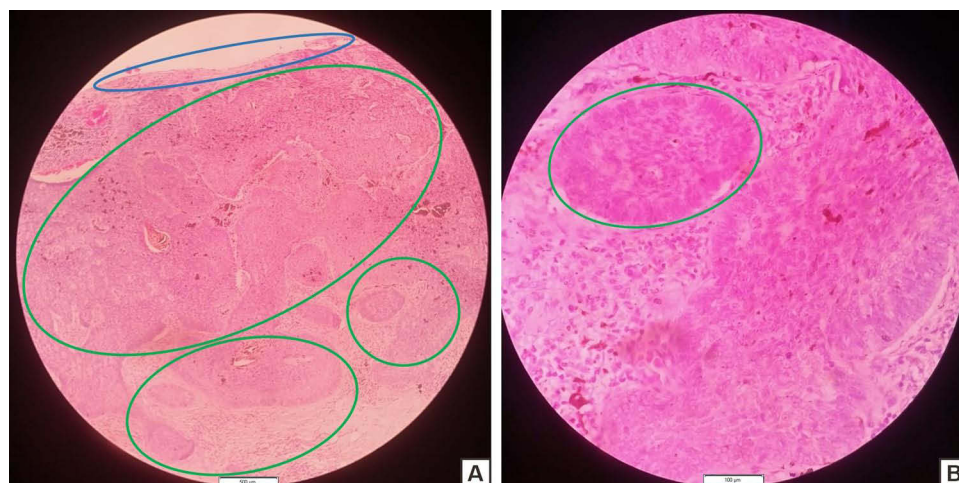


Figure 2 Histopathological features of the case. **(A)** Ulcerated epidermis (blue circle) with the tumour mass forming solid islands (green circles), extending widely throughout the dermis. (Hematoxylin and eosin stain, 10x objective magnification, scale bars are 500 μ m). **(B)** The islands of the tumour mass (green circle) consist of hyperchromatic, rounded, and oval nucleated cells in a palisading arrangement at the edges. (Hematoxylin and eosin stain, 40x objective magnification, scale bars are 100 μ m).

throughout the dermis (Figure 2A). At 40x objective magnification, it can be seen that the solid islands of tumor masses are composed of hyperchromatic, rounded, and oval nucleated cells in a palisading arrangement at the edges (Figure 2B). Based on the histopathology examination, the definitive diagnosis of nBCC was established for this patient. The superior, inferior, medial, and lateral edge incisions were found to be tumour-free.

The patient was prescribed mefenamic acid 500 mg, cefadroxil 500 mg, and 2% mupirocin ointment after the procedure. The patient was advised to keep the bandage dry and regularly change the bandage once every three days. We also counseled the patient to protect herself from direct sunlight by wearing a hat or sunscreen. Follow-up six days after

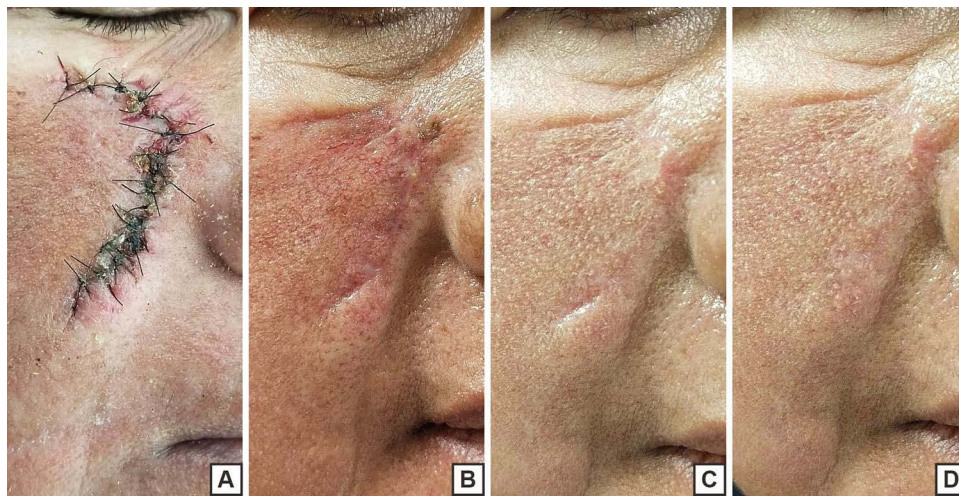


Figure 3 Post-surgical evolution of the tissue. (A) Six days after surgery. (B) Two months after surgery. (C) Four months after surgery. (D) Eight months after surgery.



