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CASE REPORT

A cephalhaematoma and maybe more, a tricky diagnosis

Thomas Saliba, Marco Preziosi

Background

Cephalhematomas are fairly common occurrences in children who have undergone traumatic births. These often result in ultrasound requests in order to rule out central nervous system damage.

Case presentation

We present the case of a 13-day-old boy with a large cephalhaematoma who was referred for a transfontanellar ultrasound. The ultrasound exam revealed a cephalhaematoma with what appeared to be a large extra-axial collection on the other side of the of the skull, opposite to the site of the cephalhaematoma. An MRI was performed to confirm the finding, revealing the collection to be caused by the mirror image artefact.

Discussion

The mirror image artefact is caused by the delayed return of ultrasound waves due to multiple reflections before reaching the ultrasound probe. This can cause the appearance of some images to be repeated and found in abnormal positions when the signal is interpreted and displayed on the screen. This is an important artefact to be aware of as it may cause images to be misinterpreted and cause unnecessary alarm, all the while making it very difficult to outright dismiss the possibility of the image being real, posing a diagnostic dilemma for the radiologist.

The existence of the mirror image artefact once again shows that ultrasound, though undeniably useful, can be fraught with challenges. Knowledge of these artefacts is important yet does not necessarily allow the radiologist to differentiate between a real image and an artefactual one.

Dr Thomas Saliba, BSc, MD
Centre Hospitalier Universitaire Vaudois (CHUV),
Lausanne, Switzerland
https://orcid.org/0000-0001-6989-9577

Dr Marco Preziosi, MD
Hopital des enfants reine Elizabeth (HUDERF),
Brussels, Belgium

Cephalhematomas are a relatively common occurrence in children who have suffered trauma during the birthing process, occurring in up to 2.5% of all live births.[1] Using ultrasound, cephalhematomas present as hypoechogenic collections outside the skull.[2] One may also see a hypoechogenic image within the skull, that may be an intracranial collection or be artefactual. We present the case of a 13-day-old boy with a substantial cephalhematoma in whom an artefact sparked concern of an intracranial collection.

CASE REPORT

A 13-day-old boy presented for a transfontanelle ultrasound following a traumatic, non-instrument-assisted birth, and the subsequent development of a left-sided parietal cephalohematoma was present. A previous transfontanelle brain ultrasound had been performed on the second day of life with normal findings. The patient was in a good clinical condition, showing no signs of neurological deterioration. Ultrasonography of the brain showed the absence of any mass effect. When the ultrasound probe was placed on the parietal cephalhematoma, a hypoechogenic liquid with hyper-echogenic mobile dots was visible on the outside of the skull. Beyond the hyper-echogenic skull bone was a hypo-echogenic zone with the appearance of circumvolutions in the deepest areas (Figure 1-3). This is unexpected in the context of an extra-axial collection. The appearance of circumvolutions, seen through the hazy deep layer, suggested a collection producing a mass effect on that segment of the brain. The diagnosis of an extra-axial collection was made, assuming that the trauma which resulted in the cephalhematoma also caused intra-cranial bleeding. To confirm the results of the ultrasound, a brain MRI was performed the following day, showing a totally normal image, without any signs of extra-axial brain hemorrhage. In the absence of pathological MRI findings, it was suspected that the ultrasound image was a mirror image artefact. The hypo-echogenic area seen within the skull was therefore the reflection of the cephalhematoma within the skull, giving rise to the image which was thought to be an extra-axial collection. This was even more confusing due to the visibility of brain circumvolutions within the mirroring effect, leading us to mistaken belief that the collection was causing a mass effect. This case demonstrates a known, but

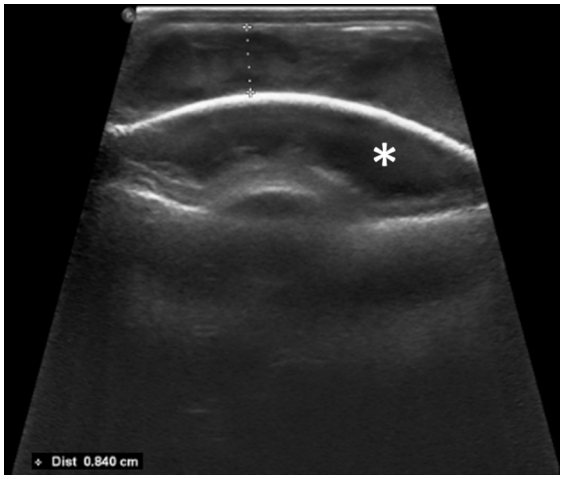

Figure 1 *Coronal image of the brain using a high frequency linear probe showing a cephalhaematoma on the external part of the skull. On the internal part of the skull is a collection (asterisk) with what appears to be a circumvolution of the brain.*

