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Ventriculo-gallbladder shunts in children

G. Stringel [1], **M. Turner** [2], **T. Crase** [2]

[1] Division of Pediatric Surgery, Health Sciences Center T-19, State University of New York at Stony Brook, Stony Brook, NY 11794-8191, USA
[2] Methodist Hospital of Indiana, Inc., 1701 North Senate Boulevard, Indianapolis, IN 46202, USA

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Abstract. Ventriculoperitoneal shunts are the most common procedure for the treatment of hydrocephalus. Ventriculoatrial shunts are effective but are subject to a higher incidence of potentially serious complications. We report our experience with ventriculo-gallbladder shunts in children. Ventriculo-gallbladder shunts are safe, effective, and technically easy to perform. We recommend their use when ventriculoperitoneal shunts have failed or the peritoneal cavity is not adequate for shunting.

Key words: Hydrocephalus – Ventriculoperitoneal shunt – Ventriculo-gallbladder shunt

Introduction

Ventriculoperitoneal (VP) shunts are the preferred method for the treatment of hydrocephalus [2]. Ventriculoatrial (VA) shunts are effective but are subject to a higher incidence of serious and potentially lethal complications [4]. In a constant search for alternatives, surgeons have placed the shunts in different cavities and organs in the body, including the pleura, fallopian tube, ureter, stomach, and gallbladder [8–10]. We report our experience with eight children given ventriculo-gallbladder (VGB) shunts after VP and VA shunts had failed.

Patients and methods

Patients

There were four male and four female patients. Ages varied from 8 weeks to 15 years. All patients had suffered repeated failure of VP and VA shunts (Table 1).

Surgical technique

A standard proximal catheter is inserted through a parietal burr hole. It is connected through a Rickham reservoir to a standard (Hokin, Holter) one-way valve. A distal peritoneal catheter is attached to a valve and tunneled to the subcostal incision made by the pediatric surgeon. Once a good flow of cerebrospinal fluid is identified from the end of the distal catheter, the wound is closed.

A small right subcostal incision is made, the right rectal muscle is partially transected. The dome of the gallbladder is identified and a double pursestring suture applied with 4-0 monofilament nonabsorbable suture. The lower end of the VP shunt is connected to a 4-cm piece of shunt tube with a small metal connector of the appropriate size. The reason for the metal connector is to be able to tie the pursestring suture in the dome of the gallbladder around the shunt tubing without obstructing the ordinary soft VP shunt catheter. We leave about 30–40 cm of redundant tubing in the peritoneal cavity to allow for patient growth (Fig. 1). The wound is closed in the usual manner.

