DOI: 10.7860/JCDR/2023/64752.18227

Case Report

Neonatology Section

Cephalhaematoma Mimicking an Extradural Haematoma due to Mirror-Image Artifact on Sonography in a Term Neonate: A Case Report

LAXMAN BASANY[1], G NAGA KARTHIK[2], G NAGA PRIYANKA[3], RK ABHISHEK[4]

ABSTRACT

Cephalhaematomas and subgaleal haematomas are among the most common birth injuries and are associated with birth trauma, forceps, and vacuum-assisted deliveries. They present as scalp swelling and are usually identified shortly after birth. During sonographic examination, if an ultrasound beam scatters off a mirror-like interface, it creates mirror-image artifacts that can cause a diagnostic dilemma. In this case report, a six-day-old neonate presented with a right-side parietal cephalhaematoma that appeared to resemble an epidural haematoma on routine sonographic examination. Gray scale ultrasound revealed an anechoic structure resembling an epidural haematoma in the right parietal region. However, a non-contrast-enhanced computed tomography (NECT) scan of the brain showed a cephalhaematoma without an underlying epidural haematoma. Further evaluation using colour Doppler sonography revealed normal vascular findings within an anechoic space, and gray scale imaging in the sagittal plane showed normal cerebral parenchyma without midline shift. These findings helped identify the observed structure as a mirror-image artifact. It is important to note that these artifacts can lead to diagnostic errors, resulting in additional investigations and causing anxiety for parents. Understanding and being aware of these artifacts can help avoid unnecessary imaging and reduce radiation exposure.

Keywords: Birth trauma, Cranial doppler, Cranial ultrasound, Epidural haemorrhage, Ultrasound artifact

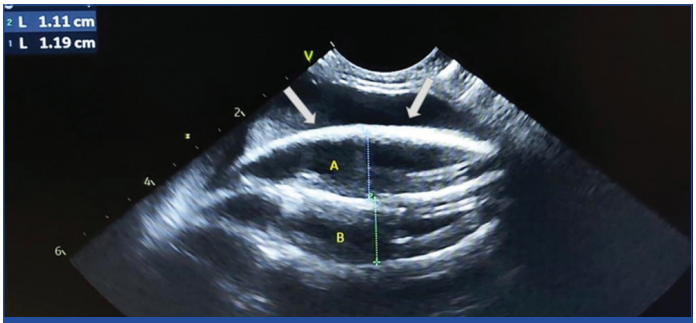
CASE REPORT

A six-day-old full-term neonate was referred to the emergency department due to an increasing size of a scalp swelling. The swelling was first noticed by the parents 24 hours after birth. The baby was born at 39 weeks of gestation to a 28-year-old primigravida mother through forceps-assisted delivery. The baby weighed 3620 grams (75th centile) and had good Apgar scores. The antenatal period was uneventful and the baby was born to non-consanguineous parents.

At 24 hours of life, the parents noticed a small swelling on the right side of the scalp and consulted a paediatrician. The baby had a soft fluctuant swelling in the right parietal region measuring 3×3 cm, with well-defined margins that did not cross suture lines. This finding was suggestive of a cephalhaematoma. The parents were reassured and the baby was discharged from the hospital at 48 hours of age with instructions to follow-up for jaundice.

On the sixth day of life, the parents noticed an increase in the size of the swelling and consulted the paediatrician again. The baby was active and breastfeeding well. Due to the progressive increase in size of the swelling, a cranial ultrasound was performed. The ultrasound showed a cephalhaematoma with an anechoic lenticular-shaped extra-axial collection underneath, measuring 5×2 cm, suggestive of an epidural haematoma [Table/Fig-1]. The ventricles were normal in size and there was no midline shift.

Considering the possibility of an epidural haematoma, the baby was immediately referred to the emergency department. On examination, the baby weighed 3580 grams, was afebrile, active, vigorous, and had a right parietal cephalhaematoma measuring 5×5 cm. The baby was icteric up to the knees. Vital signs and neurological examination were normal. Total serum bilirubin was 12.8 mg/dL (direct bilirubin 1.0 mg/dL), and thyroid profile was normal. There was no blood group incompatibility, and the bilirubin level was below the threshold for phototherapy.

