The Importance of Follow-Up: Juvenile Xanthogranuloma Mimicking Cephalohematoma

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DISCLOSURES
The views expressed in this publication are those of the authors and do not necessarily reflect the official policy of the Department of Defense, Department of the Army, U.S. Army Medical Department, or the U.S. Government.

CONSENT
Did the author obtain written informed consent from the patient for submission of this manuscript for publication? Yes

HUMAN AND ANIMAL RIGHTS
This report was conducted in accordance with the ethical standards of Tripler Army Medical Center and the Declaration of Helsinki. IRB approval was not required for single case reports per institutional policy.

ABSTRACT

Juvenile xanthogranuloma is a type of non-Langerhans cell histiocytosis primarily affecting infants and young children. It is an uncommon disease and is rarely considered in the differential in radiological studies of infants. A case of juvenile xanthogranuloma mimicking a cephalohematoma in an otherwise healthy 3-month-old infant born via vacuum assisted delivery is presented here. At a follow-up appointment, interval growth and internal color Doppler flow with arterial waveform were noted on ultrasound. The differential diagnosis was expanded to include other well-circumscribed hypoechoic scalp lesions. At 8 months of age the lesion was surgically excised, and immunohistochemistry established the definitive diagnosis of juvenile xanthogranuloma. This case emphasizes the importance of following cephalohematomas clinically to resolution in order to exclude an alternate underlying pathology.

CASE REPORT

CASE REPORT

An otherwise healthy 3-month-old infant born via vacuum-assisted delivery presented with a palpable parietal scalp mass (Figure 1). The mother of the patient noticed a bump at approximately 2 months of age, but was uncertain it was present post-delivery. Ultrasonography (US) revealed a subcutaneous hypoechoic mass external to the calvarium, not crossing calvarial sutures. The initial diagnosis of cephalohematoma was made considering the vacuum-assisted delivery history. US follow-up at 6 weeks was recommended if the lesion were to increase in size.

At 4 months of age, interval growth and internal color Doppler flow with arterial waveform were noted on US. The differential diagnosis was expanded to include dermoid cyst and pilomatricoma, as they are common, well-circumscribe,d hypoechoic scalp lesions. The less likely diagnoses of Langerhans cell histiocytosis, syringocystadenoma papilliferum, and cylindroma were also included, with lymphoma being unlikely.

Follow-up US and or MRI was recommended with referral to surgery. At 5 months of age, US demonstrated that the mass had increased in size (Figure 2). Cross-sectional CT or MRI and surgical excision were recommended. Due to the COVID-19

pandemic, surgery was delayed to 8 months of age. The surgical report was consistent with a dermoid inclusion cyst, with complete excision of the mass and preservation of its capsule. There was no calvarial involvement. Gross pathology demonstrated a thin wall containing a firm gelatinous milky yellow white material. Histologic sections and immunohistochemistry established the definitive diagnosis of juvenile xanthogranuloma (JXG) (Figure 3). The patient is doing well post-resection.

DISCUSSION

This case highlights a rare presentation of juvenile xanthogranuloma mimicking cephalohematoma in an otherwise healthy infant. The initial diagnosis was reasonable given the clinical context of vacuum-assisted delivery, but the lesion's interval growth and internal vascularity prompted reconsideration. Further imaging and histopathological evaluation ultimately led to the correct diagnosis. This case underscores the importance of continued clinical follow-up of presumed cephalohematomas and other scalp masses to ensure they resolve as expected. Lesions that deviate from the typical clinical course should prompt re-evaluation and an expanded differential, including rare entities like juvenile xanthogranuloma.

Etiology and Epidemiology

Juvenile Xanthogranuloma (JXG) is a type of non-Langerhans cell histiocytosis that primarily affects infants and young children, with the median age of onset between 5 months to one year. In children, the disease has a higher incidence in males than females (1.4:1) and may affect all ethnicities, although few cases have been reported in black patients [1]. The true incidence of JXG is unknown. The disease is characterized by the rapid proliferation of macrophages in a granulomatous histiocytic reaction, presumably in response to physical or infectious stimuli [2]. The pathogenesis of JXG remains poorly understood.

