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TECHNICAL NOTE

Ventriculocholecysto shunt: a solution to recurrent shunt complications in comorbid post-tubercular hydrocephalus with tubercular adhesive peritonitis

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Abstract

Background Tuberculosis is still a killer disease and a nightmare in developing countries. Post-tubercular hydrocephalus remains one of the most severe complications, with many diversion procedure methods. How common is the occurrence of co-morbid post tubercular hydrocephalus with tubercular peritonitis is still not known. This is a frustrating cause of repeated shunt complications and revisions.

Methods We discuss the management of two cases that were the cause of nearly 50 % of our shunt revisions due to the comorbidities of post-tubercular hydrocephalus and tubercular adhesive peritonitis. We performed the ventriculocholecysto (VC) shunt. This procedure diverts CSF from the ventricular system to the gall bladder.

Results The two children are disease free and did not require a revision in the 3.4-year follow-up period.

Conclusion The VC shunt is a simple procedure. It improved the quality of life of these children who otherwise would have had a very morbid period during shunt revisions and the active disease. These children did not require further revisions and can grow normally.

Keywords Ventriculocholecysto shunt · Post tubercular hydrocephalus · Tubercular adhesive peritonitis · Gall bladder

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Introduction

In India, tuberculosis remains a major problem despite aggressive measures to prevent and control it. It causes a wide spectrum of ailments involving almost every organ of the body. Along with HIV, it is gradually becoming a global problem.

The estimated burden in India is: prevalence including HIV patients of 256/100,000 and mortality 26/100,000. The extrapulmonary incidence is 19 % [16]. A worrying fact is that relapse occurs in 38 %, treatment after failure in 6 % and treatment after default in 25 % [16], these being reasons for the increase in the MDR and XMDR strains of tuberculosis.

Over the years, hydrocephalus, a common, life-threatening complication, has been managed by various types of diversions, from Prof. Bhagwati's ventriculoatrial (VA) shunt in 1971 to endoscopic third ventriculostomy (ETV) today [1, 3–6, 9, 14].

The literature mentions the coexistence of neurological and abdominal tuberculosis as well as their morbidity and the CSF diversion nightmare [14]. Some have tried various methods with little success [2, 3]. With HIV and many patients experiencing failure and default during antitubercular treatment [16], such comorbid conditions are on the rise.

Here, we reintroduce a method of diversion [12] that was never practiced, which we found to be simple, effective and thus promising when such comorbidities exist.

Materials and methods

Between 2007 and 2011, we did shunt procedures in 185 patients, 105 of which were for hydrocephalus secondary to tubercular meningitis. All 105 patients were treated with the ventriculoperitoneal (VP) shunt using the Chabbra shunt®. We had a 22.9 % shunt revision rate, mainly because revisions had to be done several times in five patients. Of these, two patients (an 8-year-old male and 11-year-old female) had disseminated tuberculosis with communicating hydrocephalus and matted peritonium stuck to the bowel. We performed the ventriculocholecysto (VC) shunt on these two patients.

Each of the two patients had revisions because of repeated pseudocyst formations in the peritoneum with raised pressure symptoms as the lower end would not drain. Both had revisions done at least five times. In one patient, an endoscopic third ventriculostomy (ETV) was done that failed.

Repeated revisions left the patients morbid for several months, and their abdomens had several scars.

The VC shunt was considered the treatment of choice as the problem in these children was the drainage at the lower end.

The fundus of the gall bladder was exposed by a standard right subcostal incision. Two purse string sutures were applied around the proposed puncture site, an inner one around the proposed opening and an outer one surrounding the inner one (Fig. 1). The lower end of a normal Chabbra shunt® has two slit valves. In order to preserve the valve, approximately 7 cm from the distal end of the shunt tube was cut, and the ends were connected to each other using a connecter. The two ends of the tube were tied by silk sutures over the connecter and to each other to prevent dislodgement (Fig. 2).

