

# The fate of ventriculo-peritoneal shunts and outcome of revision surgery

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**Insertion of a ventriculo-peritoneal shunt (VPS) is the only effective treatment for hydrocephalus. Revision of a VPS can be indicated for infective or mechanical complications. This study aimed to investigate the middle to long-term outcome after insertion of a VPS in Zambia and the outcome after revisions.**

**Between August 1995 and August 1998, at St Francis' Hospital, Katete, 60 Harare type VPS were inserted in 54 children. The age range at the time of insertion was 14 days to 12 months. Twenty children (37%) underwent a revision during the study period, mainly for mechanical problems (blockage). Follow-up data were available for 22 children (40% of the total) of which six had undergone revision.**

**Twenty-one children still had a functioning VPS in situ. Thirteen of the 21 had moderate to severe psychomotor retardation and eight (38%) were normal or mildly impaired. None of the six children who needed revision, were in the latter category.**

**Of the 54 children with a VPS, 20 (37%) needed revision within three years of insertion. The psychomotor development of these children was found to be moderately to severely delayed during follow-up. The need for revision of a VPS appears to be associated with a poor outcome.**

## Introduction

Hydrocephalus is not uncommon in tropical Africa. The aetiology is unknown in most cases due to the lack of imaging facilities. The only effective treatment is placement of a drainage system, usually a ventriculo-peritoneal shunt (VPS). A simple and affordable type, the Harare-shunt, consists of a silastic ventricular limb with multiple side holes, a steel elbow and a silastic peritoneal limb with slit-valves. The opening pressure of the infantile type is 5cm water<sup>1</sup>. The cost of the shunt is US\$15, which is seven times the annual budget for health per head of population in Zambia.

Although the technique of a VPS insertion is not difficult, the function can be impaired by short-term and long-term complications, like infection, wound dehiscence, migration, disconnection and blockage of the shunt. Revision of a VPS is therefore frequently indicated.

The neurological outcome in many African patients is unknown due to poor follow-up<sup>2,3,4,5</sup>. In this study, we investigated the results after insertion of a VPS, with special attention to those which had needed revision.

## Patients and methods

At St Francis' Hospital, Katete, between August 1995 and August 1998, 60 Harare-shunts were inserted in 54 children for hydrocephalus. This general hospital provides second level health care to the

population (presently estimated to be over 1 million) of the Eastern Province of Zambia.

The age at insertion ranged between 14 days and 12 months. The aetiology of the hydrocephalus was unknown in most patients but a history of meningitis or probable meningitis was obtained in 13 cases (24%).

All patients underwent ultrasonography via the anterior fontanelle and examination of CSF, prior to insertion of the VPS. If the CSF showed signs of infection (WCC>4, protein >0.4g/l), the operation was postponed and antibiotics were given until the CSF became normal.

The operation was carried out under general anaesthesia with endotracheal intubation. The ventricular limb was inserted through a burr-hole in the occipito-parietal region, two fingers breadth behind and two fingers above the ear. The distal limb was tunnelled to the anterior abdominal wall and inserted under vision into the peritoneal cavity. The silastic tubes were connected to the steel elbow with wire, and the elbow to the parietal skull with wire. The abdominal wound was closed in layers with catgut and the skin with nylon. Prophylactic antibiotics were not given if the CSF was normal but, if antibiotic treatment had been started because of initial CSF changes, it was continued for 48 hours after the operation. The patients were kept in hospital until the wounds were healed.

## Results

Pre-operative ultrasonography demonstrated symmetrical dilatation of the lateral ventricles in all cases. Three patients had signs of infected CSF on pre-operative examination and underwent antibiotic treatment before VPS insertion.

There was no operative mortality. Postoperative complications were: pneumonia (2), abdominal wound infection (2) and reactivation of meningitis (1). One intra-operative complication occurred when the distal limb of the VPS was found to have no slit valves and the surgeon decided to make slits. This shunt later became blocked.

Revision of the VPS during the study period was indicated in 20 patients (37%). The (probable)

aetiology of the hydrocephalus in the revision group was meningitis in nine (45%); congenital in six and unknown in five. Two of the three patients with infected CSF on pre-operative examination needed revision, and one was lost to follow-up. The indications for revision were: blockage (14); disconnection (2); exteriorisation of the distal limb (2); dislocation of distal limb into a subcutaneous cyst (1); abdominal wound dehiscence (1).

Revision in most cases of blockage consisted of exteriorisation of the peritoneal limb. If this was draining well or could be made to drain by removing (milking) the debris, it was replaced in the peritoneal cavity. In two cases, removal of adherent omentum was performed. In six cases, a new VPS was inserted on the contralateral side. In four cases, more than one revision was performed because of repeated blockage.

Twenty-two children (40%) presented for follow-up at between three to 36 months. Twenty-one had a functioning VPS in situ but, in one child, the VPS had to be removed after several revisions. Thirteen of the 21 had moderate to severe psychomotor retardation and eight (38%) were normal or mildly impaired. Six children presented for follow-up after revision. None of these six were in the category of being normal or mildly impaired (Table 1).

**TABLE I** Long term outcome in 21 patients with a functioning VPS

	PSYCHOMOTOR STATUS		TOTAL
	Normal / mild impairment	Moderate / severe impairment	
No Revision	8	7	15
Revision	0	6	6
TOTAL	8	13	21

## Discussion

Insertion of a VPS is one of the most frequently performed surgical procedures in children at St Francis' Hospital. The aetiology of hydrocephalus cannot be ascertained in all cases. Meningitis was the likely cause in approximately 25% of cases.

VPS insertion was associated with few immediate postoperative complications but late complications necessitating revision occurred in a high percentage (37%). Blockage of the shunt was the common indication for revision. The incidence of meningitis as the cause of hydrocephalus was higher in the revision group (9/20 = 45%) than in the whole group (13/54 = 24%). Attention to minor operative details is important to prevent mechanical problems like migration and disconnection.

The outcome after insertion of a VPS is difficult to assess as the follow-up rate was only 40% (22/54).

Out of the 22 who came for follow-up, only eight (38%) were normal or only mildly impaired. Out of the six who came for follow-up visits after revision, all were moderately or severely retarded.

Our results of VPS insertion are similar to those reported by other authors in Africa<sup>1,5</sup>. They appear unrelated to the type of shunt used<sup>2,5</sup> and the results of neurosurgeons and general paediatric surgeons are quite comparable<sup>4</sup>. Therefore, improvement of the results can probably only be achieved

by earlier diagnosis of hydrocephalus and recognition of complications after shunt insertion.

### Conclusion

Hydrocephalus can be treated with a VPS at relatively low cost. The success rate, with a good neurological outcome with no mild impairment of 38%, appears to justify the cost and effort. The outcome after revision was poor, however, and it is open to debate whether the additional cost of replacement of the VPS for complications is justified.

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