Clinical and Imaging Findings

JXG can have diverse morphological features, yet most commonly it presents as a well-defined large nodule measuring 0.5 to 2 centimeters that is classically yellowish or erythematous but can have a normal skin color [3]. In a study of 174 cases of JXG, 66% of lesions occurred as a solitary cutaneous nodule of the head, neck or torso [3]. While this lesion often resolves spontaneously [1], there are also reports of progressive growth [4, 5]. Extracutaneous manifestations are infrequent but most commonly arise in the eye or lung. Cases of xanthogranuloma with systemic involvement are rare, difficult to diagnose, and occasionally fatal [3].

Ultrasonography is first-line for the evaluation of cutaneous pediatric masses [6]. On US, JXG can be described as a superficial, well-demarcated, avascular, hypoechoic mass. CT or MRI can be performed to further characterize the lesion and define the extent of the disease. Findings can range from iso- to hyperintense on T1 and iso- to hypointense on T2 and can enhance homogeneously post-gadolinium [7].

The clinical and radiographical presentation of JXG is non-specific therefore histopathology is the gold standard for a definitive diagnosis [8]. Classically, JXG shows dense invasion of mononuclear cells, multinucleated cells with or without Touton features, and spindle cells. Since such cellular morphology is common in many non-Langerhans cell histiocytosis types, immunohistochemical staining is performed. JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin and stains mostly negative for S100 and regularly negative for CD1a and CD207 [9].

Treatment and Prognosis

Cutaneous JXG is often managed conservatively as these lesions are known to resolve spontaneously within 1 to 5 years [10]. The prognosis is good as it is a benign lesion. Surgical excision may be performed for cosmetic purposes or if the lesion continues to grow. In a study of 174 cases of JXG, systemic manifestations with a mortality rate of 5-10% occur in 4% of children with cutaneous lesions [3]. Further imaging should be pursued if there is concern for systemic involvement or to characterize the lesion before excision.

Differential Diagnosis

The differential diagnosis of cutaneous lesions in the infant is broad, and therefore, frequent US is necessary for characterization and monitoring for any changes in size, shape, content, or vascularity of the mass [6]. In this patient, the lesion was uncharacteristically large [3] and was not discolored as seen classically in JXG (Figure 1).

In this clinical setting, the parietal skull location, history of vacuum delivery, and the ultrasound imaging features of a hypoechoic extracalvarial soft tissue mass bounded by sutures were consistent with the diagnosis of cephalohematoma. Cephalohematoma is the benign aggregation of blood cells underneath the scalp, presenting as a characteristic firm bulge that is often not present after birth but arises hours or even days later [11]. Cephalohematomas should be followed clinically to resolution to exclude an alternate underlying pathology. The increase in size of the lesion between the initial appointment and the follow-up led to the expansion of the differential diagnosis to include other hypoechoic scalp lesions, and the eventual recommended MRI or US follow-up with referral to surgery.

Other common well-circumscribed hypoechoic scalp lesions include dermoid or epidermoid cysts and pilomatricoma. Pilomatricoma is a benign neoplasm of hair matrix origin, described as a calcifying epithelioma most commonly found on the face, scalp, neck or trunk [12]. Dermoid or epidermoid cysts are benign cutaneous lesions [13]. The classic histological presentations of dermoid or epidermoid cysts and pilomatricoma were not found in the histological evaluation of this lesion, and thus they were ruled out [14].

Other less common hypoechoic scalp lesions, such as Langerhans cell histiocytosis, syringocystadenoma papilliferum, cylindroma, and lymphoma, were included in the differential diagnosis following the US at 4 weeks. Langerhans cell histiocytosis (LCH) is a rare systemic hematologic disorder characterized by the differentiation of myeloid precursors into CD1a+/CD207+ in lesions [16]. The immunohistological staining of this lesion was negative for all of the previously described factors, so the diagnosis of LCH was ruled out.

Syringocystadenoma papilliferum (SP) is characterized as a rare benign adnexal tumor originating from the apocrine or eccrine sweat glands [16]. Dermal cylindromas are very rare benign adnexal tumors occurring most commonly on the head and neck [17]. The histopathology of the lesion did not match that of SP or cylindroma, so these diagnoses were ruled out.

