VALIDITY OF ULTRASOUND GUIDED PLACEMENT OF VENTRICULOPERITONEAL SHUNTS IN PATIENTS WITH IDIOPATHIC INTRACRANIAL HYPERTENSION

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Introduction

Idiopathic intracranial hypertension (IIH) is a clinical disorder of unknown etiology that is defined by symptoms and signs of raised intracranial pressure (ICP) in absence of dilated ventricles, with normal cerebrospinal fluid (CSF) composition, and no other cause of raised ICP identified on neuroimaging or other evaluation. Patients with IIH usually present with manifestations related to increased ICP like headache, visual disturbances (like blurred vision or double vision), pulsatile tinnitus, nausea, vomiting, and neck or shoulder pain, often accompanied by papilledema. The target of IIH management is to reduce ICP with the main goals of preservation of vision and relief of headache. Managing idiopathic intracranial hypertension often includes a combination of lifestyle changes, such as weight loss, and medications like acetazolamide to lower intracranial pressure. Surgical intervention in indicated in patients with acute visual deterioration and those with severe headache despite adequate conservative measures. surgical intervention include optic nerve decompression surgery, venous sinus stenting or a CSF Diversion like lumboperitoneal shunt (LPS) or Ventriculoperitoneal (VPS). For the past years, the standard CSF diversion modality for IIH has been LPS. The difficulty of introducing a catheter into ventricles of normal or small size has led most surgeons to favor LPS over VPS in these patients. Lumboperitoneal shunts, however, have significant complications as shunt infection; malfunction (including dislocation, disconnection, migration, and obstruction); Arnold–Chiari I malformation (ACM); subdural hematoma due to overdrainage; CSF leakage; and radicular pain with a more frequent need for shunt revisions. These warrant using surgical guiding modalities that improve ventricular catheter placement in small/slit ventricles. These modalities include, stereotactic localization (frame-based and frameless) and real-time imaging (CT, MRI, and U/S). Intraoperative real time ultrasound imaging is an affordable, safe, repeatable imaging technique that can be easily integrated into surgical workflow, thus allowing updated accurate visualization and localization of ventricles during surgery.
to ensuring equitable care and improving surgical outcomes across all genders.

Aim of the work

The aim of this study is to assess the validity of ultrasound guided placement of ventriculoperitoneal shunts in patients with idiopathic intracranial hypertension.

Patients and Methods

This prospective study will include 20 consecutive patients admitted to Neurosurgery department at Alexandria University with the diagnosis of idiopathic intracranial hypertension. Approval of the Medical Ethics Committee of Alexandria Faculty of Medicine was obtained. All patients fullfilling the inclusion criteria of this prospective study will undergo pre-operative assessment, surgery, and post-operative assessment. Pre-operative assessment included history taking, neurological examination, ophthalmological examination including visual acuity, fundus examination and automated visual field study, measurement of opening CSF pressure via lumbar puncture in lateral decubitus position and neuroimaging, including MRI and MR Venography. Placement of VPS with the aid of intraoperative real time ultrasound imaging (Bk medical bk5000). The used transducer is Burr-Hole Transducer (N11C5s). The transducer's design allows insertion of the puncturing needle through the same burr hole with the aid of a specially designed puncture adapter mounted to the probe. The foramen of Monro and choroid plexus are visualized, and the catheter is inserted along the inline trajectory, aiming at the foramen of Monro. In addition to the tactile feedback of entering the ventricle, direct visualization of the catheter's entry into the ventricle is obtained. Then, the usual steps of ventriculoperitoneal shunt placement are followed Post-operative assessment included neurological examination ,ophthalmological assessment will be carried out immediately after surgery and at 3 months post-surgery to assess the patients 'clinical responses. Radiological assessment including CT scan and plain X –Rays of the head, chest, abdomen and pelvis will be carried out immediately after surgery and at 3 months post-surgery to assess the adequacy of ventricular catheter and shunt function.

Results

In the immediate postoperative follow-up, 19 patients (95%) reported significant relief from pressure-related symptoms, such as tinnitus, blurred vision, and others, rather than from headaches. Among the 20 patients who had headaches preoperatively, 3 patients (15%) continued to experience headaches which were managed with medical treatment and then resolved. Regarding to 3 months post-operative follow up, Symptomatic improvement of pressure related symptoms was observed in 18 patients (90%), while fundus examination showed improvement in 17 patients (85%). Two patients (10%) required revision surgeries Revision surgeries were done, one for the proximal catheter and the other for the distal end.

Table 1: Proposed grading system for the accuracy of ventricular catheter placement on initial postoperative cranial

Placement grade based on termination of ventricular catheters	Patients (n %)
Grade I (Optimal position with the catheter tip within the ipsilateral frontal horn or third ventricle near foramen of monro)	15 (75%)
Grade II (The catheter tip located in the contralateral frontal horn or lateral ventricle)	4 (20%)
Grade III (The catheter tip located within parenchyma or failure to reach the intraventricular space)	1(5%)

Conclusion

Ultrasound guided ventriculoperitoneal shunts placement in idiopathic intracranial hypertension patients is affordable, safe, repeatable imaging technique that can be easily integrated into surgical workflow, thus allowing updated accurate visualization and localization of ventricles during surgery, with most patients demonstrating optimal catheter positioning on postoperative imaging.