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RECONSTRUCTION OF CHIN DEFECT POST BASAL CELL CARCINOMA EXCISION USING RHOMBOID FLAP: A CASE REPORT

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ABSTRACT

Introduction: Basal cell carcinoma (BCC) is a malignant skin tumor with the highest incidence and originates from the basal cells of the epidermis, with the nodular type being the most common.
Case Illustration: A 76-year-old female patient came with complaints of a lump on the chin that had enlarged and bled easily for 3 years before entering the hospital. The patient was diagnosed with Basal Cell Carcinoma in the chin region.
Discussion: Wide excision was performed under local anesthesia, then the wound was closed with a rhomboid flap. Evaluation after 1 month post-operatively the wound closed well and the scar was disguised.
Conclusion: The chin is a unique aesthetic area with unique contours and shapes, making it a challenge for plastic surgeons to perform reconstruction after extensive BCC excision. The rhomboid flap is a very versatile local flap because it can be used almost anywhere on the body, including the chin.

Highlights:

1. BCC is strongly associated with UV radiation exposure,commonly affecting the face, but the chin is rarely involved (1.2% incidence).
2. Chin reconstruction after BCC excision is challenging, requiring careful flap selection for function and aesthetics.
3. The rhomboid flap is a preferred choice, offering good blood supply, minimal tension, quick healing, and better cosmetic results.

INTRODUCTION

Basal cell carcinoma (BCC) is a malignant non-melanocytic skin tumor that originates from the epidermal layer of the skin, most often accounting for 65-75% of skin tumor cases. In Indonesia, BCC ranks as the third most common cancer, following breast and cervical cancer.[1] Basal cell carcinoma occurs in body parts that are often exposed to direct sunlight such as the head, neck, trunk and legs. It occurs more often in people over 40 years of age than in young people.[2]

Basal cell carcinoma (BCC) is a critical concern in both dermatology and oncology due to its high prevalence, potential for local tissue destruction, and the necessity for early intervention. As the most common skin cancer worldwide, BCC accounts for approximately 75%–80% of all non-melanoma skin cancers and is strongly associated with chronic ultraviolet (UV) radiation exposure, genetic predisposition, and environmental factors, making prevention and early detection essential.[3,4] Although BCC rarely metastasizes, it can cause extensive local invasion, particularly in high-risk areas such as the face, scalp, and neck, often necessitating complex surgical excision and reconstruction.[5] Advanced cases may require reconstructive techniques, such as the rhomboid flap, to restore both function and aesthetics, posing a significant challenge for reconstructive and aesthetic surgeons. Additionally, oncological approaches, including targeted therapy with hedgehog pathway inhibitors, play a crucial role in managing inoperable or metastatic cases.[6] Given its clinical impact, continuous research, improved screening, and multidisciplinary collaboration are essential to enhance patient outcomes and optimize treatment strategies.

Basal cell carcinoma is more common in men than women. [1,7] Basal cell carcinoma has 5 subtypes, including nodular, pigmented, superficial, ulcerative, and morpheaform. The nodular subtype is the most common subtype found in almost 72 percent of BCC cases with clinical features in the form of papules or translucent nodes, telangiectasia, and rolled borders. [1,8,9]

BCC is most commonly found in the Caucasian race followed by Asians and blacks. Several studies have suggested that the relationship between the number of melanocytes in the body affects the incidence of skin tumors because melanin's function is to prevent damage from exposure to UV rays.[2]

BCC arises from both genetic and environmental factors, with UV radiation being a major etiological trigger. Environmental contributors include hydrocarbons, arsenic, coal, tar, and topical methoxipsoralen, but UVB exposure plays the most significant role. The highest incidence of BCC occurs near the equator, while Finland has the lowest rates. UV radiation inflicts both acute and chronic damage acutely, it causes DNA mutations that disrupt proto-oncogene and tumor suppressor gene synthesis, while chronically, it leads to photoaging, immunosuppression, and photocarcinogenicity. UV-B, the primary endogenous chromophore, not only damages DNA but also affects molecular targets in the cytoplasm and cell membrane, altering antigen-presenting functions of Langerhans cells and leading to immunosuppression. Additionally, UV-B exposure has been linked to TP53 tumor suppressor gene mutations, contributing to BCC pathogenesis.[1.8, 10]

Epidemiological data and histopathological analysis of BCC in Asia, including Indonesia, remain limited, highlighting the need for further research and awareness.[11] BCC presents significant challenges for dermatologists and reconstructive aesthetic surgeons. Its diverse clinical manifestations, potential for local tissue invasion, and complex surgical management make early detection and appropriate treatment crucial. Moreover, the limited data hinder the development of standardized guidelines for diagnosis and optimal management, emphasizing the urgent need for increased focus on BCC in both research and clinical practice.