The final differential diagnosis considered was lymphoma, which was ruled out as the child is thriving and the location of the lesion made this diagnosis unlikely.

TEACHING POINT

Juvenile Xanthogranuloma is an uncommon disease and is rarely considered in the differential diagnosis in radiological studies of infants. The teaching point is not to consider this diagnosis but rather to emphasize the importance of imaging and clinical follow-up if there are atypical features or clinical changes in a suspected cephalohematoma or other scalp mass, and to consider surgical referral for atypical or growing lesions.

QUESTIONS

Questions 1: What is the most common sequelae of vacuum assisted delivery?

1. Cephalohematoma (applies)
2. Xanthogranuloma
3. Spongiform cylindroma
4. Syringocystadenoma papilliferum
5. Lymphoma

Explanation:

1. Cephalohematomas is the most common lesion post vacuum assisted delivery [Cephalohematoma is the benign aggregation of blood cells underneath the scalp presenting as a characteristic firm bulge that is often not present after birth but arising hours or even days later.]
2. Xanthogranuloma is not a common sequelae of vacuum assisted delivery. [The disease is characterized by the rapid proliferation of macrophages in a granulomatous histiocytic reaction, presumably in response to a physical or infectious stimuli]
3. Dermal cylindromas are not a common sequelae of vacuum assisted delivery. [Dermal cylindromas are very rare benign adnexal tumors occurring most commonly on the head and neck.]
4. Syringocystadenoma papilliferum is not a common sequelae of vacuum assisted delivery. [They are a rare benign adnexal tumor originating from the apocrine or eccrine sweat glands.]
5. Lymphoma is not a common sequelae of vacuum assisted delivery. [The final differential diagnosis considered was lymphoma, which was ruled out as the child is thriving and the location of the lesion made this diagnosis unlikely.]

Questions 2: The follow up care of a cephalohematoma is based on which of the following?

1. Radiologic Imaging
2. Clinical exam findings (applies)
3. Not ever necessary
4. Biopsy
5. Genetic analysis

Explanation:

1. Follow up care of a cephalohematoma can include radiologic imaging, but is based primarily on clinical exam findings [CT or MRI can be performed to further characterize the lesion and define the extent of the disease].
2. Clinical exam findings should guide the follow-up care of a cephalohematoma [The increase in size of the lesion between the initial appointment and the follow-up led to the expansion of the differential diagnosis to include other hypoechoic scalp lesions].
3. Follow up care of a cephalohematoma is necessary. [The teaching point is not to consider this diagnosis but rather to emphasize the importance of imaging and clinical follow up if there are atypical features or clinical changes in a suspected cephalohematoma or other scalp mass, and to consider surgical referral for atypical or growing lesions.]
4. Follow up care of a cephalohematoma can include biopsy or surgical excision, but is based primarily on clinical exam findings [Cross sectional CT or MRI and surgical excision was recommended.]
5. Genetic analysis is not relevant for the basis of follow up care of a cephalohematoma.

Questions 3: The primary workup for a palpable dermal mass is which of the following?

1. MRI
2. Nuclear medicine
3. Ultrasound (applies)
4. CT
5. Radiograph

Explanation:

1. Follow up for a palpable dermal mass may involve MRI secondary to ultrasound of the mass, but is not recommended for primary workup. [Cross sectional CT or MRI and surgical excision was recommended]
2. Nuclear medicine would not be relevant to the primary workup.

3. Ultrasound would be recommended for the primary workup of a palpable dermal mass. [Ultrasonography is first-line for the evaluation of cutaneous pediatric masses]
4. Follow up for a palpable dermal mass may involve CT secondary to ultrasound of the mass, but is not recommended for primary workup. [Cross sectional CT or MRI and surgical excision was recommended]
5. Radiograph would not be relevant to the primary workup of the dermal mass.

