

NEURO-IMAGES

Bedside Cranial Ultrasonography in Patients with Hemicraniectomies: A Novel Window into Pathology



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Introduction

Point-of-care ultrasound (POCUS) use has grown considerably recently. Inadequate windows have limited adult cranial ultrasound to transcranial Doppler and optic nerve sheath measurements, but hemicraniectomy provides an obvious, underutilized window for intracranial imaging. We describe the novel use of POCUS to monitor postoperative subdural collections and midline shift.

Methods

Serial POCUS images were obtained from a hemicraniectomy patient and compared with near-concomitant computed tomography (CT) scans. The University of Cincinnati hemicraniectomy preset was created and optimized using a broadband sector array transducer with a 4–2 MHz operating frequency range. The depth and focus were set to visualize the brain tissue and contralateral bone. Imaging parameters were tested and saved for 2D grayscale mode, with an emphasis on tissue harmonic imaging, adaptive image processing, and dynamic range.

Patient Case

A 37-year-old man presented to a regional Level I trauma center with an initial Glasgow Coma Score of 8 (E1V2M5) and index non-contrast head CT revealing bifrontal contusions, a left temporal subdural hematoma, and 3 mm of shift. Repeat imaging revealed worsening edema and uncal herniation, prompting an emergent

left hemicraniectomy. A postoperative right temporal hygroma was found on surveillance CT (Fig. 1a) that correlated with contemporaneous POCUS imaging (Fig. 1b). Neurologic decline prompted repeat imaging demonstrating hygroma expansion on POCUS, confirmed on CT (Fig. 1d, e). The patient underwent drainage with subsequent examination improvement.

Discussion

The hemicraniectomy patient has outstanding acoustic windows allowing real-time imaging of the brain, ventricles, and posterior fossa. Currently, only limited case reports describe this technique [1–3]. Advantages include rapid image acquisition and diagnosis, reducing cost, radiation, and transportation. Limitations include needing appropriate ultrasonography settings, operator-dependent image acquisition, and the risk of cortical injury.

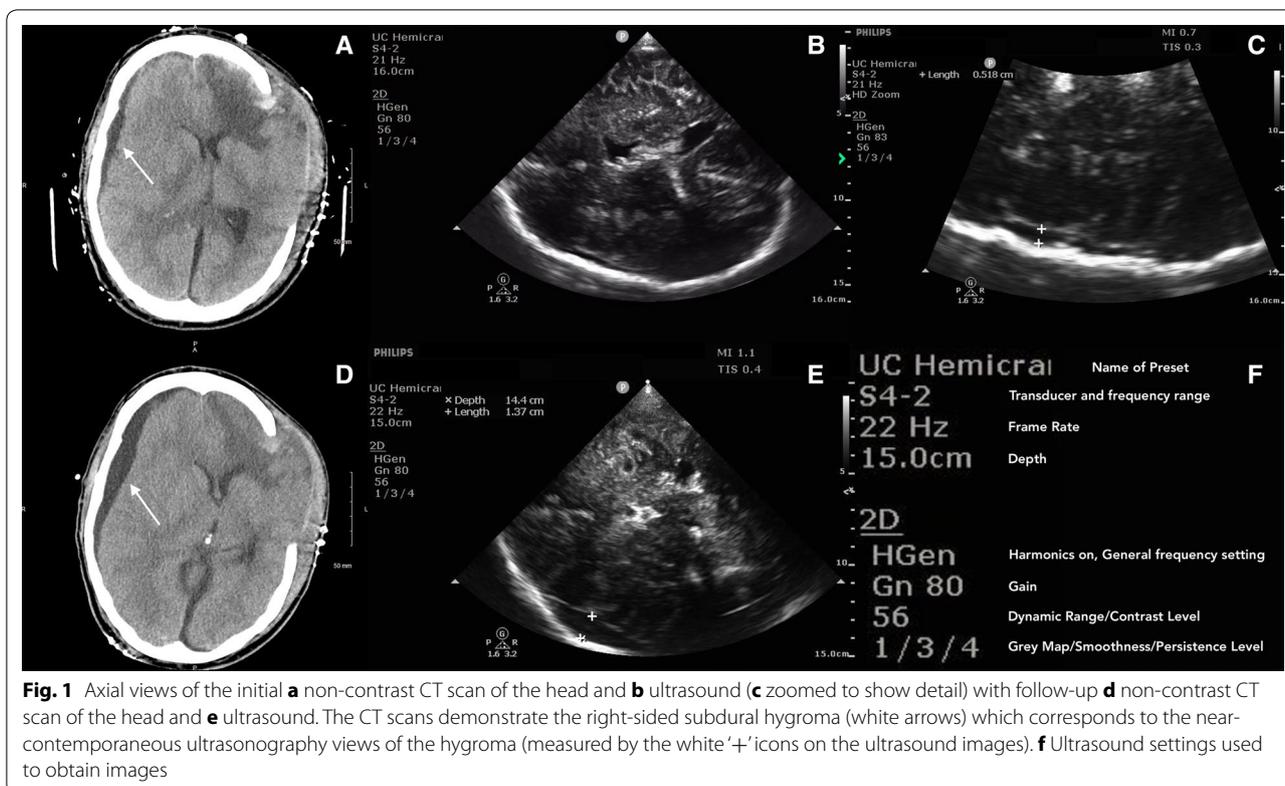
Conclusion

Hemicraniectomy POCUS can be used to visualize the intracranial cavity to identify and monitor pathology. The authors advocate adding hemicraniectomy POCUS to the intensive care unit imaging arsenal when this window is available.

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Author Contributions

VS conceived the work, created the manuscript, and took part in data acquisition. MS conceived the work and revised the manuscript. JB conceived the work, generated the ultrasound protocol, and revised the manuscript.

Source of Support

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Conflict of interest

None.

Ethical Approval/Informed Consent

Institutional IRB waived informed consent for this study.

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