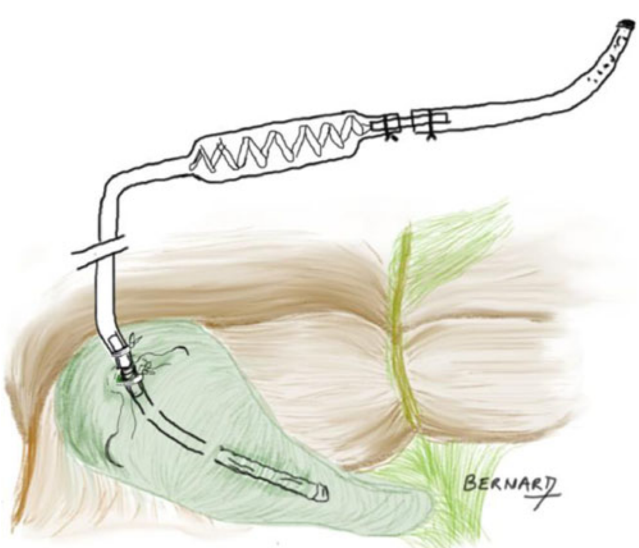

Fig. 1 Illustration demonstrating the exposure with the double purse string suture around the puncture site and introduction of the distal shunt tube (7 cm) into the gall bladder to the level of the connecter

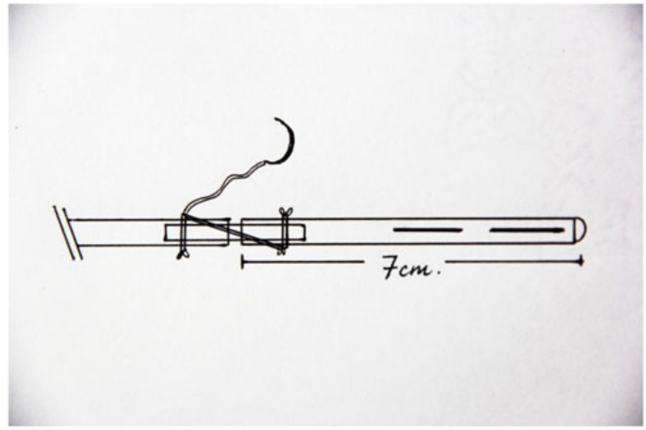

Fig. 2 The modified lower end differing from Yarzagaray's technique in that the lower end of a normal Chabbra shunt® was cut 7 cm from the distal end. The cut ends were positioned over a connecter, tied over to the connecter and to each other with silk suture. The distal end preserves the slit valves. The distal 7 cm is introduced into the gall bladder

Using a no. 11 blade, a stab puncture was made at the proposed site, just large enough to allow the catheter to enter. Seven centimeters of the lower end was introduced into the gall bladder to the level of the connecter (Fig. 1). The inner purse string suture was tied so that the opening in the gall bladder was positioned snugly around the area of the connecter. The suture used for tying the two ends of the tube over the connecter was used to anchor the connecter to the serosa of the gall bladder (Fig. 2) in the area between the two purse string sutures. This prevented the introduced lower end from slipping out. Finally, the outer purse string sutures were tied to invert the whole complex. About 20 cm of the remaining tube was left in a space made in the peritoneal cavity to allow for the child's growth.

We checked for shunt function clinically and used an MRI cholangiogram to determine the status of the gall bladder.

Results

The two patients had a very morbid period for several months because of repeated revisions secondary to associated tubercular peritonitis and matted abdomens. ETV was tried in one patient, but failed.

The VC shunt was a good alternative to a VA shunt or any other form of diversion in this situation as the problem we faced with our patients was drainage at the lower end due to a matted peritoneum. The procedure was simple.

We differed from the standard Yarzagaray technique [12] in that our spring valve remained at the standard retromastoid position and not just outside the gall bladder. We introduced 7 cm of the distal end into the gall bladder, used two purse string sutures and anchored the tube around the connecter to the gall bladder serosa.

We were able to turn around the lives of these two patients who now are growing normally and enjoy a good quality of life. We had a follow-up period of 3.4 years. Neither child developed infection or retrograde ventriculitis. The gall bladder showed some 'hydrops' in the follow-up MR cholangiogram (Fig. 3).

Discussion

Since the 1980s, the VP shunt has continued to be the most effective cerebrospinal fluid (CSF) diversion procedure for treating both communicating and non-communicating hydrocephalus [15].

Shunting in tuberculosis patients has been a nightmare for neurosurgeons [14]. Each procedure is met with complications and failures. Agrawal (2005) had shunt complications in 30 % of cases, of which more than 50 % were due to blockades, and three patients required repeated revisions more than once [9]. Palur (1991) reported a 22.8 % revision rate with one patient requiring more than three revisions [11]. Lamprecht (2001) reported a complication rate of 32.3 %, obstruction being the main cause for revision, some several times [8]. Sil and Chatterjee (2008) reported a 43.8 % revision rate, and 18.7 % required multiple revisions [14]. In the present study, the revision rate was 22.9 %, with multiple revisions in five patients; most were due to blockage.