Figure 4 The patient's dermatological status before (A) and after (B) treatment.

surgery showed that the flap was in good condition without any signs of infection or other complication (Figure 3A). Two months after the surgery, visible scars appeared on the right PMC and NJC (Figure 3B). At four months of follow-up, the scar on the right PMC was perfectly hidden following the natural crease, while that on the right NJC faded insignificantly (Figure 3C). Follow-up after eight months revealed excellent cosmetic as well as functional results, with the scar on the right NJC fading significantly and becoming similar in contour with the adjacent tissue (Figure 3D). There was no recurrence after one year. After evaluating the patient from the first visit to the current condition (Figure 4), we concluded that the patient's prognosis was favourable.

Discussion

Basal cell carcinoma is the most common cancer in humans, which accounts for approximately 65–75% of all non-melanoma skin cancers.^{2,8,17} The typical age of onset for BCC is over 60 years old.^{2,5–7,14} The frequency of skin tumours depends on the influence of external factors, such as UV radiation,^{1–3,6–8,13,36} and biological properties of the skin, with a higher incidence in fair-skinned people with Fitzpatrick skin types I and II.^{2,4,7,14,15} However, a study conducted by Oh et al¹³ showed that the incidence of BCC had increased from 1968 to 2016 and was the highest among Chinese, Malay, and Indian populations, whose skin tend to be relatively darker compared to Caucasians with Fitzpatrick skin types I and II. The risk of skin cancers increased sharply with increasing age after 60 years,^{2,5–7,14} with men showing a higher incidence compared to women.^{2–4,6,7,14} On the other hand, Matas-Nadal et al⁷ found that 138 early-onset BCC cases were predominated by females (63.8%) with risk factors including light skin type, family history of keratinocyte carcinoma, and more than four blistering sunburns during childhood. Here, we reported a case of BCC in an Indonesian 61-year-old woman with Fitzpatrick skin type IV and a family history of suspected skin cancer.

The most common BCC-affected locations include the nose,^{2-5,8,12,13} cheek,^{2-4,8,12,13} forehead^{2,4,8,13} eyelid,^{2,4,13} and scalp.^{4,8,12,13} BCC is usually seen on the face as a pigmented nodule¹¹ that generally continues to enlarge slowly, is difficult to heal, bleeds easily, and may be accompanied by itching. It may also be asymptomatic.⁶ The condition has various clinical appearances and histological features. Some forms of common BCC, such as nodular, superficial,^{1,4-6,8-12,16,17} morpheaform,^{1,4,5,11,14,16,17} and pigmented type,^{1,4-6,8,9,12,16,17} as well as FEP, are clinically recognised.^{1,6,12,16} Nodular BCC, the most common type of BCC^{2,3,5,9,12,16} is characterised by nodules or papules that are associated with telangiectasias, and in rare occasions, central ulcerations^{4,16} with rolled edge may also be present.^{12,16} In histopathological examination, nBCC appears as peripheral palisading^{1,7} tumour islands^{1,7,12} of hyperchromatic round cells with either uniform nuclei or no nucleoli⁷ in varying sizes, arising from the basal layer and extending widely into the dermis.^{1,12} Both clinical and histopathological findings in this case report are consistent with those of nBCC.

Properly treated, BCC has an excellent prognosis.^{4,17} Several modalities for BCC treatment are available, including WLE,^{1,2,5,6,8,13,17} MMS,^{1,2,5,6,13,17} curettage,^{2,6,8} electrodesiccation,^{2,6} and topical chemotherapy.^{1,2,5,6,8,13} Various studies also have demonstrated photodynamic therapy (PDT) usage to be an efficacious treatment option for BCC.^{37,38} It requires photosensitizers that are activated by visible or near-infrared light, thereby generating cytotoxic reactive oxygen species to selectively kill cancer cells and other abnormal cells in the body.³⁹⁻⁴¹ Methyl aminolevulinate and 5-aminolevulinic acid demonstrated promising result as photosensitizers used in PDT to treat superficial BCC, either in single administration^{42,43} or combination with vismodegib chemotherapy.⁴⁴ PDT can also be used in conjunction with surgery as a neoadjuvant, adjuvant, or repetitive adjuvant treatment.^{40,41} However, European Dermatology Forum guideline on topical PDT 2019 confirmed that topical non-surgical treatments, such as PDT were recommended only for BCC type other than nodular, while nBCC should be treated with surgery first.⁴⁵ Based on the guideline, despite of the unavailability of PDT in our resource-constrained setting, this nBCC patient was considered to be treated surgically.