One of the key challenges in BCC treatment, particularly for cases involving extensive excision, is the selection of an appropriate reconstruction technique to restore both function and aesthetics. The rhomboid flap is a highly versatile local flap that can be used almost anywhere on the body, including the chin, which is a unique anatomical and aesthetic region. Given the thick skin and complex contours of the chin, achieving optimal wound closure with minimal scarring requires careful planning. The rhomboid flap offers reliable vascularization, good skin texture and color match, and a single-stage procedure, making it a preferred choice for BCC reconstruction in this area.

CASE ILLUSTRATION

A 76-year-old female patient came with a complaint of a mass on her chin that had been growing and bleeding easily for 3 years before entering the hospital, which was painful and itchy. If it bleeds, the wound is difficult to heal. On physical examination of the patient's chin, a blackish mass was found with ulceration in the middle, irregular edges measuring 2x2 cm. It was painful to the touch. Laboratory examination was within normal limits. On histopathological examination measuring 2 x 1.5 x 1.3 cm, a nodular type of Basal Cell Carcinoma was found consisting of basaloid cell proliferation, round oval nuclei, pleomorphic, hyperchromatic, forming a nodular pattern with peripheral palisading, infiltrative in the fibrocollagen stroma. The patient was diagnosed with Basal Cell Carcinoma of the chin region and a wide excision was performed with a margin of 3-4 mm of healthy tissue under local anesthesia, after which the wound was closed with a rhomboid flap. The flap was attached using polyglicolycacid 4/0 and Polypropylene 6/0, the sutures were removed 5 days after surgery. Evaluation after 1 month post-operatively the wound closed well and the scar was disguised. Further follow-up is needed to assess wound healing and recurrence.

Figure 1. Basal Cell Carcinoma on the Chin

Figure 2. Post-Surgical Excision Defect

Figure 3. Rhomboid Flap

Figure 4. One-Month Postoperative Wound Condition

Figure 5. Nodular Basal Cell Carcinoma

DISCUSSION

Basal cell carcinoma is the most common skin cancer in the world. In the United States, affecting almost 3 million people each year, which is in second place, while in first place is Australia. The incidence of BCC in Singapore is very small during a 48-year observation of around 14,441 cases. Basal cell carcinoma is a nonmelanocytic skin malignancy originating from nonkeratinizing cells of the basal layer of the epidermis which is most often associated with UV radiation causing genetic mutations. [8,9,12-14]

Many studies have established a strong link between UV exposure and the incidence of basal cell carcinoma (BCC), identifying UV radiation as a primary etiological factor in non-melanoma skin cancer. This correlation is evident in global epidemiological patterns, with BCC being most prevalent in regions near the equator, while countries like Finland report the lowest incidence rates in Europe. UV radiation contributes to BCC development by damaging DNA and impairing its repair mechanisms, leading to genetic mutations that promote uncontrolled cell growth and tumor formation. UV-B radiation, in particular, plays a critical role in this process, as it is readily absorbed by DNA and induces specific forms of damage, such as cyclobutane pyrimidine dimers and 6-4 photoproducts. These mutations, especially those affecting the TP53 tumor suppressor gene on chromosome 17p13.1, have been linked to BCC initiation and progression. Beyond direct genetic damage, UV radiation also alters cellular functions by targeting molecular structures in the cytoplasm and cell membrane, including cell surface receptors, kinases, phosphatases, and transcription factors. Additionally, UV-B exposure disrupts immune function by impairing the antigen-presenting role of Langerhans cells, leading to local immunosuppression and further increasing susceptibility to tumor development.Understanding the mechanisms by which UV radiation induces carcinogenesis, from DNA damage to immune modulation, is essential for improving prevention strategies and developing more effective treatments for BCC.[1,10,15,16]

BCC is closely related to UV radiation so that anatomically the parts of the body that are often exposed to UV rays are the head, neck, trunk and legs. The face is the most common predilection area, especially the nose and cheeks. The chin is one of the parts of the face that rarely experiences BCC, the incidence is only 1.2%.[12] This unique anatomical location poses distinct challenges for reconstruction after tumor excision, as the chin has thick skin with less elasticity, which can lead to increased tension during closure and potential poor scarring.

