Ventriculo-peritoneal shunt failure in the adult patient

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Abstract

A Ventriculo-Peritoneal (VP) shunt is a diversion of the Cerebrospinal fluid (CSF), by means of an implanted shunt, to a receptacle in the peritoneal cavity. Shunts are not curative, but serve only as a diversion of the excess fluid and do not correct the underlying disease. Shunt failure is pretty common in the pediatric population and its not uncommon to have multiple shunt revisions in a lifetime [1]. On the other hand, the experience and literature on VP shunts in the adult seems pretty limited. Also, the diagnosis of shunt failure can be confounded by a variety of factors in an adult patient.

INTRODUCTION

VP shunt placement is a common neurosurgical procedure in the pediatric population for a variety of indications. Hydrocephalus is the commonest of these [4] . VP Shunt has one of the highest incidences of complications amongst all neurosurgical procedures. [4] Shunt failure rate in children is very high, (~50% by the end of 2 [nd] year post op) 2 and so the literature available regarding its management is pretty exhaustive. The guidelines regarding management of a shunt failure /other complications in this population also seem to be pretty well defined.

Indications of a VP shunt placement in an adult, however, are less well defined and the experience and literature on the management of its complications, even less so. Described here is a case of an 88 year old lady who underwent a VP shunt placement for Normal Pressure Hydrocephalus (NPH) and presented with altered mental status (second episode) three years after the initial surgery. The hospital stay and management are presented here. Also a small discussion about the complications of VP shunt follows the case presentation. Only obstruction and mechanical complications are discussed here, infectious causes are beyond the scope of this paper.

CASE PRESENTATION

An 88 year old Haitian-Creole speaking lady presented with altered mental status. Three years prior to this admission, she had presented similarly, along with a month's duration of ataxia. During that admission, she was evaluated and was found to have Normal Pressure Hydrocephalus (NPH) affecting the 3 [rd] and 4 [th] ventricles. Serial Lumbar Punctures (LPs) did not improve the symptoms and finally a VP shunt was placed.

A year later, she presented with confusion and ataxia again. A cranial CT scan done at that time revealed enlarged ventricles and a Subdural Hematoma. The hematoma was drained and the patient returned to her baseline mentation and functions.

Two years after that presentation, that is this time, she presented with a month's duration of a "flu-like" illness. She had also become increasingly confused over this period, and per her daughter, who was her care provider at home; this was very similar to the presentation 2 years prior. The daughter described her mother as being "not-quite-herself" and reported her becoming dependent on others for Activities of Daily Living (ADL). Of note is that the patient was fairly independent in terms of ADL previous to the onset of this presentation and she was ambulatory with an assistive device (walker) at baseline. She had not been ambulating much for 2 wks prior to admission. The daughter reported that 2 yrs ago, shunt failure was being considered by the neurosurgeon and that was her main concern at this presentation.

Her past medical history was significant for well controlled Type 2 Diabetes Mellitus and Hyperthyroidism. She was on Methimazole, Aricept, Metofrmin, Glyburide, multivitamins and Tylenol at home.

Physical examination done on admission included temperature of 98.4 degrees F, a heart rate of 89/ min, respiratory rate of 20/ min, BP was 160/84, and her pulse

oximetry showed 98% O2 saturation on room air. Neurologic exam was grossly non focal. Rest of the physical exam was unremarkable. On this admission there was no evidence of infection. All basic labs were within reference ranges. No metabolic cause could explain the alteration in her mental status. A Cranial CT scan was negative for any acute changes, infarction, hematomas or space occupying lesions. A lateral X ray of the skull showed increased pressure of the Codman-Hakim shunt between 180-190 cc of water.

The patient remained confused throughout the course of this hospitalization, even after adjustment of her shunt pressure down to 150's. This raised the probability of shunt malfunction or failure (from non infectious causes). A neurosurgical opinion was sought. MRI of the Brain did not show any change in the ventricular size compared to the previous studies 2 years prior. An Indium cisternogram was suggested by the neurosurgeon for further evaluation of the CSF flow. However, the Indium study could not be completed because of technical difficulties. And later, the patient's family refused further care and unfortunately she was lost to follow up.

DISCUSSION

A ventriculo-peritoneal shunt is a diversion of excessive CSF to the peritoneal cavity. In children, a VP shunt is placed for the treatment of various conditions such as an Ependymoma, Hydrocephalus, Posterior fossa tumors, Intracranial hemorrhage, Idiopathic Intracranial Hypertension (IIH). In adults the most common indication is Normal Pressure Hydrocephalus (NPH), which is not amenable to serial Lumbar Punctures and other medical treatment.

Most of the data available on complications of VP shunt are limited to the pediatric population. Shunt failure is pretty common in children, with rates of 40% in the first post operative year, approaching ~50% in the second year post operatively. [3] Shunt failure can be from infectious or non-infectious causes. Infections are common in the early post op period and become exceedingly rare 6 months after the initial surgery. [3] A rare case of shunt infection with Brucella melitensis has been reported as late as 1.5 years after initial surgery. [5] Non infectious causes include mechanical obstruction, over-drainage, loculation, fracture of the shunt or valve, migration of the shunt components. The factors associated with high rates of shunt failure in children included age at the time of age at the time of initial shunt insertion (Tuli et al.) [3] , indication for which the initial surgery was done, early post op visit, headache, fever, meningismus, CSF leakage, purulent drainage, skin erosion, abdominal pain and signs of peritonitis at the time of presentation. [3] Absence of irritability , nausea, vomiting and headache were negative predictors for development of shunt failures [2.] But these data were from very limited age population and were difficult to generalize even in pediatric or teenage population. The data in adults is even more deficient.

Diagnosis of shunt failure or other complications in adults is rather difficult. Data available is limited and hardly any large studies have been done on it. Also, using altered mental status as a positive predictive feature for diagnosis can be tricky. It tends to be, more often than not, a diagnosis of exclusion. Also, other confounding factors like progression of the senile dementia, presence of other causes of dementia like Alzheimer's disease, Parkinson's disease and other metabolic causes may make it difficult to evaluate the patient. Very often, these patients live in nursing home or other care facilities and transition to and from these settings to which they are used, can by itself make them confused. Usually, the persons most closely associated with their care can provide a fairly accurate assessment of their baseline function, like the patient's daughter in our case. Poly-pharmacy is another confounding factor in the elderly population, which makes the assessment and management difficult. Social, psychiatric and placement issues make the presentation even more challenging. Often, patients themselves may not be competent enough to make decisions in their own best interests.

Also, evaluation of the patient in terms of lab studies and radiological work up may be limited by a variety of factors, most importantly by co-morbid conditions.

Obstruction of shunt in children is generally managed surgically by revision, which can either be partial, that is, of the individual components of shunt, or involving a replacement of the entire system. [3] .Management of obstruction in adults usually proceeds on similar lines. Pressure settings of the Codman-Hakim shunt can be varied using electromagnetic devices. Rates of success of this procedure are unknown. The decision to replace the shunt adults, however, may often be influenced by various other factors like associated co morbidities, general surgical fitness of the pt, life expectancy at the time of presentation and quality of life at that time and expected quality of life

after revision surgery. Also, the data on these are lacking at this time. A lot of the management would depend on the locally available expertise and their experience with such cases. Specific data and guidelines in adult population are lacking.

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