Questions 4: Xanthogranuloma stains positive for:
1. CD163
2. CD68
3. CD1a
4. a and b only (applies)
5. all of the above

Explanation:
1. Xanthogranuloma stains positive for CD163, however another answer (4) is a better choice because it includes two of the markers. [JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin]
2. Xanthogranuloma stains positive for CD68, however another answer (4) is a better choice because it includes two of the markers. [JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin]
3. Xanthogranuloma does not stain positive for CD1a, and in fact regularly negative for CD1a and CD207. [JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin and stains mostly negative for S100 and regularly negative for CD1a and CD207]
4. This is the best answer choice because it includes the two markers listed, CD163 and CD68, which Xanthogranuloma is known to stain positive for. [JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin]
5. This answer choice is false, as JXG does not stain positive for CD1a. [JXG stains positive for CD163, CD68, CD14, factor XIIIa, and fascin and stains mostly negative for S100 and regularly negative for CD1a and CD207]

Questions 5: The benign neoplasm juvenile xanthogranuloma is derived from:
1. proliferating eccrine sweat glands
2. immature T Cells
3. Erythrocytes
4. Keratinocytes
5. foamy histiocytes (applies)

Explanation:
1. Syringocystadenoma papilliferum is derived from proliferating eccrine sweat glands. [Syringocystadenoma papilliferum (SP) is characterized as a rare benign adnexal tumor originating from the apocrine or eccrine sweat glands]
2. Lymphoma is derived from immature T cells.
3. JXG is not derived from erythrocytes.
4. Pilomatricoma is derived from keratinocytes [Pilomatricoma is a benign neoplasm of hair matrix origin,]
5. JXG is derived from foamy histiocytes. [The disease is characterized by the rapid proliferation of macrophages in a granulomatous histiocytic reaction, presumably in response to a physical or infectious stimuli]

REFERENCES

[1] Janssen D, Harms D. Juvenile xanthogranuloma in childhood and adolescence: a clinicopathologic study of 129 patients from the Kiel pediatric tumor registry. *Am J Surg Pathol*. 2005; 29(1): 21–28. PMID: 15613853.

[2] Szczerkowska-Dobosz A, Kozicka D, Purzycka-Bohdan D, Biernat W, Stawczyk M, Nowicki R. Juvenile xanthogranuloma: a rare benign histiocytic disorder. *Postepy Dermatol Alergol.* 2014; 31(3): 197-200. PMID: 25097495.

[3] Dehner LP. Juvenile xanthogranulomas in the first two decades of life: a clinicopathologic study of 174 cases with cutaneous and extracutaneous manifestations. *Am J Surg Pathol.* 2003; 27(5): 579-593. PMID: 12717244.

[4] Park YW, Koh EJ, Choi HY. Rapid-growing juvenile xanthogranuloma on the scalp in 18-month-old girl. *J Korean Neurosurg Soc.* 2011; 50(3): 271-273. PMID: 22102964.

[5] Kwon HN, Choi KU, Oh SJ, Choi SW. Rapidly growing juvenile xanthogranuloma of the auricle. *Ear Nose Throat J.* 2025; 104(5): 265-267. PMID: 35791499.

[6] Bansal AG, Rosenberg HK. Sonography of pediatric superficial lumps and bumps: examples from head to toe. *Pediatr Radiol.* 2017; 47(9): 1171-1183. PMID: 28779193.

[7] Ginat DT, Vargas SO, Silvera VM, Volk MS, Degar BA, Robson CD. Imaging Features of Juvenile Xanthogranuloma of the Pediatric Head and Neck. *AJNR Am J Neuroradiol.* 2016; 37(5): 910-916. PMID: 26744443

[8] Höck M, Zelger B, Schweigmann G, et al. The various clinical spectra of juvenile xanthogranuloma: imaging for two case reports and review of the literature. *BMC Pediatr.* 2019; 19(1): 128. PMID: 31018833.

[9] Freyer DR, Kennedy R, Bostrom BC, Kohut G, Dehner LP. Juvenile xanthogranuloma: forms of systemic disease and their clinical implications. *J Pediatr.* 1996; 129(2): 227–237. PMID: 8765620.

[10] Isaacs H Jr. Fetal and neonatal histiocytoses. *Pediatr Blood Cancer*. 2006; 47(2): 123–129. PMID: 16416419.

[11] Raines D, Krawiec C, Jain S. Cephalohematoma. *StatPearls.* 2022. PMID: 29262234.

[12] DeRosa DC, Lin-Hurtubise K. Pilomatricoma: An Unusual Dermatologic Neoplasm. *Hawaii J Med Public Health.* 2012; 71(10): 282-286. PMID: 23115748.

