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Calvarial bone destruction secondary to dermoid cyst with squamous cell carcinoma transformation: A rare case report

Laksmi Indreswari[1*], Novan Krisno Adji[2], Komang Yunita Wiryaning Putri[3], Jane Kosasih[4], Muhammad Yuda Nugrah[5]

[1,2,3,5]Faculty of Medicine, Universitas Jember, Indonesia
[1]Department of Surgery, RSD dr. Soebandi Jember, Jawa Timur, Indonesia
[2,3]Department of Neurosurgery, RSD dr. Soebandi Jember, Jawa Timur, Indonesia
[3]Department of Neurology, RSD dr. Soebandi Jember, Jawa Timur, Indonesia
[4]Department of Pathology Anatomy, RSD dr. Soebandi Jember, Jawa Timur, Indonesia
[5]Department of Emergency, RSD dr. Soebandi Jember, Jawa Timur, Indonesia

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ABSTRACT

Dermoid cysts are congenital, benign lesions that originate from ectodermal inclusions during embryogenesis and are most often encountered in the scalp and intracranial regions. While their clinical course is generally indolent, malignant transformation is an exceptionally rare phenomenon, with squamous cell carcinoma (SCC) being the most frequently reported histologic subtype. Such transformation is clinically significant, as it alters the otherwise benign natural history of dermoid cysts into a locally aggressive neoplasm capable of extensive tissue invasion. We report a rare case of a dermoid cyst undergoing malignant degeneration into SCC with associated calvarial bone destruction. This case highlights the importance of recognizing atypical clinical presentations and radiologic findings that may suggest malignant change. The clinical manifestations, radiographic characteristics, surgical approach, histopathological confirmation, and postoperative course are presented, followed by a review of the relevant literature to contextualize this uncommon entity and its therapeutic implications.

Corresponding Author:

Laksmi Indreswari,
Faculty of Medicine,
Universitas Jember,
Jl. Kalimantan No.37, Krajan Timur, Sumbersari, Kec. Sumbersari, Kab. Jember, Jawa Timur, 68121, Indonesia
Email: laksmiindreswari.fk@unej.ac.id

1. INTRODUCTION

Dermoid cysts are congenital lesions that originate from ectodermal inclusions during embryonic development and are most frequently found in the scalp, orbit, or intracranial regions, particularly along lines of embryonic fusion (Barkovich, 2005)(Smirniotopoulos & Chiechi, 1995). They are typically benign, slow-growing, and composed of keratinizing squamous epithelium with adnexal structures such as sebaceous and sweat glands (Andersen et al., 2005)(Retnani et al., 2021)(Ariesta, 2024)(Hutasoit et al., 2022). Although the vast majority remain non-neoplastic, rare cases of malignant transformation have been documented, most commonly into squamous cell carcinoma (SCC)(Tangjitgamol et al., 2003)(Tanggo et al., 2024)(Mahendra et al., 2026). Malignant transformation is estimated to occur in less than 2% of intracranial or scalp dermoid cysts, but when it does occur, it often presents with aggressive local behavior (Nickl et al., 2022)(Yolanda et al.,

2022)(Klinis, 2023)(Hana Muthi'a, 2025). The resulting SCC can cause progressive bone destruction of the calvaria and direct extension into adjacent soft tissues, meninges, or even intracranial structures, leading to significant morbidity (Kania et al., 2011)(Shaikh et al., 2019). In this case, we present a patient with calvarial bone destruction secondary to dermoid cyst with squamous cell carcinoma transformation.

2. RESEARCH METHOD

A 45-year-old man presented to the outpatient clinic with a progressively enlarging scalp mass over the left fronto-temporal region, initially painless. A neurological deficit was not noted. Based on physical examination, a firm and fixed mass were found adherent to the calvarium, with no skin changes, approximately 5x5 cm in size. No lymphadenopathies were found during physical examination. Further diagnosis using a contrast head CT scan was done, revealing a solid mass in the left fronto-temporal area and bone destruction around it (Figure 1).

The patient was planned for wide excision with resection of involved bone (craniectomy) ± dura, followed by reconstruction. During the surgery, a solid mass with a dermoid cyst-type mass was found in the extracranial region (Figure 2A), invading the intracranial tissue (Figure 2B and C). The wide excision successfully removed the entire of the mass.

