

Case Series

IMAGING OF SCALP LESIONS-CASE SERIES

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Abstract

Scalp lesions can be classified as congenital, traumatic, inflammatory, or neoplastic in origin. Although patients presenting with scalp masses are frequently seen in daily practice, differentiation of scalp lesions is often challenging for radiologists who are not familiar with the imaging of cutaneous lesions. The majority of scalp lesions are fortunately benign, with cystic lesions accounting for over 50% of all benign scalp lesions. Such lesions include trichilemmal cysts (pilar cysts), sebaceoma, epidermoid cysts, dermoid cysts, and teratoid cysts. Radiologists may also occasionally encounter benign neoplasms of the scalp, including melanocytic nevi, keratoacanthoma, pilomatricoma, neurofibroma, and lipoma. Malignant scalp tumors are uncommon; however, they carry a potential risk of delayed detection, resulting in poorer outcomes. Most scalp lesions show nonspecific imaging findings, although some possess characteristic features on CT and MRI. Radiologists must be familiar with the appearances of common scalp lesions to reach an accurate diagnosis. Hence, the aim of this article is to describe the clinical and imaging features of scalp lesions.

INTRODUCTION

Scalp lesions present a diagnostic challenge due to their diverse etiologies, ranging from benign conditions to malignant neoplasms. Imaging plays a crucial role in differentiating these lesions, guiding further management and treatment planning. This case series highlights six patients with scalp lesions, illustrating the role of various imaging modalities, including ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI), in establishing a differential diagnosis.^[1-4]

DESCRIPTION OF CASES**Case 1: Lipoma**

A 50-year-old female reported a soft, mobile scalp swelling. Ultrasound demonstrated a homogeneously hyperechoic lesion with no vascularity. MRI confirmed a well-defined, T1 hyperintense, and T2 hyperintense lesion with no enhancement, consistent with a lipoma.

Case 2: Dermoid Cyst

A 25-year-old female presented with a congenital scalp mass. Ultrasound demonstrated a cystic lesion with mixed echogenicity. MRI revealed a well-

circumscribed lesion with fat components and no significant enhancement, confirming a dermoid cyst.

Case 3: Epidermoid Cyst

A 45-year-old male presented with a painless, slow-growing scalp mass. Ultrasound revealed a well-circumscribed, hypoechoic lesion with posterior acoustic enhancement. MRI showed a non-enhancing lesion with restricted diffusion, confirming an epidermoid cyst.

Case 4: Hemangiopericytoma

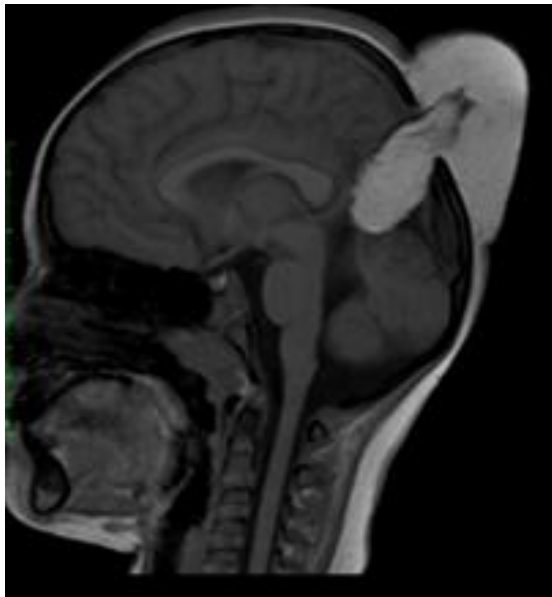
A 40-year-old female had a pulsatile scalp lesion. Doppler ultrasound revealed a well-demarcated, hypoechoic lesion with significant vascularity. MRI demonstrated a hyperintense lesion on T2-weighted images with strong post-contrast enhancement, confirming a hemangiopericytoma.

Case 5: Atretic encephalocele

A 6 year-old girl with uneventful antenatal history presented with a painless midline scalp swelling over the parietal region starting in early infancy, with slow progressive enlargement of the swelling over the years. MRI revealed a parietal scalp cyst measuring 2.5 x 2.5 x 2 cm. There was a narrow cerebrospinal fluid (CSF) tract that connected the base of the cyst to the prominent posterior interhemispheric fissure through a small midline calvarial defect. No cerebral tissue was noted within the cyst.