[13] Prior A, Anania P, Pacetti M, et al. Dermoid and Epidermoid Cysts of Scalp: Case Series of 234 Consecutive Patients. *World Neurosurg.* 2018; 120: 119-124. PMID: 30189303.

[14] Hoang V, Trinh C, Nguyen C. Overview of Epidermoid Cyst. *European Journal of Radiology*. 2019; 291-301. PMID: 31516916.

[15] Rodriguez-Galindo C, Allen C. Langerhans cell histiocytosis. *Blood.* 2020; 135 (16): 1319–1331. PMID: 32106306.

[16] Sangma MM, Dasiah SD, Bhat V R. Syringocystadenoma Papilliferum of the Scalp in an Adult Male – A Case Report. *J Clin Diagn Res.* 2013; 7(4): 742–743. PMID: 23730665.

[17] Chauhan DS, Guruprasad Y. Dermal cylindroma of the scalp. *Natl J Maxillofac Surg.* 2012; 3(1): 59–61. PMID: 23251061.

FIGURES

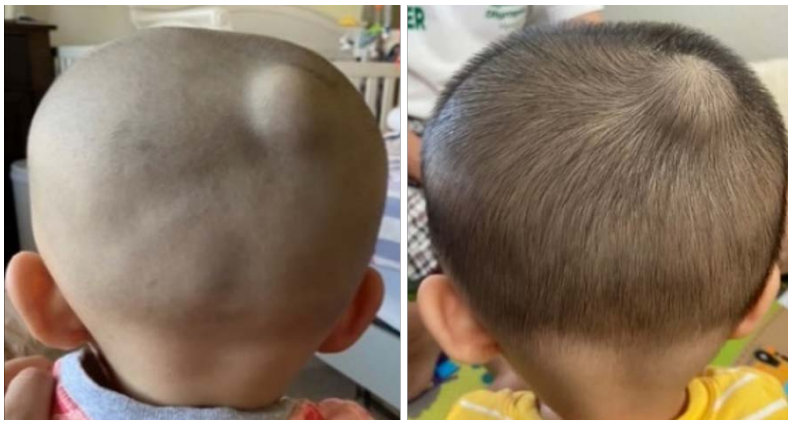

Figure 1: A 3-month-old male patient with juvenile xanthogranuloma.

FINDINGS: Patient presents with a superficial well-circumscribed palpable parietal mass.

TECHNIQUE: Clinical images provided by the patient's mother.

