Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Radiology

Computed Tomography in the Evaluation of Ossified Cephalhematoma: Imaging Insights

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DOI: https://doi.org/10.36347/sjmcr.2025.v13i10.052 | **Received:** 19.08.2025 | **Accepted:** 07.10.2025 | **Published:** 21.10.2025

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Abstract **Case Report**

Ossified cephalhematoma (OC) is a rare benign complication of neonatal cephalhematoma. While cephalhematoma itself is a relatively common condition in neonates typically undergo spontaneous resolution, the progression to ossification is an uncommon pathological evolution that characterizes this distinct clinical entity. The diagnosis is primarily clinical, particularly in the context of a documented cephalhematoma at birth or a difficult delivery with or without instrumental assistance. However, certain differential diagnoses most notably encephalocele and calvarial bone tumors may create diagnostic challenges for the clinician. Computed tomography (CT) is essential, as ossified cephalhematoma demonstrates pathognomonic features that allow for a definitive diagnosis. We report two cases of OC in newborns, emphasizing the characteristic CT findings.

Keywords: Cephalhematoma, Computed tomography, Double skull sign, Infant, Neonatal trauma, Ossified cephalhematoma, Skull lesions.

INTRODUCTION

Cephalhematoma in neonates results from bleeding in the subperiosteal layer of the scalp, confined between the periosteum and the outer table of the calvaria, and therefore does not cross cranial sutures [1]. It is most commonly located in the parietal region and frequently associated with traumatic deliveries, particularly assisted vaginal births using forceps or vacuum extraction, although it may also occur after normal delivery. With improved antenatal monitoring and obstetric care, its incidence has declined [1]. The natural course is spontaneous resorption within 4–6 weeks. Ossified cephalhematoma (OC) represents a rare pathological evolution, occurring sporadically without clearly defined causes or mechanisms [1,2]. Diagnosis is usually straightforward, but atypical cases with incomplete history or minimal deformity may pose challenges. CT scanning is the modality of choice, as it best demonstrates the characteristic ossified layer and provides clear differentiation from other bony lesions [4].

CASE PRESENTATION

Case 1:

A 2-month-old developmentally normal male infant presented with a firm tumefaction of the right parieto-occipital scalp noted since birth. The child was delivered via spontaneous vaginal delivery, without instrumentation or perinatal complications. Shortly after birth, a swelling developed over the right parietal region, which was initially considered benign by the attending midwife. The newborn's neurological examination was unremarkable. Over the following weeks, the lesion progressively indurated and became firm. Computed tomography (CT) of the head revealed a right parietal extra-cranial hypodense collection, unenhanced after contrast administration, and delineated by two osseous layers. The outer layer was in continuity with the calvarium, creating the characteristic "double skull sign," thereby confirming the diagnosis of ossified cephalhematoma.

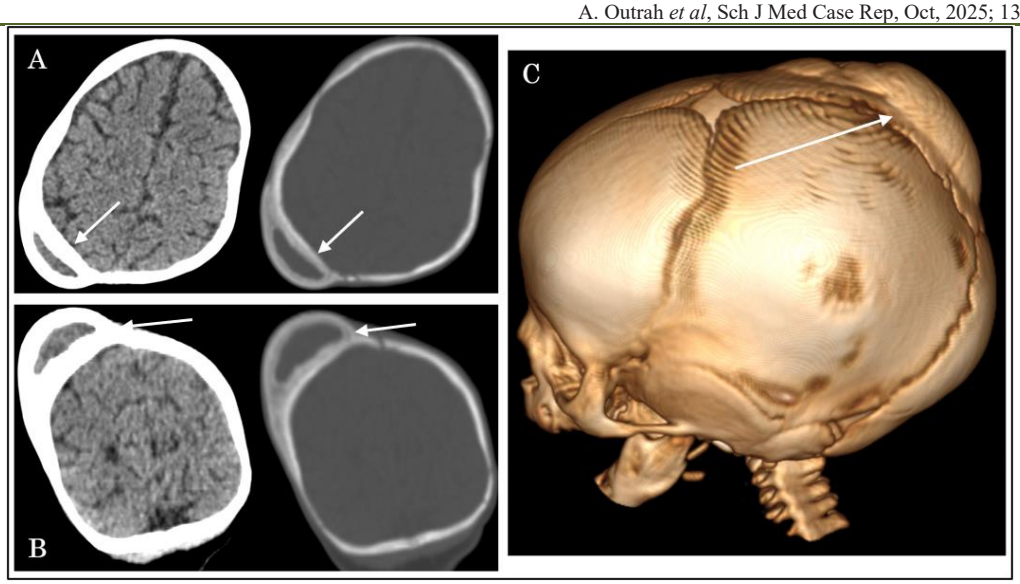

Figure 1: A CT-scan in axial (A) and coronal (B) views with 3D reconstruction (C) a right parietal extra-cranial hypodense collection, unenhanced after contrast administration, and delineated by two osseous layers. The outer layer was in continuity with the calvarium, creating the characteristic "double skull sign"

Case 2:

A 3-month-old male infant was brought for evaluation of a persistent, hard swelling over the left parietal region. The lesion had been noticed since early infancy and showed no tendency to regress. Neurological examination was unremarkable. Computed tomography (CT) of the skull revealed a well-circumscribed extra-cranial hypodense collection in the left parietal area, without post-contrast enhancement. The collection was enclosed between two bony plates, with the external layer continuous with the calvarium, producing the characteristic "double skull sign." These findings were diagnostic of an ossified cephalhematoma.

