

INVASIVE SKIN CARCINOMA OF THE SKULL TREATED WITH A ROTATIONAL FLAP - A CASE REPORT

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Abstract

The escalating incidence of skin malignancies, particularly in sun-exposed areas such as the head and neck, requires innovative approaches for challenging cases. Squamous cell carcinoma, though common, rarely infiltrates the skull, presenting unique challenges in treatment and reconstruction.

In this case report, we describe the management of a 77-year-old patient with recurrent invasive squamous cell carcinoma of the left temporal region extending into the skull. The patient underwent three surgeries within our institution due to squamous cell carcinoma recurrence, leading to a complex skin defect unsuitable for conventional closure methods. Our approach involved the use of a local rotational flap, using the robust vascularity of the scalp, allowing versatile orientation relative to the defect. The operating technique consisted of a craniectomy, removal of infiltrated tissue, and affected dura, followed by plastic reconstruction of the skin with a rotational flap, preserving healthy periosteum and temporal fascia.

As the population with cutaneous neoplasms ages, the demand for expeditious and less morbid reconstructive options grows. This case underlines the effectiveness of the local rotational flap for reconstructing medium-sized complex scalp defects post-cancer resection. Our experience suggests that the rotational scalp flap is a reliable and safe choice, offering a favorable balance between surgical outcomes and patient well-being.

Keywords: scalp, squamous cell carcinoma, rotation advancement flap, recurrence, invasion of dura

Introduction

The incidence of cutaneous malignancies has been steadily rising during the past couple of decades, and areas exposed to the sun - the head and neck - have a high risk of developing the disease. The most common tumors affecting the head are squamous cell carcinoma (SCC), basal cell carcinoma, and malignant melanoma [1, 2].

Due to their slow progression, scalp SCCs are usually diagnosed before extension into the skull. Invasion into the bone, cortex, and dura mater is rare [2].

Without treatment, these skin cancers can grow horizontally to cover a significant area of the scalp and grow vertically through the soft tissues and periosteum, all the way to the cranium. Wide local excision of large scalp tumors extending into and through the periosteum presents a reconstructive challenge. Obtaining a negative surgical margin often requires the removal of soft tissue and periosteum. The skull bone and dura must be removed occasionally to obtain clear healthy edges.

A defect can be difficult to close because of the poor elasticity of the soft tissues of the scalp. Additionally, skin grafts cannot survive on exposed bone when the periosteum is removed. The main use of this flap is for defects where the periosteum has been removed and the bone is exposed [3]. The rotational flap takes advantage of the robust vascularity of the scalp in that it can be oriented in any direction relative to the defect [3].

The goal of our case report is to present the clinical course, surgical strategy, and postoperative outcome of a patient with an invasive squamous cell carcinoma of the scalp.

Case report

A 77-year-old patient comes to our hospital with a complaint of recurrent squamous cell carcinoma in the left temporal region. Previously, he was surgically treated in our hospital 3 times due to the recurrence of the squamous cell carcinoma in the same region. On examination, a coin-sized ulcerating skin change is noted in the left temporal region, on the upper superior temporal line on the left, which is immobile in relation to the base. The patient is hospitalized in our institution for operative treatment.



Figure 1. Local appearance of the recurrent invasive squamous cell carcinoma.

In November 2021, he was admitted to our institution for the first time with information about the first appearance of the squamous cell carcinoma, when he was surgically treated, during which a complete excision of the skin change was made and the defect was covered with a free flap taken from the lower extremity. Then in January 2022, the patient came back to our hospital due to a recurrence in the same region, which was clinically manifested by swelling in the area of the operated region, when he was again surgically treated with excision of the defect and indirect suture of the skin defect. In August of the same year, the patient was admitted to our hospital due to a recurrence in the same region, which was completely removed by excision and a primary suture of the skin defect.