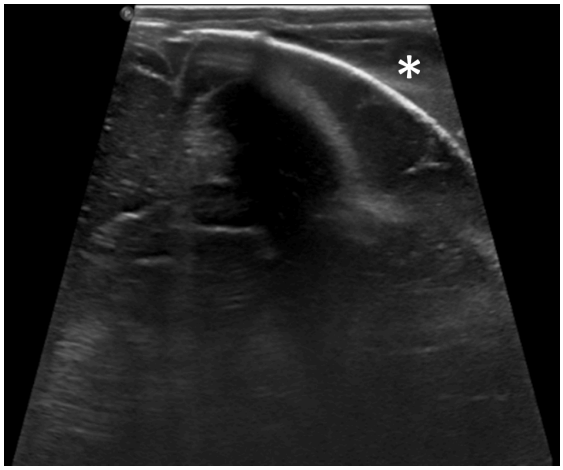

Figure 2 *Coronal image of the brain using a high frequency linear probe showing a cephalhematoma on the external part of the skull (asterisk). On the inner part of the skull one can see the circumvolutions alongside what appears to be a collection.*

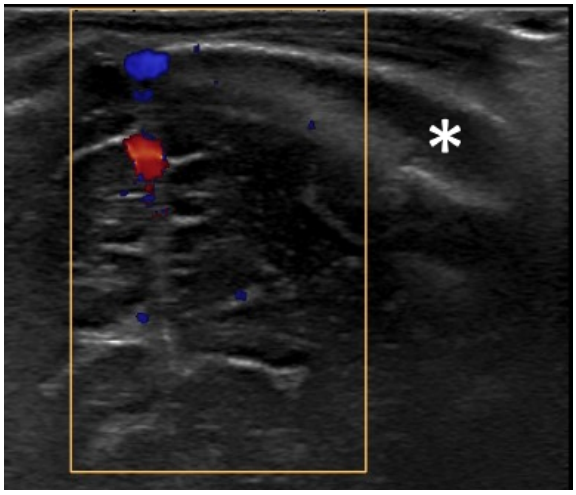

Figure 3 *Coronal image of the brain using a high frequency linear probe with color doppler showing what appears to be an extra-axial collection (asterisk) overlying the circumvolutions of the left hemisphere of the brain.*

uncommon, pitfall in neonatal brain ultrasounds. As the image was an artefact, the patient required no treatment and the cephalhematoma regressed spontaneously.

DISCUSSION

This case demonstrated a classic ultrasound pitfall, known as the mirror image artifact. The mirror image artefact is caused by multiple reflections of the ultrasound waves.[3] When the primary beam encounters a surface which is highly reflective, it may pass through the front before being reflected on the rear as it attempts to pass through to return to the probe[3]. After this happens, it may once again be reflected on the object that is targeted and then make it through the rear of the reflective surface on the second pass, allowing it to be detected by the probe[3]. However, although the ultrasound beam will eventually reach the probe, the multiple reflections result in a distorted view due to the time for the echoes to return being longer than normal, thus making the object appear deeper (**Figure 4**).[3,4] This is classically seen in abdominal ultrasound, with the image of the liver being reflected off the diaphragm.[5] It has also been noted by some authors that, despite changing the angle of the probe and adopting other stratagems to mitigate the problem, it is possible that the artefact can persist, making it difficult to interpret[2]. Although other cases have been reported, our case stands out in that there were deep layers appearing to be circumvolutions, rendering the diagnosis more difficult. Due to the severity of a missed diagnosis of a post-traumatic intracranial collection, it is probably prudent to perform a follow-up exam to confirm or disprove the ultrasound findings.

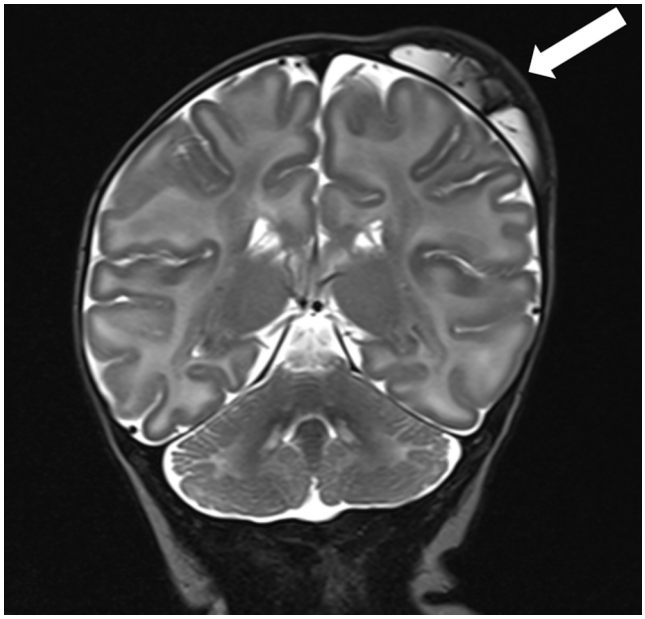

Figure 4 *T2-weighted MRI showing the cephalhematoma (arrow) on the outside of the skull with no underlying intra-cranial hemorrhage.*

CONCLUSION

Cephalhematomas are relatively common occurrences in newborns who have undergone traumatic births, often resulting in ultrasound requests . However, it is important to be aware of common pitfalls when performing these scans, including mirror image artefacts resembling an intracranial collection when performing transfontanellar scans on a cephalhaematoma in a neonate.

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