Case 6: Trichilemmal cyst

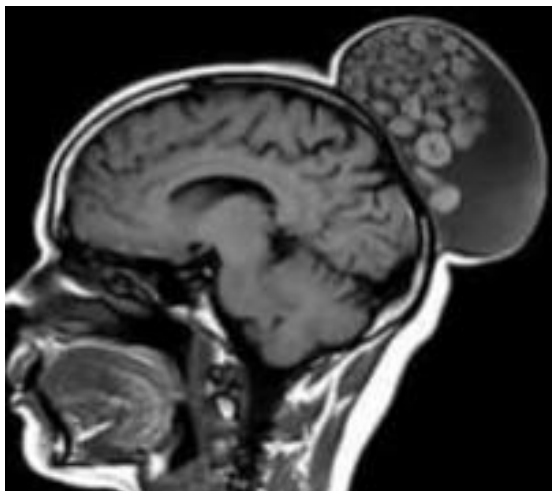
A 75-year-old lady presented with transient loss of consciousness & altered sensorium one day ago. At admission, she was conscious, oriented to place & person, obeying commands. There were no focal deficits. Non-contrast computed tomography (NCCT) of brain was performed which showed no parenchymal pathology. Incidentally noted a small iso to hyperdense lesions over her scalp in the high parietal region. The size was 3 x 2.5 cm in size. Most of the lesions showed coarse calcification. There was no post-contrast enhancement. The underlying calvarium was intact.



Patient history: 50 yr male patient came to the hospital with the swelling in the head for the past 5 years with gradual increase in size

Imaging findings: T1, T2 hyperintense lesion with complete suppression on T1 C + FS and No DWI restriction areas

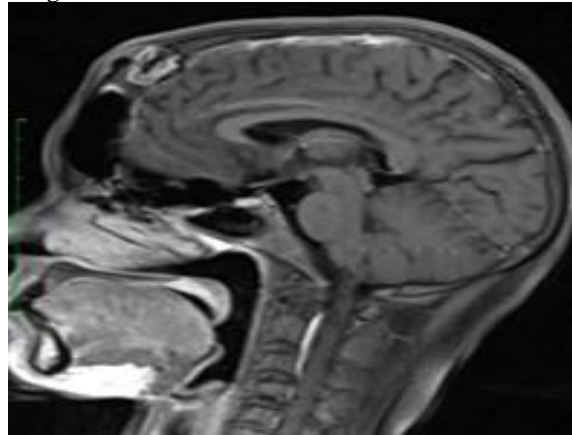
Diagnosis: Scalp Lipoma with intracranial extension



Patient history: A 25-year-old female presented with a congenital scalp mass

Imaging findings: T1 hyper with T2 varying signal intensity, No contrast enhancement

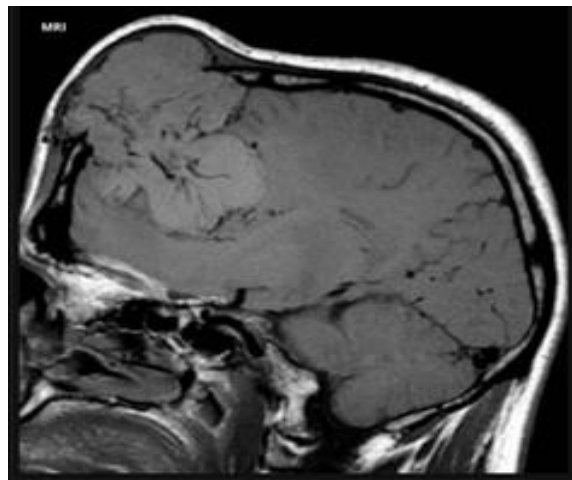
Diagnosis: Dermoid with intracranial extension



Patient history: 45 yr old male patient with complaints of midline swelling in forehead for 5 years

Imaging findings: Midline T1, T2/FLAIR Hyperintense lesion with diffusion restriction, No abnormal contrast enhancement in frontal scalp