Mohs micrographic surgery is acclaimed to be the “gold standard” for the treatment of BCC¹⁸⁻²⁰ with histopathological evaluation of biopsy samples as a confirmatory test.^{5,6,9} In this procedure, horizontal histological sections are performed, allowing evaluation of the entire lateral and deep margins. After excision, the tumour is immediately oriented, sectioned on a cryostat, fixed, and stained with hematoxylin and eosin. Subsequently, the tissue is analyzed on microscope to evaluate for the presence of cancer cells and the margins are assessed for completeness of excision. If there is a residual tumour, the affected areas should be excised.^{22,24,25} MMS offers several advantages such as superior cure rates and negligible recurrence²¹⁻²⁴ while minimizes tissue removal, sparing normal tissue^{22,23} which is of great importance in improving cosmetic results.²²⁻²⁴ Despite the advantages, a significant drawback in widespread practice of MMS in resource-constrained settings like Subang is the unavailability of cryostat for processing samples. Moreover, distance and cost considerations for the patients may result in limited access to specialized centers offering MMS facilities in developing countries,^{23,24} such as Indonesia. Although not as good as MMS, WLE with safety margins usually performs for BCC cases in resource-constrained setting^{8,16,26,27} and gives low rates of recurrence and metastasis.^{3,4,17} The patient in this case report underwent WLE of the lesion with a margin of 0.5 cm.

Several methods might be utilised to close the defect after excision. Most lesions can be excised with an elliptical pattern by noting the size and direction of the long axis. The elliptical length should be 3–4 times wider than the width to cover the defect without “dog ears”. Most of the time, facial lesions need a more complicated surgical technique to cover the defect optimally. The decision regarding which method to implement is mainly based on the nature of the defect, including its location and size, as well as functional outcome after closure, the patient’s medical comorbidities, structures surrounding the defect, and whether the defect is secondary to malignancy or trauma. Considerations in those conditions include skin-flap technique options.²⁶ Based on the type of movement mechanism required to close the defect, flaps are divided into transposition,^{4,26} rotation flap, and advancement flap.^{4,8,26,27}

Transposition flap is a random pattern flap^{26,46,47} utilising skin laxity from an adjacent area in to fill a defect in an area with little or no skin laxity. The flap is transposed from the donor site to be rotated and cover the recipient site as primary defect,^{26,47} while subsequently leave a secondary defect.^{26,48} The defect is then covered with part of the design.^{26,47} This type of flap redistributes and redirects tension of the wound closure from defect to donor site well,^{46,47} resulting in less neural and vascular damage than other flaps.^{26,49} Transposition flap was frequently designed at a rotation angle between

45° and 90°. ^{50,51} The rotation angle that is smaller than 45° might cause a tension overlap between primary and secondary defects, ⁵¹ whereas the rotation angle that is larger than 90° would decrease the flap effective length significantly. Therefore, a larger flap is required ^{51,52} Transposition flap can usually be performed when the surgical defect raises either malfunction risk or a poor aesthetic result if corrected with simple coverage, graft or advancement flap. ²⁶ The defect area in the mid-cheek of this patient has sufficient skin laxity to allow advancement flap technique without involving larger flap size.

Rotation flap is created using adjacent tissue that is rotated ^{4,26,46,52} following an arc of rotation or central point ^{26,46,52} to close a defect. ^{4,26} Classically, this flap has a pivot point distance of two to three times the defect diameter with an arc about four to five times the defect width and a design that can achieve along a 30° or less rotation. ^{26,46} An arc of rotation greater than 30 will generally necessitate excision of a standing cone deformity called Burrow's triangle. ^{46,53} This flap is not only best suited for triangular defects closure, ^{46,54} but also usually used to cover relatively large defects such as the cheeks, ^{4,26,46} forehead, or scalp. ^{26,46,52} Rotation flap on the cheek can cover a wide range of area ^{4,55} with robust blood supply. ^{4,26} However, this flap create more tension than other flaps, so it often causes ischemia or tissue necrosis. ^{26,54} In practice, nearly all local flaps involve some degree of both rotation and advancement flap. ^{37,56–58}

