



Microbubble assisted ultrasound guidance for assessing the adequacy of endoscopic membrane fenestration in multiloculated hydrocephalus in children

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Introduction

Multiloculated hydrocephalus remains one of the most challenging pediatric neurosurgical conditions to treat. Endoscopic membrane fenestration has reduced the shunt revision rate, but adequate communication of the various compartments remains difficult to confirm intra-operatively. We present a novel ultrasound-based intra-operative technique, utilising an intraventricular microbubble injection technique for assessing the ventricular anatomy and adequacy of membrane fenestration.

Methods

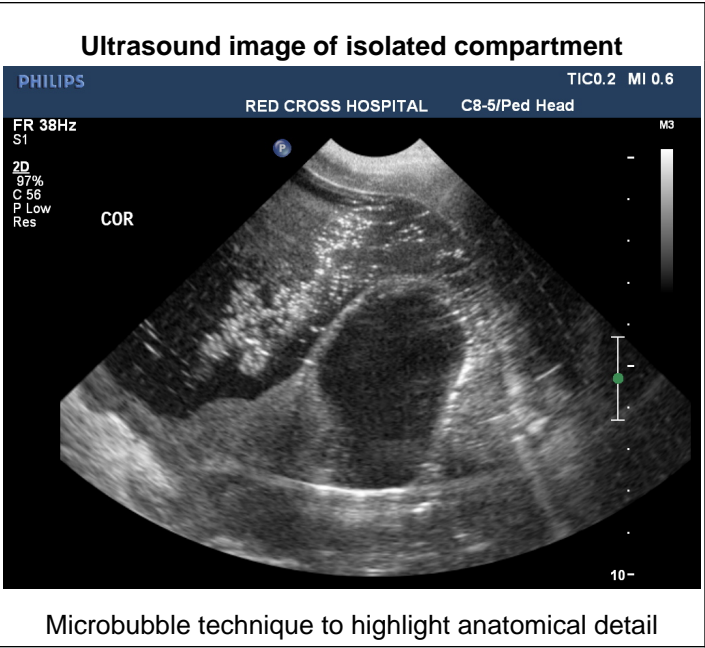
12 endoscopic procedures performed in 11 patients with a diagnosis of multiloculated hydrocephalus were prospectively studied. In all patients neuronavigation was used to plan the trajectory preoperatively and intraoperative ultrasound was used to guide the procedure and assess its adequacy. The appropriate ventricular compartment was cannulated and CSF relased, 5ml of air was then injected into the ventricle, prior to endoscopic membrane fenestration to morphologically delineate the distorted, compartmentalised ventricular anatomy. During the procedure, the microbubble injection was repeated and imaged with IOUS to confirm adequate communication of the compartments.

Results

The 11 patients included 6 males and 5 females with a mean age 12.4 months. The etiology of the hydrocephalus was post infectious in 9 cases (82%). In 7 patients the post-fenestration IOUS imaging demonstrated adequate communication of the ventricular system and a single ventricular catheter was inserted. In 3 patients isolated or inadequately communicated compartments were demonstrated, the fenestrations were revisited and either enlarged or new fenestrations were made. The mean number of loculated compartments preoperatively was 4.6. All patients received a single ventricular catheter for treatment of their hydrocephalus.

Conclusions

Microbubble assisted ultrasound guidance for endoscopic fenestration of multiloculated hydrocephalus is a useful technique, and currently the only imaging technique that allows for real-time intraoperative assessment of the adequacy of the endoscopic procedure.



Microbubble technique to highlight anatomical detail

Learning Objectives

By the conclusion of this session participants should be able to: 1)Describe the importance of intraoperative neruonavigation, 2)Identify the benefit of real-time feedback in deciding the adequacy of treatment in multiloculated hydrocephalus