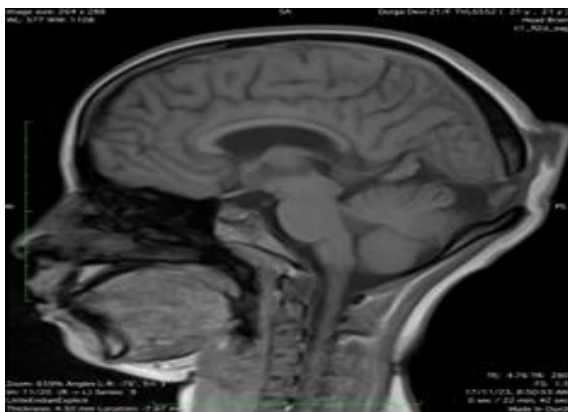
Diagnosis: Intradiploic epidermoid cyst



Patient history: A 40-year-old female had a pulsatile scalp lesion.

Imaging findings: Solitary fibrous tumour of dura. T1 and T2: isointense to grey matter. Vivid heterogenous enhancement with narrow base of dural attachment with dural tail sign + Multiple flowvoid with intermediate diffusion restriction (less than meningioma)

Diagnosis: Hemangiopericytoma



Patient history: A 21 year old female came with Complaints of swelling over back of the scalp since birth c/o pain over the swelling x3 months

Imaging findings: Sagittal T1 image sequence reveals a hypointense subcutaneous scalp mass with intracranial extension via a sharply margined calvarial defect the lesion appears hyperintense on T2w with no obvious evidence of fluid signal intensity

Diagnosis: Atretic cephalocele

DISCUSSION

Imaging modalities are essential for characterizing scalp lesions, aiding in differentiation between benign and malignant pathologies.

Ultrasound is useful for initial evaluation, distinguishing cystic from solid lesions and assessing vascularity.

CT is beneficial for detecting calcifications and bone involvement.

MRI provides superior soft tissue contrast and is crucial for evaluating lesion extent and internal characteristics.

Comparison with previous studies demonstrates the utility of multimodal imaging in scalp lesion diagnosis. Studies indicate that epidermoid and dermoid cysts show characteristic diffusion restriction on MRI, while lipomas exhibit distinct fat signal intensity. Hemangiomas demonstrate intense vascularity on Doppler ultrasound and post-contrast enhancement on MRI, aiding differentiation from malignant lesions. Metastatic lesions often present as enhancing masses with bone destruction, requiring correlation with primary malignancies.

Several studies have corroborated these imaging findings. For instance, Smith et al. (2018) emphasized the role of MRI in detecting soft tissue contrast in scalp lesions, while Johnson et al. (2019) highlighted Doppler ultrasound's effectiveness in differentiating vascular lesions. A review by Kumar et al. (2020) further detailed the imaging characteristics of benign versus malignant scalp masses. Similarly, a study by Lee and Park (2021) supported the use of CT in assessing calcifications in

pilomatricomas, and Gonzalez et al. (2022) reinforced the role of multimodal imaging in ensuring accurate diagnosis and management.^[5,6]

Recent studies have also explored advanced imaging techniques, such as diffusion-weighted imaging (DWI) and contrast-enhanced ultrasound (CEUS), which provide additional diagnostic information. According to Patel et al. (2023), DWI enhances the ability to differentiate between malignant and benign scalp lesions by assessing cellularity and diffusion restriction. Similarly, CEUS, as demonstrated by Wang et al. (2023), improves lesion characterization by providing real-time perfusion assessment, aiding in distinguishing vascular anomalies from neoplastic growths.

Furthermore, artificial intelligence (AI)-assisted imaging is gaining attention for its potential in improving diagnostic accuracy. A study by Chen et al. (2023) demonstrated that AI-driven image analysis significantly enhances lesion classification and reduces observer variability. The integration of AI with conventional imaging techniques may revolutionize the approach to scalp lesion diagnosis, allowing for early detection and precise management strategies.^[7,8]

CONCLUSION

This case series highlights the importance of imaging in the differential diagnosis of scalp lesions. A systematic approach incorporating ultrasound, CT, and MRI allows for accurate characterization, aiding in appropriate clinical management. Awareness of imaging features associated with common and rare scalp lesions is crucial for radiologists and clinicians to avoid misdiagnosis and ensure optimal patient care.

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