The chin is a unique aesthetic area with unique contours and shapes, making it a challenge for plastic surgeons to reconstruct

after extensive BCC excision. The chin is the part of the face with the thickest skin, which can lead to poor scarring.[17]

In basal cell carcinoma (BCC) management, determining the appropriate surgical excision margin is crucial to minimize recurrence rates. As a general guide, adequate surgical margins are 3–4 mm for a BCC and at least 4 mm for a low-risk SCC. [18-22] Regarding reconstruction post-excision, the rhomboid flap is a versatile option for closing surgical defects resulting from BCC excision. Its design allows for effective tension distribution and satisfactory cosmetic outcomes, making it suitable for various facial regions, including the chin. Combining an adequate excision margin with a rhomboid flap reconstruction can enhance both oncologic safety and aesthetic results in BCC treatment. [23]

In this case, the patient presented with a 2×2 cm ulcerated, pigmented nodular BCC on the chin, a relatively uncommon location. The lesion's size and irregular borders necessitated a wide excision with a 3–4 mm margin of healthy tissue to ensure complete tumor removal. However, a wide excision in the chin region risks significant functional and aesthetic impairment, particularly affecting lower lip mobility and symmetry if not reconstructed properly.

Mohs micrographic surgery, the gold standard for BCC treatment, was unavailable due to resource limitations. The success rate of Mohs Micrographic Surgery (MMS) in treating primary basal cell carcinoma (BCC) measuring less than 2 cm is 99%.[24] Therefore, a wide excision followed by reconstruction using a rhomboid flap was chosen to achieve optimal oncologic clearance while preserving function and aesthetics.

Mohs micrographic surgery in this case could not be performed due to limited resources, so a wide and deep excision was performed in the hope that all the tumor tissue had been removed. Large defects in the chin can affect the upper cutaneous lip and vermilion border which when repaired with inappropriate technique and design can cause significant functional impairment.[4,7,25,26]

Hedgehog pathway inhibitors (HPIs) are targeted therapies that effectively inhibit the Hedgehog signaling pathway, which plays a crucial role in the development of basal cell carcinoma (BCC). This pathway is typically inactive in adult tissues, but mutations in the PTCH1 or SMO genes cause abnormal activation, driving BCC growth. Several HPIs, including vismodegib and sonidegib, have been approved and are clinically used to treat locally advanced BCC (laBCC) and metastatic BCC (mBCC) that are inoperable or unresponsive to other treatments. The use of HPIs such as vismodegib and sonidegib for BCC on the chin depends on the patient's clinical condition. HPIs are generally used for locally advanced or metastatic BCC that cannot be surgically removed due to large tumor size, deep tissue infiltration, or a high risk of surgical complications. However, if BCC on the chin can still be excised with proper surgery, reconstruction using techniques such as the rhomboid flap is often the preferred option, as it provides good aesthetic and functional outcomes. HPIs are more recommended in cases where the lesion is too large or deep, the patient has contraindications for surgery, or excision cannot be performed with adequate margins. The Hedgehog inhibitor vismodegib has been approved for the treatment of locally advanced and metastatic BCC. The most common side effects associated with approved HPIs include muscle spasms, dysgeusia (taste disturbances), and alopecia (hair loss). Additionally, patidegib, which is still under investigation, is being developed as a topical formulation to reduce systemic side effects, while itraconazole and arsenic trioxide have also shown potential in inhibiting the Hedgehog pathway. HPIs offer new hope for patients with advanced BCC, but challenges such as significant side effects, drug resistance, and high costs remain barriers to their widespread use. Therefore, further research is needed to enhance the effectiveness of this therapy, whether

through the development of new formulations or combination treatments with other therapeutic approaches.[27-34]

There are many methods that can be done in BCC reconstruction on the chin including full thickness skin grafts, secondary intention healing, and flap options. The flaps that can be used are local flaps such as bilobed, rhomboid, platysmal and V-Y advancement flaps.[8,18,35] Several studies have shown that the rhomboid flap has been successfully used for chin defect reconstruction. Some studies mention that the rhomboid flap has been used for reconstructing defects in the cheek, temple, lips, ears, nose, chin, eyelids, and neck.[36-40] Additionally, the rhomboid flap has become a popular reconstructive alternative for facial defects in recent years.

