Feasibility of Handheld Optical Coherence Tomography in Craniosynostosis

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The RIO Study

Introduction: Craniosynostosis is characterised by the premature fusion of cranial sutures. It is often associated with intracranial hypertension (IH) and can cause cognitive impairment, visual impairment and death, if untreated.[1] Invasive intracranial pressure (ICP) measurement represents the gold standard, but requires hospital admission and carries risk.[2] Here, we evaluate whether handheld optical coherence tomography (OCT) is feasible in children with craniosynostosis (Figure 1), as a potential surrogate measure for IH.

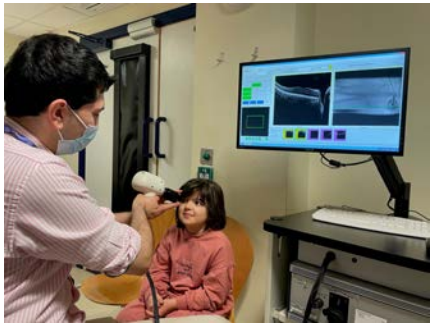

Figure 1: Handheld OCT in child with craniosynostosis
(Taken with consent)

Aim: To determine whether handheld OCT is feasible in children with craniosynostosis.

Methods:

Prospective observational study

50 patients with craniosynostosis aged 0-18 recruited

- Syndromic (n=13); non-syndromic (n=37); male (n=33); female (n=17)

Main outcome measures:

- Recruitment success rate
- Imaging success rate: ≥1 analysable optic nerve head (ONH) image

Results: : Figure 2 displays the feasibility flowchart. Median age was 51.1 months (range: 1.9-156.9 months; IQR: 37.0 – 74.2 months). 45 children were imaged in clinic and 5 in theatre. Figure 3 displays three sample handheld OCT scans.

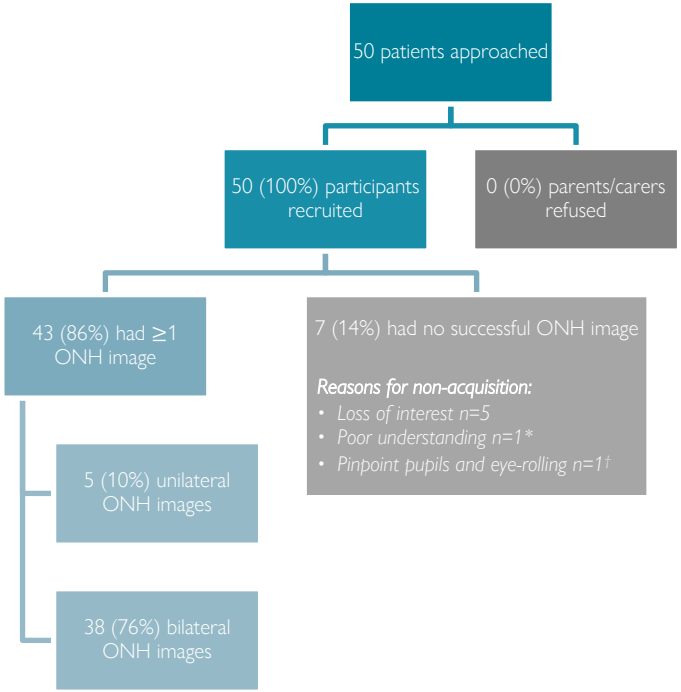

Figure 2: Feasibility flowchart
*Key: *Child with Crouzon syndrome and cognitive impairment had limited cooperation due to poor understanding; †Pinpoint pupils and eye-rolling caused by opiate administration prior to handheld OCT examination; ONH = optic nerve head.*

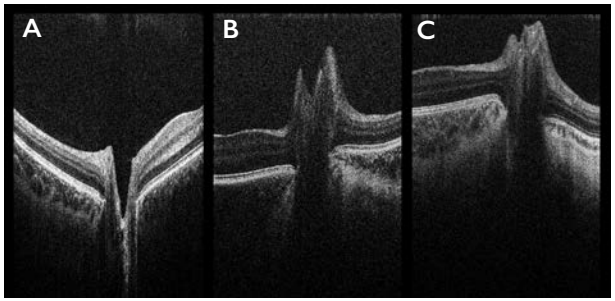

Figure 3: Sample handheld OCT scans
A: normal ONH; B: swollen ONH; C: swollen ONH. In Patients B and C, prior fundoscopy was inconclusive, but IH was confirmed on invasive ICP monitoring, thus OCT findings were accurate.

Conclusion: In the first study of its kind, we find that handheld OCT is acceptable and feasible in children with craniosynostosis. Further prospective research is required to determine whether handheld OCT represents a suitable screening tool for IH in this patient population.

References:
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2. Tamburrini G, et al. Childs Nerv Sys. 2005 Oct;21(10):913-21.

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The RIO Study = Recognition of Intracranial hypertension in children using handheld Optical coherence tomography

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