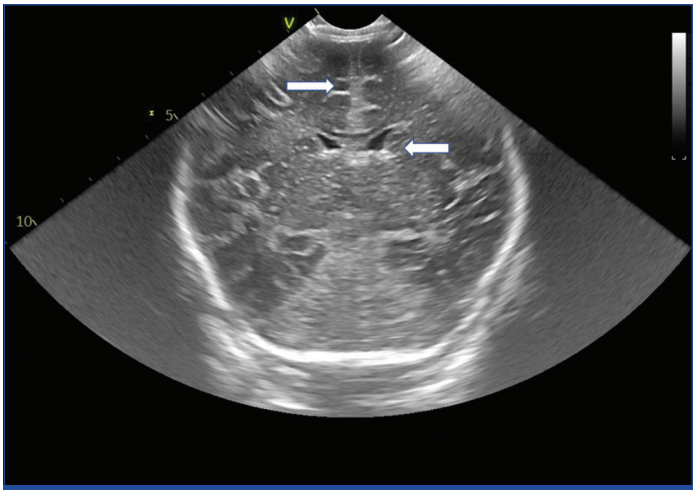


[Table/Fig-1]: Coronal sonogram in the right parietal region shows cephalhematoma (A). An anechoic meniscus shaped area (B) in pericerebral space mimics an epidural haematoma. The white arrows indicate the calvarium.

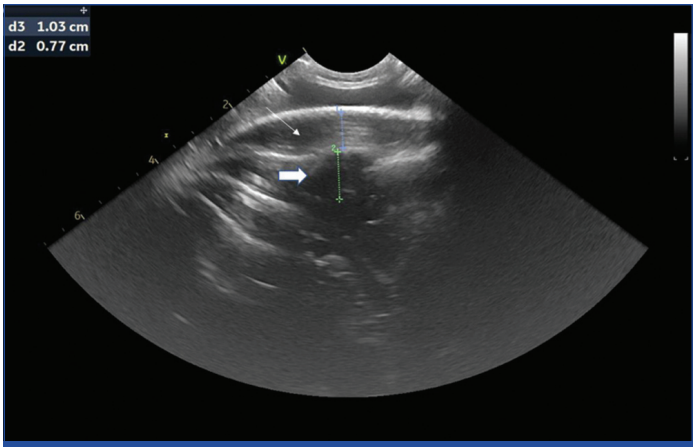
To further investigate the epidural haematoma, despite the normal neurological examination, a non-contrast-enhanced CT scan (NECT) of the brain was performed. The coronal section of the NECT brain showed a cephalhaematoma without any underlying intracranial extra-axial collections or mass effect, as demonstrated in the ultrasound. This confirmed the possibility of a mirror image artifact in the ultrasound [Table/Fig-2].

In our hospital, a cranial ultrasound with Doppler study was performed, which showed normal midline structures and parenchymal vascularity. There was no displacement of vascular structures or midline shift [Table/Fig-3]. Gentle compression of the cephalhaematoma with the transducer reduced the size of the image, confirming that the anechoic structure resembling an epidural haematoma was a mirror-image artifact of the cephalhaematoma [Table/Fig-4]. The baby remained asymptomatic and the cephalhaematoma resolved within three weeks. At three months of age, the baby's growth and development were normal.

[Table/Fig-2]: Unenhanced CT scan shows cephalhaematoma (arrow) in right parietal region without epidural haematoma.



[Table/Fig-3]: Coronal view showing normal ventricles without any compression or midline shift (shown by arrows).