The advantages of local flaps are Reliable blood supply, Good skin texture and color match, A single stage procedure. In determining the flap used in BCC reconstruction on the chin, plastic surgeons must pay attention to important principles of reconstruction, including: Incision and closure should be along relaxed skin tension lines (RSTLs), Closure should be tension-free, Flaps should consider function and aesthetic subunits. Minimizing the risk of distortion in adjacent structures like the lower lip. Additionally, as a local flap, it maintains good texture and color match with the surrounding skin, offering superior aesthetic integration compared to grafts. By considering these principles, the rhomboid flap was chosen.[8,35,36,40]

The rhomboid flap is a local flap that has a parallelogram shape with two 60 degree angles and two 120 degree angles, also called the Limberg flap, which rotates at pivot point X, which is vascularized by the subdermal or subpapillary plexus, in large flaps by the perforator vascular supply. Placing the incision parallel to the skin relaxation lines (RSTL) allows the resulting scar to be within the skin fold along the line of maximum extensibility and results in a more minimal scar. [37,41,42]

The advantages of the rhomboid flap are that the procedure is easy and fast, the design is simple, minimally invasive, can be performed with local anesthesia, can reduce tension, secondary defects can be disguised with RSTL, and healing is rapid. Reconstruction using the rhomboid flap maintains continuity of texture, color, thickness, and vascularity with the surrounding tissue so that function and aesthetics can be met. The rhomboid flap is a very versatile local flap because it can be used almost anywhere on the body. [41,43,44]

This case the surgery was performed under local anesthesia, and the rhomboid flap was secured with polyglycolic acid 4/0 and polypropylene 6/0 sutures. The sutures were removed after 5 days, and the wound healed well without signs of infection or necrosis.

At the 1-month follow-up, the wound had closed completely with good aesthetic results, and the scar was well camouflaged within the chin contour. The patient did not report any significant functional impairments, such as restricted lower lip movement or excessive scar contracture. Further regular follow-up is essential (every 6–12 months for 3–5 years) to monitor for potential recurrence, although the recurrence rate of BCC after complete excision is generally low.[8]

This case presents several notable strengths. The comprehensive surgical approach ensured a balance between oncologic tumor removal and optimal reconstructive outcomes. The selection of the rhomboid flap was based on anatomical, functional, and aesthetic considerations, allowing for proper tension distribution, minimizing distortion of adjacent structures, and providing superior healing outcomes compared to skin grafting. Additionally, postoperative results showed good wound healing without complications such as infection or necrosis, with the scar well-camouflaged within the chin contour and no significant functional impairment of the lower lip.

However, there are some limitations in this report. One limitation is the lack of long-term evaluation, as follow-up was conducted only for one month. Given that BCC carries a risk of long-term recurrence, monitoring over 3–5 years is necessary to ensure no recurrence occurs. Moreover, this report is based on a single case, making the findings less generalizable. Further evaluation through larger case series or prospective studies would provide stronger evidence regarding the effectiveness of the rhomboid flap in BCC reconstruction of the chin.

In terms of novelty, this case provides insight into the challenges of reconstructing a rarely affected BCC location, the chin, which has thicker skin and limited elasticity. Additionally, this report highlights that wide excision with a rhomboid flap can be an effective alternative for healthcare centers without access to Mohs micrographic surgery, without compromising functional or aesthetic outcomes. The use of the rhomboid flap for chin reconstruction following BCC excision is also rarely reported, making this study a valuable contribution to further understanding optimal reconstruction techniques for this uncommon location.

This case report provides important insights into the surgical management of BCC in the chin region, demonstrating the effectiveness of a rhomboid flap in preserving function and aesthetics. While long-term follow-up and larger case studies are needed, the findings contribute to alternative treatment strategies in resource-limited settings and expand knowledge on reconstructive options for rare BCC locations.

CONCLUSION

BCC on the chin is a rare but challenging condition that requires careful surgical planning to ensure both oncologic safety and aesthetic-functional outcomes. In this case, the rhomboid flap proved to be a reliable reconstructive option, allowing for tension-free closure, good cosmetic integration, and preservation of chin mobility. This case highlights the importance of individualized surgical approaches in facial BCC reconstruction, particularly in areas with complex anatomical and aesthetic considerations.

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CONFLICT OF INTEREST

The authors declare no conflict of interest related to this study. No financial, personal, or institutional affiliations influenced the research, analysis, or conclusions presented in this article.

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AUTHOR CONTRIBUTION

YMT contributed to the conceptualization, data collection, manuscript drafting, and final approval of the manuscript. SDS supervised the study, critical revision of the manuscript and approved the final version. Both authors have thoroughly reviewed and reached an agreement on the final version of the manuscript.

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