What should be the length of the peritoneal catheter in VP Shunt?
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Abstract
Complications of distal ventriculoperitoneal shunt tubing is quite common either due to a short length of the catheter or a very long length of catheter in the peritoneal cavity. This review article is based on two sample cases of hydrocephalous, in which one had a short and the other had a long peritoneal catheter placement in the peritoneal cavity during VP Shunt surgery.

Keywords : Cerebrospinal fluid shunts, complication.

Case no. one

A thirteen years old right handed young boy, an amateur cricket player came to us in November 1996 with the complaints of headache, Vomiting and blurring vision. Fundoscopic examination revealed gross papilloedema.

A CT Scan brain revealed gross hydrocephalous with dilatation of all four ventricles without any other CT findings. A medium pressure ventriculoperitoneal shunt system was inserted by canulating the right lateral ventricle through a right parietal burr hole and the peritoneal catheter inserted through a right lower abdominal incision. After surgery the patient had an excellent recovery. He started back his usual activities as a cricketer. He was very good in bowling. After one year of surgery he noticed a small swelling in the right lower abdomen. He was advised for revision shunt surgery but he did not comply. About six and a half years later, in mid 2004 he developed headache and vomiting with gradually enlarging abdominal swelling, to the size of a cricket ball. An ultrasonogram of the abdomen revealed a cyst containing the peritoneal catheter of the VP Shunt in the anterior abdominal wall and a CT Scan of Brain revealed moderately dilated ventricular system suggesting improperly functioning VP Shunt system. He was hospitalized and revision of the peritoneal end of the ventricular catheter was planned. Upon surgery it was confirmed that the peritoneal end of the catheter had been

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pulled out of the peritoneal cavity and was lying between the external and internal oblique muscle layer of the anterior abdominal wall with the formation of a cyst. Excision of the cyst, repair of the anterior abdominal wall at this site and reintroduction of the peritoneal catheter in the peritoneal cavity with added length was undertaken. Post operative recovery was excellent.

Case no. two
A two months old female child was brought to the neurosurgery unit of Mitford Hospital Dhaka, Bangladesh on March 16, 2003 with an irregular mass in the lower back. On clinical examination it was found to be a lumbar meningocele with no motor deficit of lower limbs and no urinary incontinence. The head circumference was moderately enlarged with tense and bulging anterior fontanel (OFC 45 cm). An ultra sonogram of the brain was done which revealed grossly dilated lateral and third ventricles. A right sided Chababra Medium Pressure VP shunt system was inserted by canulating the right lateral ventricle through a right parietal burr hole and the peritoneal catheter inserted through a right sub costal incision. Excision and three layered repair of the lumbar meningocele was done in the same sitting. Post operative recovery was satisfactory and the baby was discharged after removal of skin stitches. Fifteen months later on July 4, 2004 the baby was readmitted with the peritoneal catheter coming out per anus and CSF draining out drop by drop through the slit at the tip of the peritoneal catheter of the VP shunt. The fontanel was non bulging with an OFC of 48 cm. and a midline bulge at the lower part of the back. The VP shunt was removed by opening up sub cutaneous tract below the valve of the shunt system in the neck under local anesthesia and then bisecting the peritoneal catheter there. The extruding catheter per anus was gently pulled out. Then the ventricular catheter along with the valve was also pulled out by the neck opening of the catheter tract by gentle pull. The baby was kept on a third generation cephalosporin and metronidazole for five days and nothing by mouth and IV infusion for next twenty four hours. Oral feeds were subsequently started after confirming no bowel complications. A subsequent fresh VP shunt was inserted and the baby was doing quite fine after surgery.

Discussion
Shunt complications are numerous and can be classified under three main headings
i. Infection
ii. Functional failure
iii. Mechanical failure

Late anal extrusion of the peritoneal catheter is a very rare complication with a very few cases reported so far\(^1,2\). Factors relating to shunt failure have three potential origins: the surgeon the patient and the shunt. Shunt complications are in fact more often related to a combination of the factors\(^3\).

Experience with the primary insertion of an extended length of peritoneal tubing (120 cm) undertaken to avoid the need for a lengthening procedure because of growth of the patient, had been reported very successful\(^4\).

In a review about insertions of VP shunts using the extended length tubing over a 14-year period at Childrens Hospital of Los Angeles, a total 998 shunts were placed in 952 patients, with a mean follow-up period of 6.7 years. The patients experienced a total of 52 distal shunt revisions for a variety of malfunction etiologies. In patients ranging in age from premature neonate to 20 years, there was no
increase in the distal complication rate, and specifically no complications were experienced that were directly related to the use of the extended length tubing. An extra-abdominal cyst filled with cerebrospinal fluid was found postpartum in a patient with a ventriculoperitoneal (VP) shunt. No similar complication of VP shunting has been reported before except for our case no-1.

**Conclusion**
Extra long peritoneal catheter and the rigidity of the tube along with the poor nutritional status of the patient appears to be the cause of slow penetration of the catheter tip inside the lumen of the large gut. Pulsatile CSF out flow at the catheter tip and the peristaltic bowel movement added to the ultimate extrusion of the shunt per anus. This rare complication can be prevented by keeping the peritoneal end of the catheter to a minimum size, not more than 10 cm in the peritoneal cavity of the neonates and 25-30 cm in infants. Our experience reveals that keeping the peritoneal catheter in infants not more than 20 cm gives better results. As regards the patient factor the nutritional status of the patient must be taken into good consideration in preventing such complications. So the answer for the question of what should be the length of the peritoneal catheter inside the peritoneal cavity be considered on the merit of each individual case.

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