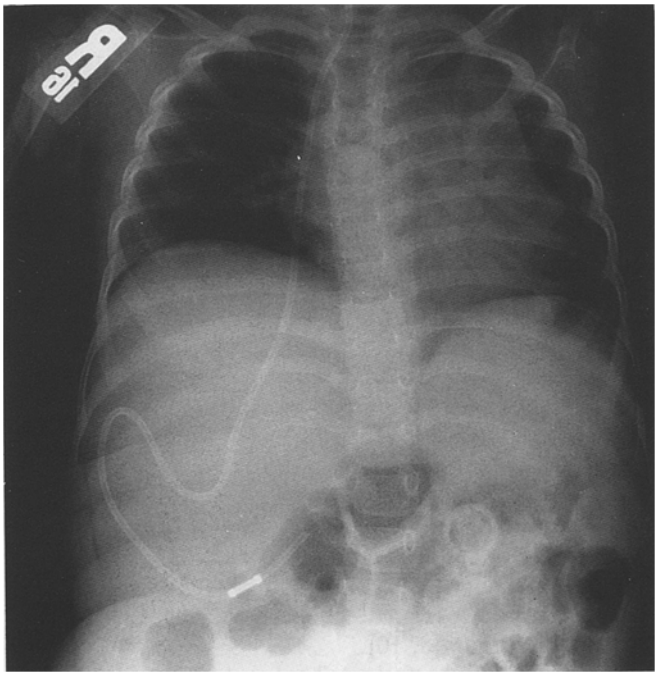

Fig. 1. Radiograph showing ventriculo-gallbladder shunt in place

Correspondence to: G. Stringel

Table 1. Summary of patient data

Patient	Age, sex	Indication for shunt	Complications	Follow-up length
W. M.	8 weeks, female	3 failed VP shunts: infection	Nil	8 years
W. B.	4 years, male	Multiple failed VP shunts: infection	Revision due to distal end malfunction 5 years and 6 years after insertion; conversion to VP shunt 14 years later	
H. S.	15 years, female	2 failed VP shunts: sheathing and infection	Nil	6 years
E. S.	4 years, male	Multiple VP shunt failure (>5): infection, sheathing	Conversion back to VP shunt after 1 year because of infection	
S. N.	19 months, male	Multiple VP shunt failures (>6) and VA shunt infection sheathing	Conversion to VP shunt because of lower end malfunction and gallbladder atony 1 week later	
B. J.	5 years, male	Failed VP shunt due to peritoneal malabsorption syndrome; failed infected VP shunt	Nil	3 years
L. A.	15 months, female	Multicystic encephalopathy, multiple failed VP shunts: infection	Nil	1 year
A. J.	5 months, female	Multiple infected VP shunts: colon perforation	Nil	10 months

Results

Five children with VGB shunts have not had any significant complications related to the shunt. In these children follow-up has varied from 10 months to 8 years. In the three other children the shunts were converted to VP shunts because of complications. A 19-month-old male was converted to VP shunt after 1 week because of gallbladder atony. Two other children were converted to VP shunts because of malfunction and infection 1 year and 14 years respectively after VGB shunt insertion. The latter of these underwent revision of the VGB shunt on two occasions before conversion to VP shunt.

Discussion

VP shunting is the most dependable and effective shunting procedure for the treatment of hydrocephalus [2]. It also carries the lowest incidence of complications [5–7]. When the peritoneal cavity cannot be used because of complications, such as peritoneal malabsorption or infection [2, 3], a second choice has been the VA shunt. Complications with VA shunts are potentially more severe since infection can readily spread through the blood stream [4].

VGB shunts have become increasingly popular since first reported by Smith et al. in 1959 [8]. These shunts are technically easy to perform, and the gallbladder is an adequate draining reservoir because bile is normally sterile. Biliary tract pressure usually does not exceed 20 cm H_2O and cerebrospinal fluid passes readily into the intestinal tract where it can be reabsorbed, eliminating fluid and electrolyte losses. Moreover, the gallbladder is an expendable organ [8, 10].

Five of our eight patients have not had any complications related to the shunting procedure; our longest follow-up is 8 years. In the three other cases, revision and conversion were needed, in two because of malfunction and in 1 due to infection. In one of these cases, gallbladder atony prompted early revision 1 week postoperatively. Gallbladder atony has been reported by other authors following VGB shunt [10]. They have successfully treated this problem with cholecystokinin and magnesium sulphate, but medical manipulation was not attempted in our case. Our success rate and the 70% success rate reported by other authors is acceptable in comparison to other shunting procedures, considering also that VGB shunted patients all had previously failed VP shunts and VGB shunt was not used as the primary shunt. The chances of VP shunt revision in children over a 10-year period have been reported to be 82%, with a likelihood of three hospitalizations and two revisions over the same period for a newly diagnosed hydrocephalic infant [5].

In a recently reported series of VGB shunts in children [10], the infection rate was 24% with no mortality and few complications related to the shunt. Smith [8] reported a mortality rate of 40% in 10 patients, but death was related to problems other than the VGB shunt, which remained functional and patent until the time of death. An early death in a 5-year-old girl following a VGB shunt reported in the literature was secondary to bile reflux ventriculitis [1]. This problem can be avoided with the use of a competent antireflux valve in the shunt system and ensuring the biliary tract is patent with no obstruction. We do not routinely perform preoperative ultrasonography of the gallbladder, cholangiography, or other investigations unless the patient has a history of biliary tract or liver disease.

Ventriculo-gallbladder shunts are safe, effective, and technically easy to perform. Based on our personal experience and literature reports, we recommend their use when ventriculoperitoneal shunts have failed or the peritoneal cavity is not adequate for shunting.

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