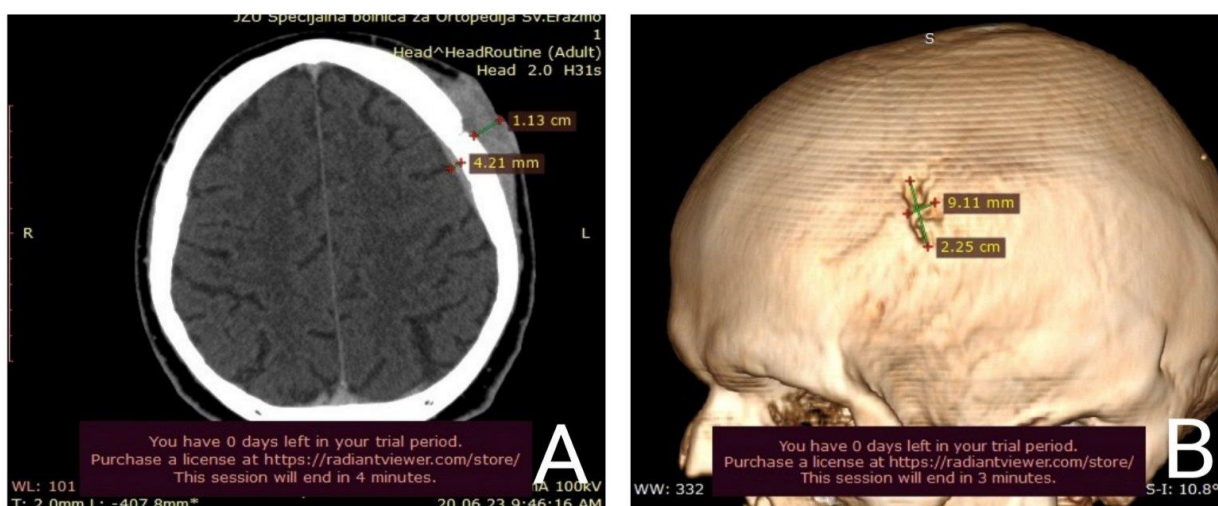


Figure 2A. CT result of head and neck preoperatively shows an ulcerative soft tissue thickening on the left temporoparietal region with a thickness of about 1.13cm, and local dural thickening of a longer segment with a width of about 4 mm is also visible. **Figure 2B.** 3D CT result of head and neck preoperatively shows the parietal bone osteolysis, with dimensions 22x9mm.

CT result of head and neck preoperatively showed condition after surgery due to squamous cell neoplasm on the left temporoparietal region. A larger superficial ulcerative soft tissue thickening with an area of about 50-60mm and a thickness of about 12mm with intense contrast attenuation is observed locally, a finding of recurrence. Permeative osteolysis of the underlying part of the parietal bone with greater erosion of the external tabula and diploa is evident, and local dural thickening of a longer segment with a thickness of about 2-3 mm is also visible, which is clearly recolored after contrast.

Operative technique:

In July of 2023, the surgical treatment of the patient was performed at our hospital, during which the following steps were taken: the region to be excised was sterilely marked, a complete excision of the squamous cell carcinoma in the left frontotemporoparietal region was performed, after which a craniectomy was done on the local bone in healthy tissue. The infiltrated tissue of the squamous cell carcinoma in the left temporal muscle was removed, and excision of the locally affected dura was carried out, after which plastic reconstruction was performed on the defect with a healthy periosteum and temporal fascia.

The skin reconstruction was achieved on the local skin defect using rotating flaps with significant subgaleal “undermining”. The removed material was intraoperatively isolated and sent for pathohistological examination.