Shunt blockage is a major cause of redo surgery. Narasimharao (1984) reported recurrent abdominal pseudocyst formation after a VP shunt, citing peritoneal tuberculosis as the etiology [10]. There is no mention of the incidence of disseminated tuberculosis in patients with a comorbidity of hydrocephalus with tubercular adhesive peritonitis. Here we report a 1.9 % incidence.

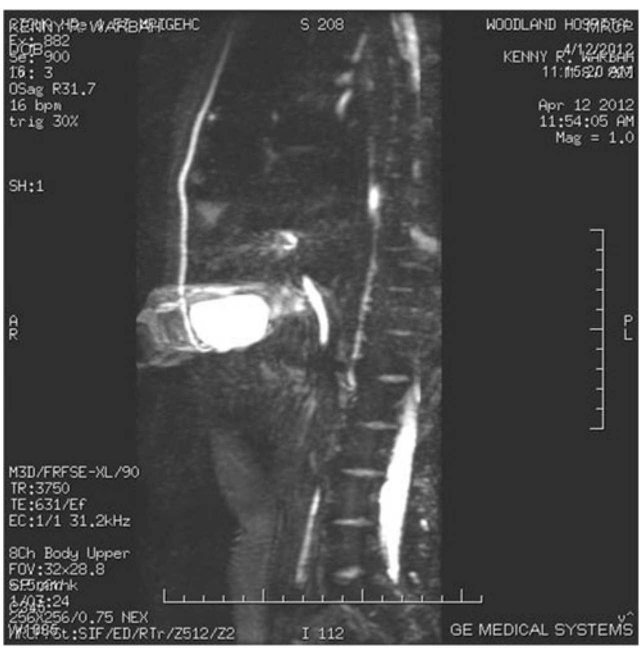

Fig. 3 Follow-up MR cholangiogram after 3.4 years showing the distal shunt tube in the gall bladder. There is a small 'hydrops' of the gall bladder

This peritonitis might have been responsible for the multiple revisions seen in many series that reported pseudocyst formation. We faced this problem in two patients. Both repeatedly returned to the hospital with increasing morbidity.

Alternative commonly practiced CSF diversion techniques are ETV and VA shunts.

VA shunts are less commonly practiced nowadays because of their high incidence of failures, causing dissemination and septicemia, and because they require repeated revisions as the child grows [3, 9].

Ever since the first use of ETV for post-tubercular hydrocephalus [5–7], many neurosurgeons have used this procedure [4, 13, 14]. The success with ETV has mainly been with the obstructive type of hydrocephalus. The communicating type was an exclusion criteria in the reports of Figaji [5] and Yadav [4]. Most ETV failures occurred in the communicating type [4, 6, 14]. Performing an ETV in post-tubercular hydrocephalus patients is very demanding, as the anatomy of the ventricular floor is very distorted and opaque [4]. Chatterjee reported in 2008 that in four cases of post-tubercular hydrocephalus where ETV was done, all failed. They now do not do ETV for this indication [14]. In our study, both cases were the communicating type. ETV was performed in one patient but failed. It was not attempted in the second.

CSF can be diverted to many other spaces, such as the pleural cavity, the intestines, the gall bladder or the urinary bladder [12]. There is a report of a ventriculorenal shunt [2].

In our two cases of recurrent failures, we performed the ventriculocholecysto (VC) shunt with good success. This procedure was first done in 1958 [12] but never reported again.

We preferred this procedure as our patients suffered blockade at the abdominal end due to tubercular adhesive peritonitis, CSF was always draining on withdrawing the lower end during revisions, the gall bladder was in close proximity to the lower end, and a gastro surgeon was available to assist. The major activity of the gall bladder is to remove water and electrolytes. The water flux rate is about 25 ml/h, with 90 % of water being removed in this process. The important advantage of CSF absorption into the circulation via this route is that it is more physiological. The valves of the gall bladder prevent reflux of the intestinal contents and maintain a constant pressure for CSF drainage.

Yarzagaray (1958), in his unpublished observation, had a 6-year follow-up [12]. He reported conversion of ten gall bladder shunts to VP shunts after a few years. During the conversion, laparotomy revealed the gall bladder to have a small 'hydrops' appearance. We have a 3.4-year follow-up of our patients. The MR cholangiogram did reveal a small 'hydrops' appearance. The children are growing normally and enjoying a good quality life.

The successful CSF diversion as shown by the long-term follow-up in our two patients who underwent VC shunts following the development of tuberculous meningitis and peritonitis suggests the usefulness of this procedure in this extremely recalcitrant situation.

Conflicts of interest None.

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