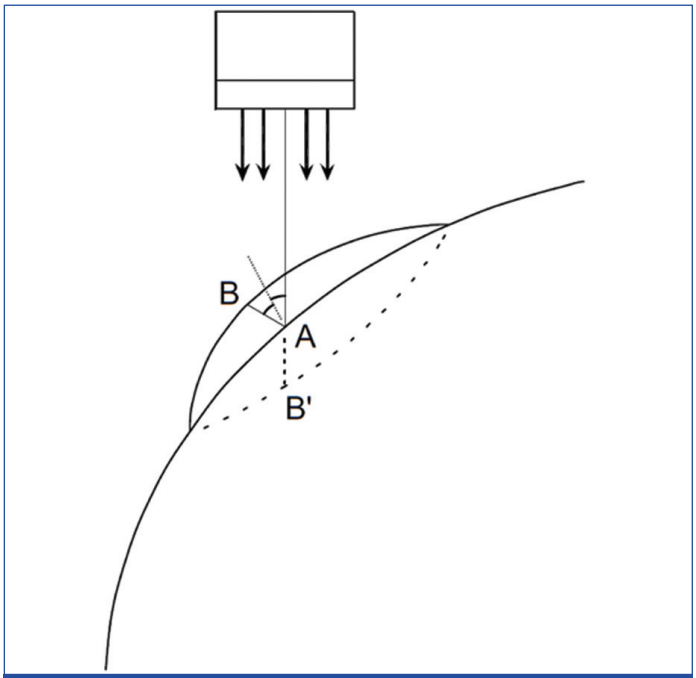


[Table/Fig-4]: Gentle compression of the cephalhaematoma (thin arrow) with transducer reduced the size of the image, which confirmed the mirror-image artifact (bold arrow) of cephalhaematoma.

DISCUSSION

Artifacts in ultrasonography are not uncommon, and it is important to be aware of them to prevent diagnostic errors. Common artifacts include posterior acoustic shadows, enhancement artifacts, edge artifacts, mirror imaging artifacts, and reverberation artifacts [1]. These artifacts can cause misdiagnosis and obscure important findings.

For example, [Table/Fig-5] when the ultrasound beam strikes an oblique reflective echogenic structure at point A, it reflects to point B and returns to the transducer. The transducer interprets the delayed echo as being reflected from an equidistant structure at point B/, creating a mirror-image artifact of the haematoma on the other side of the reflective calvarium [2,3].



[Table/Fig-5]: Illustration depicts the mechanism of the formation of mirror-image artifact on transcranial sonogram obtained using linear-array transducer. The ultrasound beam is reflected off the calvarium at point A, hits point B and returns to the transducer, which assumes that image originated from B/ [3].

Similar cases were reported in the literature. In one case, a neonate with a suspected epidural haematoma underwent an emergency CT scan of the brain after cranial ultrasound showed a suspicious finding [2]. Another case involved a neonate with a cephalhematoma that mimicked an epidural haematoma; an MRI ruled out the haematoma [3]. In yet another case, a neonate with a cephalhematoma underwent a non-enhanced CT scan of the brain due to a suspicious ultrasound image [4]. In all these cases, further imaging (CT or MRI) was performed because the cranial ultrasound images raised suspicion of an epidural haematoma that couldn't be ruled out conclusively.

Large and smooth surfaces like the diaphragm, pleura, bowel, gall bladder, and urinary bladder can produce these artifacts due to their highly reflective acoustic interfaces [5].

In the index case, the skull bone reflected the ultrasound beam, creating a mirror-image artifact of the cephalhematoma on the opposite side, resembling an epidural haematoma. The use of the Doppler technique can be helpful in evaluating cerebral lesions and extra-axial collections [6]. However, this artifact was difficult to recognise as it mimicked an abnormality seen in forceps-assisted deliveries. Power Doppler sonography, which shows vascular structures within the lesion, can aid in identifying it as an artifact [7].

The baby developed a cephalhematoma that progressively increased in size but remained asymptomatic, with a normal neurological examination. Babies with subgaleal, epidural, and subdural haematomas usually present with symptoms such as shock, vomiting, irritability, decreased activity, and seizures. A history of difficult delivery, instrumentation, birth trauma, and resuscitation is often present [8]. Neurological examination may reveal abnormalities such as a bulging anterior fontanelle, abnormal pupils, and altered sensorium. After obtaining non-enhanced CT (NECT) images that ruled out an epidural haematoma, we performed cranial ultrasound in our unit. Gentle graded compression of the lesion with the transducer reduced the size of the mirror-image artifact proportionately, and Doppler ultrasonography showed normal blood vessels in the cerebral parenchyma crossing the artifact [9,10].