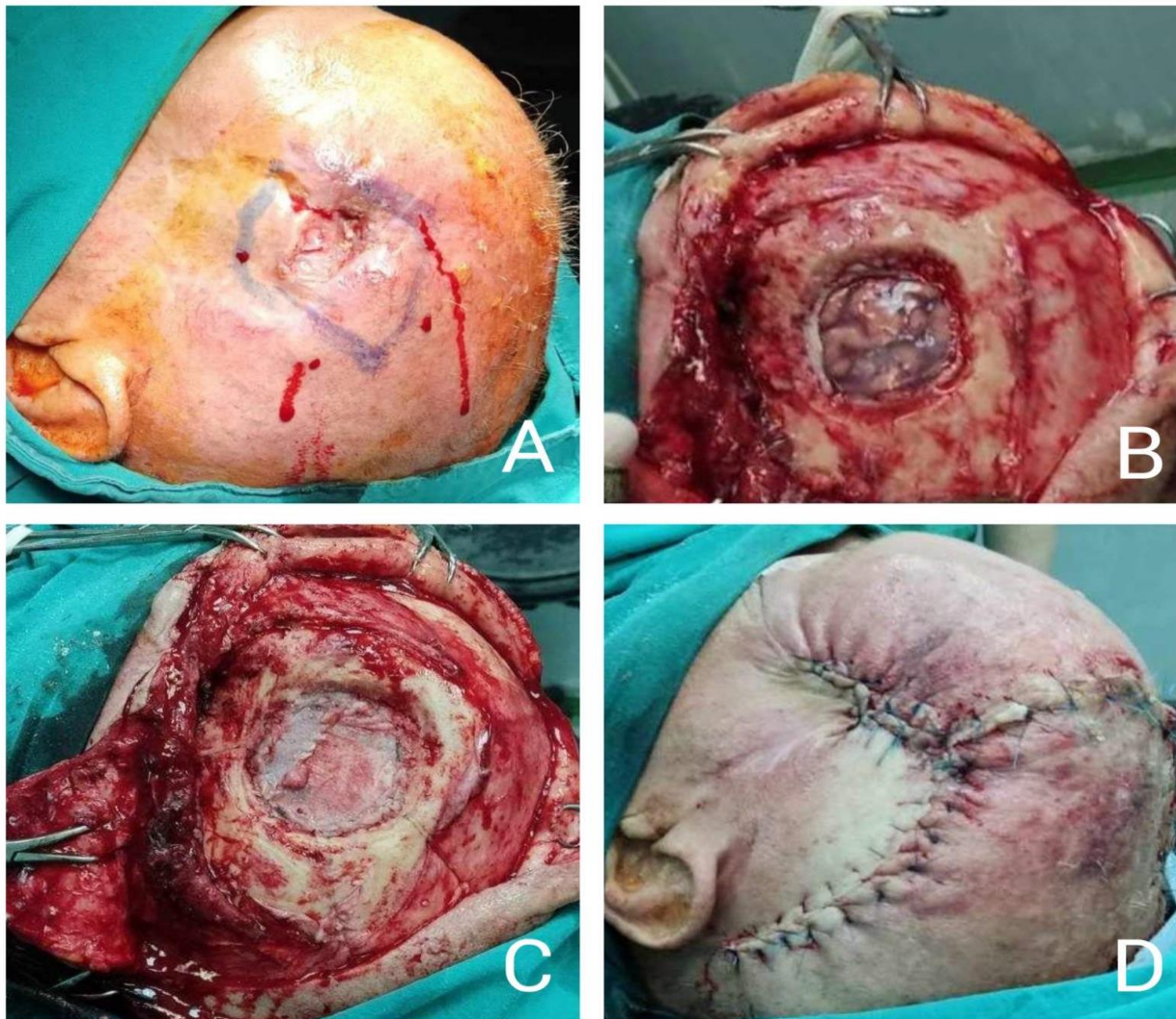


Figure 3A. Intraoperative sterile markings with methylene blue of the planned excision **Figure 3B.** Intraoperative showing of the meninges and brain tissue after a craniectomy was performed on the infiltrated bone and excision of the affected dura. **Figure 3C.** Intraoperative reconstruction of the locally

affected dura with the use of healthy periosteum and temporal fascia. **Figure 3D.** Intraoperative closure of the skin defect after plastic reconstruction using rotating flaps. Even though ischemic changes are visible in the temporal region, the vascular blood flow of the region returned shortly after surgery.

CT head and brain postoperatively showed a narrow subdural hygroma around the left cerebral hemisphere with the largest width of up to 5mm as observed, with a slight subdural hemorrhage in the proximal part of the described hygroma. During the hospitalization, the patient experienced a transient period of psycho-organic syndrome that was regulated with time and antipsychotics. Pathohistological analysis of the specimen confirmed invasive squamous cell carcinoma pT4. The patient was discharged in stable general health and improved local condition and was referred to an oncologist for disease control.