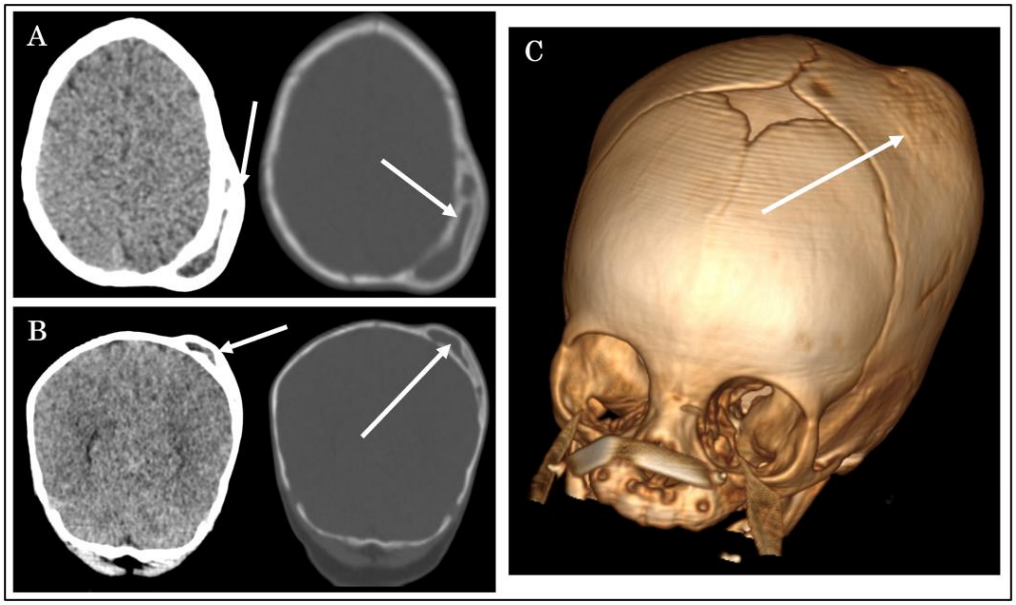

Figure 2: A CT-scan in axial (A) and coronal (B) views with 3D reconstruction (C) a left parietal extra-cranial hypodense collection, unenhanced after contrast administration. The collection was enclosed between two bony plates, with the external layer continuous with the calvarium, producing the characteristic "double skull sign".

DISCUSSION

Cephalhematoma is a frequent neonatal finding, resulting from subperiosteal bleeding after birth trauma [4]. It is localized between the periosteum and the outer table of the cranium, and because of periosteal attachments it does not cross suture lines [1]. This anatomical distinction is important, as it differentiates cephalhematoma from caput succedaneum and subgaleal hematoma [3,4]. In most cases, cephalhematomas are self-limited and undergo spontaneous resorption within the first weeks of life. In a minority of patients, however, the hematoma progresses to calcification and

ossification, giving rise to ossified cephalhematoma (OC) [1]. The pathogenesis of this rare outcome remains uncertain, though proposed mechanisms include stimulation of osteogenic periosteal progenitor cells within the organizing hematoma and the influence of local inflammatory mediators [1]. Recognition of OC is clinically important, as it may mimic other cranial lesions and create diagnostic uncertainty. Clinically, OC usually manifests as a hard, immobile scalp swelling that persists beyond the expected period of resolution [5]. Although benign, OC may occasionally result in significant cosmetic deformity, and in rare cases has been associated with complications such as inward depression of the calvarium or secondary craniosynostosis [2]. The differential diagnosis includes encephalocele, calvarial tumors, and chronic intradiploic hematoma, entities that may require a different therapeutic approach [1]. Radiological evaluation is therefore essential. Computed tomography (CT) is the modality of choice because of its superior ability to delineate osseous structures [2]. The hallmark CT finding is a hypodense extra-cranial collection bounded by two bony layers, with the outer lamella in continuity with the calvarium [6]. This appearance, known as the "double skull sign," is pathognomonic of OC and was present in both of our cases. Conversely, the presence of a defect in the inner lamella argues against the diagnosis of OC and raises suspicion for alternative pathologies [6]. Ossified cephalhematomas are classified into two types: type 1, in which the inner table is preserved without inward encroachment, and type 2, where depression of the inner lamella is present and may compromise intracranial volume [1,6]. This classification is clinically relevant, as it guides management. Treatment strategies remain debated. Conservative observation is often favored in type 1 OC, where the risk of complications is low and spontaneous remodeling has been described, even after ossification has occurred. Surgical intervention is generally reserved for type 2 lesions, or in cases with marked cranial deformity or significant cosmetic concerns [4]. When performed early, surgery typically yields excellent functional and aesthetic outcomes, reducing long-term psychosocial impact on the child and family. The cases presented here illustrate the diagnostic value of CT in confirming OC and differentiating it from more aggressive or congenital lesions. They highlight the clinical spectrum of this condition, which may present either as a persistent incidental swelling or as a progressively hard mass causing parental concern. Ultimately, awareness of OC and its radiological hallmarks is essential for timely diagnosis, avoidance of unnecessary procedures, and appropriate management tailored to each patient.

CONCLUSION

Ossified cephalhematoma is a rare but distinctive complication of neonatal cephalhematoma that may mimic other calvarial lesions. Computed tomography provides pathognomonic imaging features, particularly the "double skull sign," allowing a confident diagnosis and appropriate management planning. While most cases remain benign, recognition of this entity is crucial to avoid misdiagnosis and unnecessary interventions. Our two cases highlight the pivotal role of CT in establishing the diagnosis and underline the importance of considering ossified cephalhematoma in the differential diagnosis of persistent cranial swellings in infancy.

Conflict of Interest: The authors declare no conflicts of interest.

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