Clinical Image

Assessment of pupillary response to light with ultrasound

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DOI: https://doi.org/10.3329/bccj.v11i1.66035

An 18-year-old lady presented to ICU following traumatic brain injury due to fall from height. Her GCS was 13 and was agitated. She had sustained frontal contusion with swelling of bilateral eyelids. Due to significant swelling of eye lids, it was not possible to retract the lids for examination of pupils. We used bedside ultrasound to assess pupillary response to light in this patient. The ambient lighting was made dim, the eyelids were covered with transparent film dressing and coupling jelly was applied over the covered eyelids. ALARA (As Low As Reasonably Achievable) principle was followed. High frequency linear probe (frequency of 13-6 MHz) was used. Ophthalmic preset of the ultrasound machine was selected, with the Mechanical Index (MI) set at 0.2. Pupils were insonated with the probe positioned flat on the lower eyelid (Fig. 1A). The size of pupil (indicated by thin arrow) was 0.61 cm at baseline, as measured with B mode ultrasonography. The pupil was exposed to bright light through the closed eyelids using penlight. The subsequent pupil size (indicated by bold arrow) was 0.28 cm (Fig. 1B).

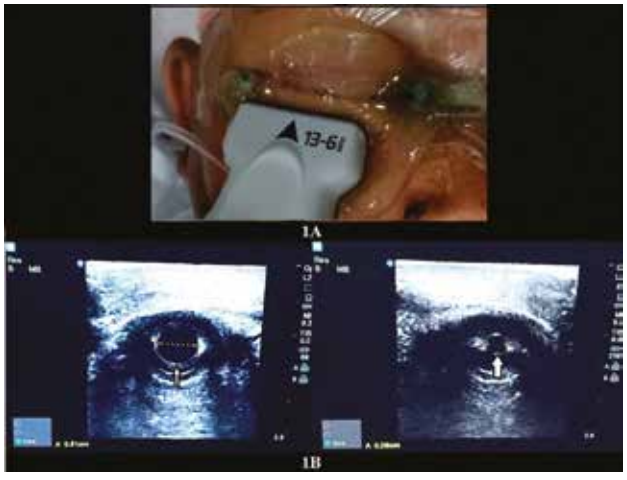

Figure 1A: Pupil insonated with the probe positioned flat on the lower eyelid; **1B**: The size of pupil (indicated by thin arrow) was 0.61 cm at baseline. The pupil was exposed to bright light. The subsequent pupil size (indicated by bold arrow) was 0.28 cm.

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Received : May 10, 2022; Accepted : June 17, 2022

Discussion:

Assessment of pupillary response to light is an important component of bedside neurological assessment.[1] Pupillary assessment can be hindered in patients with trauma and in post-operative neurosurgical patients due to swelling of eyelids, making retracting of eyelids difficult or impossible. Bedside B-mode ultrasonography is a simple and easily available modality that can be used for rapid and quantitative assessment of pupillary function in these patients.[2] To avoid contamination of eyes, transparent film dressing was used to cover the eyelids, over which coupling ultrasound jelly was applied. Probe was positioned flat over the lower eye lids to insonate the pupils by leveraging the physiological Bell's phenomenon.[2]

To ensure biosafety while performing ultrasonography, ALARA principle was used. Higher MI is associated with nonthermal bioeffects in the form of rupture of microbubbles. Damage has been seen at MI greater than 0.4. To mitigate the damage, sonography was performed with ophthalmic preset and with MI of 0.2.[3]

To summarize, bedside ultrasonography can be a valuable tool for objective assessment of pupillary response to light in patients with trauma and swollen eyelids. However, safety precautions need to be strictly exercised.

References

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