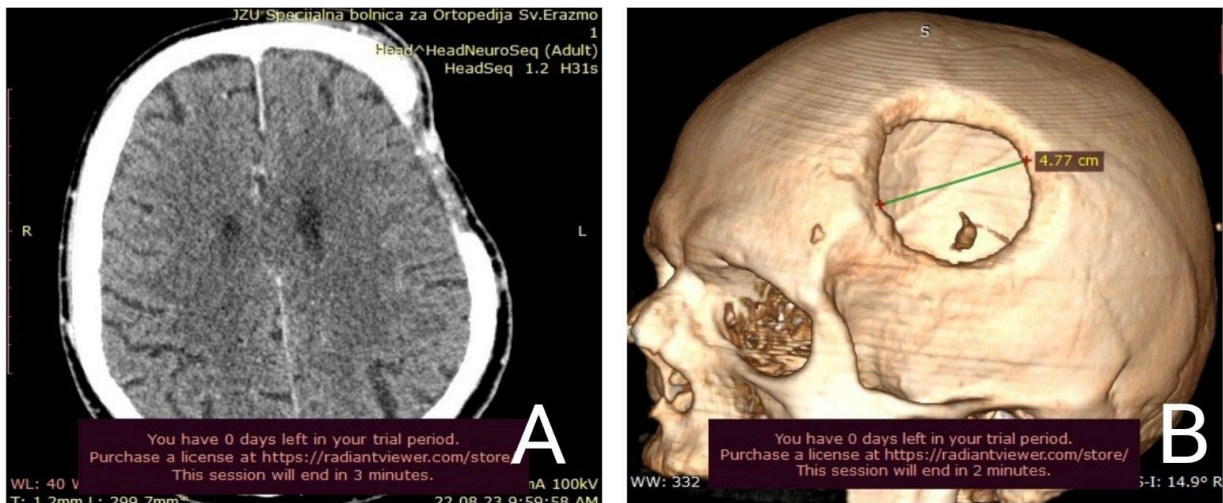


Figure 4A. CT result of head and brain postoperatively shows the removal of infiltrated tissue, a narrow subdural hygroma, and a slight subdural hemorrhage in the operated region. **Figure 4B.** 3D CT result of head and neck postoperatively shows the removal of infiltrated bone tissue, with a width of 4.77cm.



Figure 5. Postoperative follow-up 3 months after surgery.

Discussion

The reported case of recurrent invasive squamous cell carcinoma involving the skull necessitated a comprehensive discussion, which led to drawing insights from relevant literature. Taking into consideration the epidemiological insights, Andrade et al.'s comprehensive 5-year review of basal cell and squamous cell carcinomas in a dermatology department [1] and Chiu et al.'s study of malignant cutaneous tumors in Taiwanese patients [2] highlight the prevalence and demographic characteristics of the aforementioned cutaneous malignancies. These works underscore the rising incidence of skin cancers, particularly in sun-exposed regions like the scalp.

The selection of a rotational flap for skin reconstruction aligns with the principles outlined in Prohaska et al.'s discussion of Rotation Flaps [3].

The versatility of rotational flaps, outlined by Costa et al. [6], facilitates reconstruction in cases where conventional methods are inadequate. The rich vascular supply of the scalp allows for various orientations relative to the defect [3], a crucial aspect in addressing the intricacies of extensive scalp lesions.

When taking into consideration the reconstructive challenges and solutions Eck et al.'s evaluation of options for large scalp defect reconstruction [4] emphasizes the miscellaneous nature of the challenge. Our case aligns with their findings, highlighting the complexity of skin defects post-tumor excision and the imperative for a layered reconstructive approach.

The role of rotational flaps in achieving vascularized soft tissue coverage is particularly evident in our case. Cöloğlu et al.'s study on the management of non-melanocytic skin malignancies of the scalp and calvarium [5] and Malahias et al.'s exploration of extended scalp flaps [7] contribute to the understanding of reconstructive strategies and challenges.

Chirukandath et al.'s challenging case of squamous cell carcinoma with intracranial extension [8] aligns with our multidisciplinary approach. The collaboration between surgical and non-surgical disciplines becomes of supreme importance in cases with intracranial involvement.

Carducci et al.'s case report [9] emphasizes the importance of a multidisciplinary approach in managing exposed bone following malignant scalp tumor excision. In conclusion, the broad specter of epidemiological insights, innovative reconstructive techniques, and multidisciplinary collaboration, as outlined in the literature, resonates with the presented case report. Our experience emphasizes the importance of personalized, layered approaches in managing complex skin malignancies of the scalp.

Conclusion

In conclusion, the treatment of recurrent invasive squamous cell carcinoma involving the skull demands innovative approaches that balance efficacy, expeditious recovery, and optimal aesthetic outcomes.

The rotational scalp flap emerges as a reliable and safe choice for medium-sized complex scalp defects, offering not only a resolution but also a pathway to improved patient satisfaction and quality of life. The versatility of the rotational scalp flap, guided by an understanding of the vascularity of the scalp, positions it as a valuable tool in the collection of available resources for reconstructive surgeons.

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