An advancement flap might be utilised to reconstruct skin defects through tissue mobilisation along linear directions. It can cover various sizes and shapes of defects located around the eyelids, glabella, forehead, cheeks, dorsal nose, lips, neck, and medial as well as lateral eye angles. ⁹ The advancement flap from the cheek was first described by Beare in 1969 as a reconstruction technique using skin from the whole of the cheek below the periorbital defect, and its anterior border follows the nasolabial fold as well as the neck. ⁵⁷ In 1970, Mustarde described the CAF, ⁵⁸ which was rapidly adopted by many surgeons worldwide as the traditional cheek flap. The incision of this flap is made from the lateral aspect of the defect to the lateral canthus and extends superolaterally, then inferiorly ending at the preauricular area. The flap is elevated in the subcutaneous plane widely. The flap is tacked to the medial wall of the orbit medially and the lateral wall of the orbit laterally. ^{46,57} It was mainly a random-pattern flap, with potential complications of flap-tip necrosis, lower eyelid ectropion, and upper lip imbalance. ²⁷

In contrast to the traditional cervico-facial-rotation-advancement flap, this modified mini-CAF technique omits horizontal incisions towards the lateral cheek parallel to the projection line of the natural creases of mid-cheek, namely PMC and NJC. By placing incisions in both natural creases, the advancement flap is adequate enough to close the defect without the need for rotation, so that the risk of necrosis can be minimized. The risk of lower eyelid ectropion and upper lip imbalance is minimized by placing the incision only around the cheek, without involving wider areas such as the preauricular and periorbital areas. The goal of the method used in this case report, which includes restoring contour and natural function by utilising the natural creases, was achieved in eight months. The favourable result of this case report shows that this technique might be an effective treatment option for BCC in the resource-constrained setting.

While rates are low, which account for only 7.10%, surgical site infection (SSI) and tumour recurrence are the most common complication of head and neck local flap as was reported in a retrospective cross-sectional held by Yassin et al ⁵⁹ towards 84 patients of all plastic surgery units from Khartoum, Sudan in 2024. Chow et al ⁶⁰ showed that anatomic location is the best predictor of bacterial species in SSI based on the tendency for certain bacteria to be found at the site of various postoperative infection, namely *Escherichia coli*, *Enterobacter sp.*, *Proteus sp.*, and *Klebsiella sp.* in the lower extremities; *Pseudomonas aeruginosa* in the ear; and *Methicillin-sensitive Staphylococcus aureus* (MSSA) on the back, scalp and face of 260 postoperative patients from San Diego, California, in 2021. Cephalexin and cefadroxil are two oral first-generation cephalosporins used to treat MSSA infections. Regarding the ability to achieve similar thrice-daily cephalexin antibiotic exposures with only twice-daily dosing, cefadroxil become more preferable drug of choice. ^{61,62} Given its board-spectrum activity against Gram-positive bacteria including *Staphylococcus aureus* and *Streptococcus pyogenes*, as well as certain Gram-negative bacteria, ^{63,64} 2% mupirocin ointment is considered as an effective SSI topical prevention. ^{64–67} The patient was prescribed postoperative cefadroxil 500 mg and 2% mupirocin ointment to prevent SSI after the flap procedure on her face. SSI after flap procedure did not occur in this patient.

Based on 18 cases of head and neck BCC recurring no sooner than 11 months after surgery between January 2016 and December 2020 at Al-Azhar hospitals, Cairo, Egypt, Hasan et al ³ identified the risk factor of recurrent BCC as male sex, nodular type, excision margin less than 0.4 cm, and sun exposure. The patient of this case report is a 61-year-old female

with nBCC on the mid-cheek. The lesion had been excised with a margin of 0.5 cm. The patient had been advised to protect herself from direct sunlight by wearing a hat or sunscreen. There was no tumour recurrence in one year of follow-up.

Conclusion

A mini-CAF is an appropriate method for defect closure after total facial tumour excision on the mid-cheek in the resource-constrained setting where the access and availability of specialized expert centers offering MMS facilities are limited. This procedure has advantages for facial defect closure because it can optimise the cosmetic and functional result by utilising the natural creases on the mid-cheek.

Ethics Statement

The publications of images were included in the patient's consent for publication of the case. Institutional approval has been obtained to publish the case details.

Consent Statement

The authors certify that they have obtained all appropriate patient consent forms. The patient signed a consent form for the publication of case details and images.

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Disclosure

The authors report no conflicts of interest in this work.

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