The mass tissue was examined for pathological anatomy and were found multiple ulcers penetrating the underlying bone resembling a thin sheet. On the surface and inside the mass, multiple nodules with a soft, brown appearance (sebaceous-like) were observed. Several cut fragments showed soft tissue masses mixed with bone. The mass surface was covered with fibrin and debris (Figure 3).

Histopathologically, we found a calvaria specimen with multiple ulcers. One of the ulcers contains a tumor mass consisting of anaplastic squamous epithelial cells with heavily atypical nuclei, coarse chromatin, prominent nucleoli, and abundant cytoplasm containing keratin pearl. The cells are arranged in a solid pattern with keratin pearls, invading between the trabecular bones being part of the tumor is necrotic (Figure 4).

Postoperative course assessment: The patient was fully recovered without any complications. The patient was planned for referral to the oncologist for the next medication with adjuvant radiotherapy/chemotherapy administered due to malignant transformation.

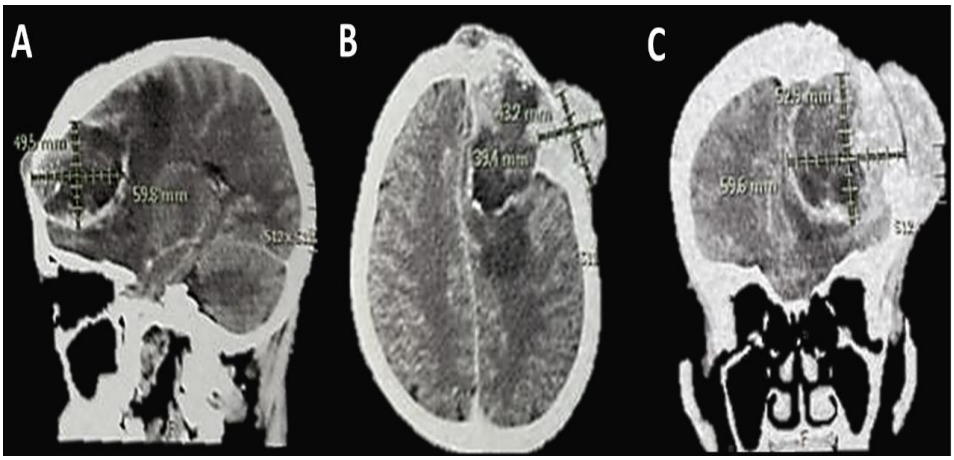

Figure 1. Head CT scan with contrast showed a solid mass in the brain parenchymal and showed calvarial bone destruction and an extracranial soft tissue mass. A. Sagital view, B. Axial view, C. Coronal view

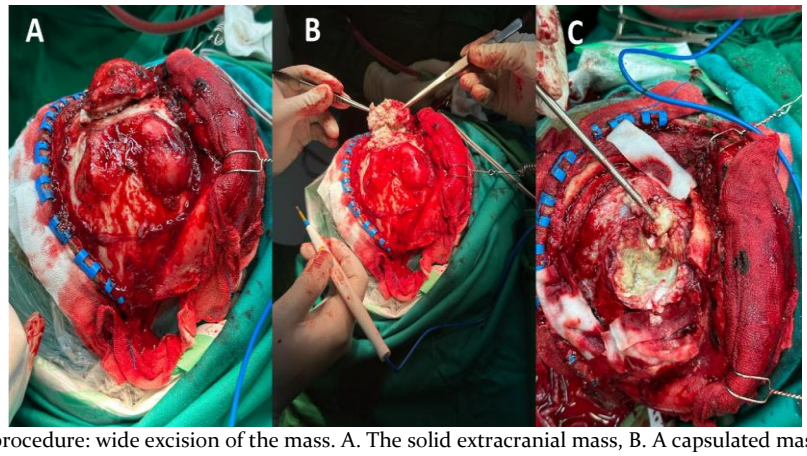

Figure 2. Surgical procedure: wide excision of the mass. A. The solid extracranial mass, B. A capsulated mass, C. Invasive mass into intracranial region