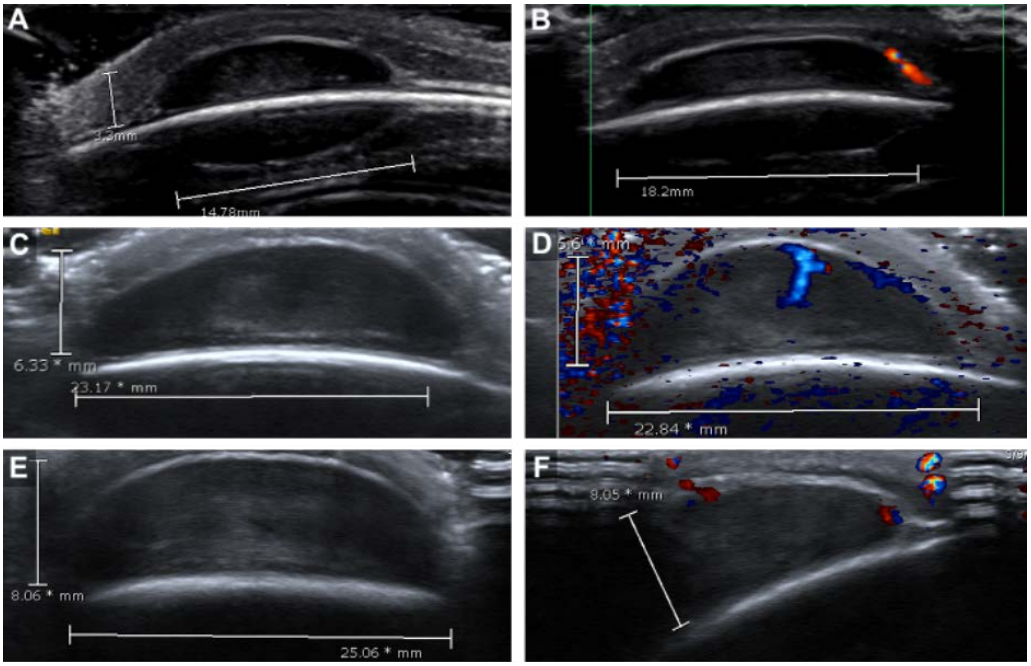

Figure 2: A 3-8 month old male patient with parietal cutaneous JXG.

FINDINGS:
Presentation at 3 months: Ovoid hypoechoic subcutaneous slightly compressible lesion external to the calvarium measuring 1.8 x 1.5 x 0.3 cm and small mirror image artifact (A) with peripheral color Doppler (B). Diagnosis of right parietal cephalohematoma was reported with recommendation for 6 week follow up if lesion increased.
Follow up at 4 months: Interval growth of well circumscribed non fixed mass of right parietal region 2.3 x 2.1 x 0.6 cm (C) with internal flow on color Doppler (D). Differential included persistent resolving cephalohematoma post vacuum extraction versus Dermoid cyst, Pilomatricoma, Langerhans cell histiocytosis, Syringocystadenoma papilliferum and Cylindroma, with Lymphoma unlikely. MRI follow-up and/or surgical consultation was recommended.
Follow up at 5 months: Interval growth of right parietal soft tissue mass now measuring 3.1 x 2.5 x 0.8cm (E) with persistent central color Doppler signal (F). Surgical excision recommended with consideration for MRI for calvarial involvement.

TECHNIQUE: GE Voluson E10 Ultrasound Machine

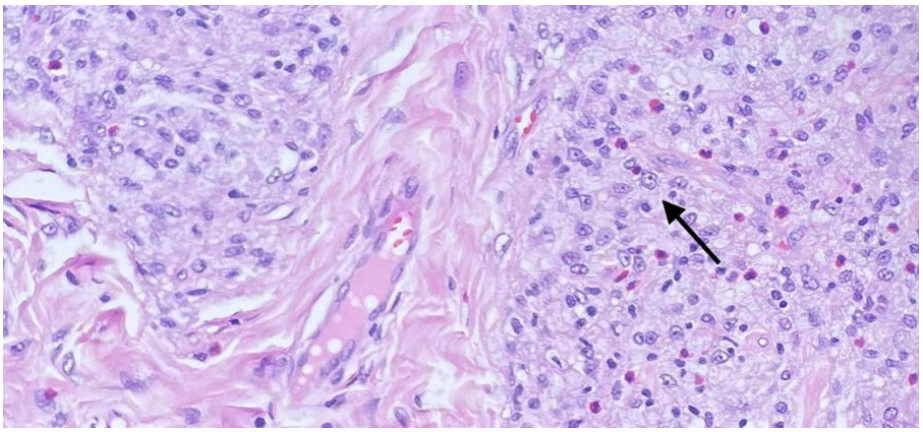

Figure 3: 8 month old male with parietal cutaneous JXG.
FINDINGS:
Histologic sections of excised mass revealed a well-circumscribed neoplasm predominantly composed of foamy histiocytes (black arrow), arranged in nests and sheets, with intervening fibrovascular stroma. Many eosinophils and scattered lymphocytes were noted in the background. Mitotic figures were inconspicuous, and no necrosis was present.
Immunohistochemical staining revealed the cells were positive for CD163, CD68, and Factor 13A and negative for CD1A, Langerin, and S100. A final diagnosis of juvenile xanthogranuloma was made.
TECHNIQUE: Histologic evaluation of excised mass of parietal scalp

KEYWORDS

juvenile xanthogranuloma, non-Langerhans cell histiocytosis, cephalohematoma, vacuum assisted delivery, ultrasonography, follow-up care

ABBREVIATIONS

JXG = JUVENILE XANTHOGRANULOMA
US = ULTRASOUND
LCH = LANGERHANS CELL HISTIOCYTOSIS
SP = SYRINGOCYSTADENOMA PAPILLIFERUM

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