No midline shift or compression of the lateral ventricle, which is often observed with extra-cerebral haematomas, was noted. This case demonstrates that mirror-image artifacts can be observed on cranial sonography, particularly in babies with cephalhematomas. Identifying artifacts helps avoid unnecessary further investigations and alleviates parental anxiety.

CONCLUSION(S)

Cranial ultrasound is an essential, non-invasive, non-ionising, and portable imaging modality in newborns. It provides quick and valuable information for diagnosing intracranial bleeding, assessing ventricle size, and identifying cerebral malformations. Mirror images can occur during ultrasonography, leading to misdiagnosis and unnecessary further investigations. In the index case, a cephalhematoma was initially mistaken for an epidural haematoma, but this was ruled out with a non-enhanced CT (NECT) scan of the brain. History and physical examination play a crucial role in interpreting ultrasound images. Having knowledge and awareness of these artifacts reduces parental anxiety, avoids additional imaging, and prevents radiation exposure.

REFERENCES

[1] Scanlan KA. Sonographic artifacts and their origins. AJR Am J Roentgenol. 1991;156(6):1267-72.
[2] Liz CF, Novo A, Nascimento M, Alves JE, Frutuoso S, Carvalho C. An unexpected cranial ultrasound image. Neoreviews. 2020;21(1):e63-e65.
[3] Amosa DM, Hernandez GB, Ruiz GJA, Alvarez SJA. False epidural haematoma in a neonatal ultrasound. An Pediatr (Barc). 2014;80(6):405-06.
[4] Van SE, Valgaeren B, Claikens B. Mirror-image artifact of a cephalhematoma mimicking an epidural hematoma in a newborn. J Belg Soc Radiol. 2022;106(1):28.
[5] Mihmanli I, Cetinkaya S, Kurugoglu S, Kantarci F, Esen G. Another face of mirror-image artifact. Eur J Ultrasound. 2001;14(2-3):183-85.
[6] Chen CY, Chou TY, Zimmerman RA, Lee CC, Chen FH, Faro SH. Pericerebral fluid collection: Differentiation of enlarged subarachnoid spaces from subdural collections with color Doppler US. Radiology. 1996;201(2):389-92.
[7] Cakmakci H, Gulcu A, Zenger MN. Mirror-image artifact mimicking epidural hematoma: Usefulness of power Doppler sonography. J Clin Ultrasound. 2003;31(8):437-39.
[8] Sorantin E, Brader P, Thimary F. Neonatal trauma. Eur J Radiol. 2006;60(2):199-207.
[9] Zenger MN, Kabataş S, Zenger S, Cakmakçi H. The value of power Doppler ultrasonography in the differential diagnosis of intracranial extraaxial fluid collections. Diagn Interv Radiol. 2007;13(2):61-63.
[10] Couture A, Veyrac C, Baud C, Saguintaah M, Ferran JL. Advanced cranial ultrasound: Transfontanellar doppler imaging in neonates. Eur Radiol. 2001;11(12):2399-410.

PARTICULARS OF CONTRIBUTORS:
1. Consultant Neonatologist, Department of Neonatology, Ankura Hospital for Women and Children, Hyderabad, Telangana, India.
2. Chief Radiologist, Department of Radiology, Prathyusha Diagnostics and Advanced Fetal Imaging Centre, Hyderabad, Telangana, India.
3. Junior Consultant Neonatologist, Department of Neonatology, Ankura Hospital for Women and Children, Hyderabad, Telangana, India.
4. Registrar, Department of Neonatology, Ankura Hospital for Women and Children, Hyderabad, Telangana, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Laxman Basany,
Flat 301, B Block, Legend Galaxy, Laxminagar Colony, Kothapet,
Hyderabad-500035, Telangana, India.
E-mail: laxmanbasani@yahoo.co.in

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 17, 2023
- Manual Googling: Apr 28, 2023
- iThenticate Software: May 18, 2023 (2%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 15, 2023**
Date of Peer Review: **May 11, 2023**
Date of Acceptance: **May 27, 2023**
Date of Publishing: **Jul 01, 2023**