Figure 3. Macroscopic tissue of the mass

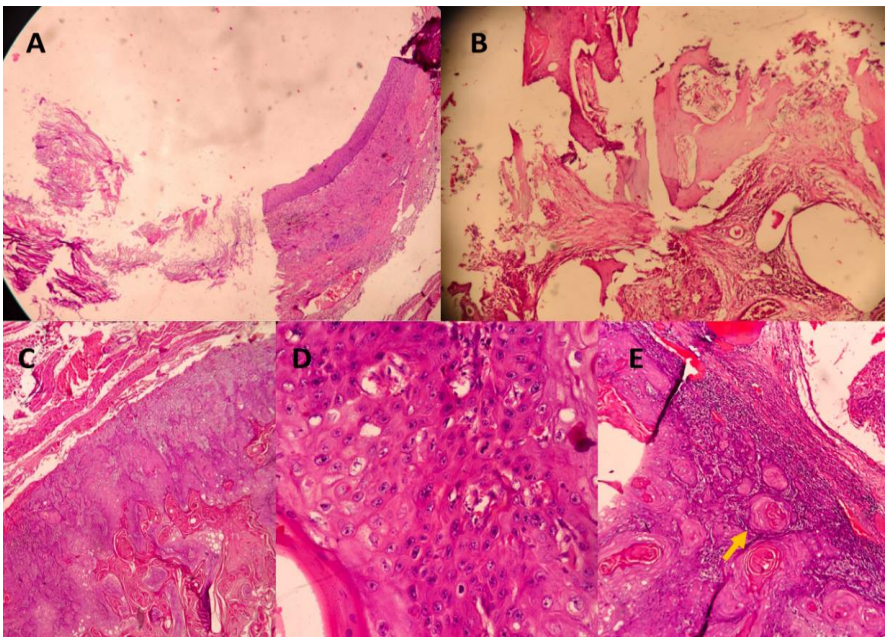

Figure 4. Histopathological appearances. A. Benign cyst with squamous epithelial type. B. Bone destruction within infiltrative malignant cell in the matrix and osteoid bone. C. Infiltrative malignant squamous

carcinoma cells. D. Atypical tumor cells. E. Keratin pearls appearances

3. RESULT AND DISCUSSION

Malignant transformation of dermoid cysts into SCC is exceedingly uncommon—virtually all cases of malignant dermoid cyst derive from the ectodermal components, with SCC being the predominant type. Imaging features of bone destruction—such as aggressive periosteal reaction, poorly defined margins, and soft tissue mass—often indicate malignancy rather than benign lesions (Epsilawati et al., 2018)(Elistyasari, 2023)(Nickl et al., 2022; Shaikh et al., 2019).

Similar malignant transformations occur more frequently in ovarian dermoid cysts (also known as mature cystic teratomas), although these remain rare (1–3% incidence), and SCC accounts for the majority of such transformations. While these reference cases do not involve calvarial lesions, they illustrate the broader oncologic potential of dermoid-type cysts (Maku et al., 2025)(Wijayanti et al., 2026)(Loyo et al., 2011).

Accurate imaging plays a crucial role in diagnosis and treatment planning. Computed tomography (CT) is particularly useful for detecting cortical and trabecular bone erosion, calcifications, and assessing the extent of osseous involvement (Miller et al., 2019)(Rahman et al., 2020)(Maulidiyah, 2023). In contrast, magnetic resonance imaging (MRI) provides superior soft tissue contrast and is essential for evaluating marrow infiltration, dural involvement, and potential extension into brain parenchyma (Koeller & Shih, 2019)(Sitanggang et al., 2021)(JUHAMRAN, 2025). Early recognition of malignant transformation within dermoid cysts is critical, as delayed diagnosis often leads to extensive local invasion and poor clinical outcomes (Nakazato & Hirato, 2005). Treatment requires wide surgical excision including affected bone and dura, with adjuvant therapy as indicated. Prognosis varies but warrants aggressive management and long-term follow-up.

4. CONCLUSION

We describe a rare calvarial dermoid cyst that underwent SCC transformation, resulting in bone destruction. Early diagnosis, radical surgical resection, and appropriate adjuvant treatment are crucial to optimizing outcomes. Clinicians should remain vigilant for malignant change in longstanding scalp dermoid cysts.

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