

## Commentary

Hippocrates, 5<sup>th</sup> Century B.C. (460-377 BC), Greek physician and surgeon, the father of medicine, is thought to be the first physician to attempt and document the

treatment of hydrocephalus.<sup>[1]</sup> Vesalius (1514-1564) clarified many of the anatomical and pathological characteristics of hydrocephalus.<sup>[1]</sup> Hydrocephalus

is a common pediatric disorder in which there is an increase in cerebrospinal fluid (CSF) volume, which in turn causes enlargement of the ventricles, thinning of the cortical mantle, and elevation of the intracranial pressure.<sup>[2]</sup> The use of peritoneal cavity for CSF absorption in ventriculoperitoneal (VP) shunting was introduced in 1908 by Kausch; since then, VP shunt are amongst the most frequently performed operations for the management of hydrocephalus; not only in children, but also in adults.<sup>[1-4]</sup> Other shunting techniques are ventriculoatrial shunts, endoscopic third ventriculostomy, and lumboperitoneal shunts.<sup>[5-7]</sup> Endoscopic third ventriculostomy is more physiological and anatomical diversion pathway for CSF and at the same time, it obviates the needs to place a foreign body such as ventricular shunt, thus avoiding shunt-related complications such as malfunction, infection, and over-drainage.<sup>[8]</sup>

Although the risks in performing a shunt operation are low, the complications related to shunts are many and reported to occur in 24% to 47% of the cases, of which abdominal complications are reported in 25% of VP shunt operations. Many of the shunt complications need shunt revision and many of them require multiple revisions.<sup>[3,4,9]</sup>

Extrusion/protrusion of the peritoneal catheter are an unusual but serious complication following VP shunting.<sup>[3,9]</sup> The bowel is the most commonly and frequently involved site for perforation and extrusion by peritoneal catheter and is reported to occur in up to 2.5% of cases.<sup>[3,9]</sup> Non-enteric viscous perforation has also been sporadically reported in literature and includes urinary bladder, vagina, uterus, urethra, etc., VP shunt catheter extrusion/protrusion has also been reported through umbilicus, gastrostomy wound, healed abdominal scar, scrotal skin, mouth, etc.<sup>[5,9,10]</sup> In cases of bowel perforation and extrusion of peritoneal catheter through anus, the interval between shunt insertions to extrusion may range from 2 to 20 months, and most of them present within 6 months following shunt insertion.<sup>[3,9]</sup> Many of the cases with extrusion of peritoneal catheter through non - enteric viscous may also present within 6 months following shunt insertion.<sup>[9,10]</sup> The occurrence of a viscus perforation by the abdominal portion of a VP shunts usually does not lead to acute peritonitis.<sup>[3,9,10]</sup> Acute viscus perforation may also occur due to peritoneal catheter following VP shunting; this is the exception rather than the rule.

The exact mechanism for the extrusion of the peritoneal catheter is not known. Multiple factors may play an important role for the occurrence of the perforation of the viscus and ultimately extrusion of the catheter and includes infection, meningitis, long length of peritoneal

catheter, foreign body reaction for shunt, pressure necrosis, age of patient, peristaltic motility of bowel, poor surgical technique, poor host immunity etc.<sup>[3,9,10]</sup>

Management of the extruded shunt must be individualized and depends on the involved viscera, presence or absence of infection (shunt/shunt tract infection, meningitis, and peritonitis), functional status of the shunt system etc., Many options are available for the management of patients who presented with extrusion of peritoneal catheter and are (1) Mini laparotomy and revision of peritoneal catheter of the VP shunt. Most of the cases who presented with extruded catheter; they present without peritonitis and, therefore, formal abdominal exploration for localization of perforation and repair of the same are not required, (2) formal exploratory laparotomy for repair of perforation and shunt revision in selected cases having peritonitis, (3) shunt removal, external ventricular drainage, followed by delayed VP shunt/VA shunt or contra-lateral shunt, (4) removal of entire shunt system and contra lateral shunting or delayed shunting.<sup>[3,9,10]</sup> Shunt extrusions can also be managed using laparoscope, cystoscope, sigmoidoscope etc., depending up on the site of peritoneal catheter extrusion. During shunt revisions, if there is evidence of infection (shunt, shunt tract infection, meningitis, peritonitis), then shunt removal and external ventricular drainage would be a preferred approach.

VP shunt operations done for the management of hydrocephalus are not only prone for complications, but also require shunt revisions in the follow-up period. Visceral perforation and extrusion/protrusion by peritoneal catheter are also well-known complication and may occur following VP shunt operations. A regular follow-up is a must during first 6 months after the VP shunt surgery as majority of complications are being reported within this period.

Rajendra K Ghritlaharey

*Department of Pediatric Surgery, Gandhi Medical College and Associated Kamla Nehru and Hamidia Hospitals, Bhopal, Madhya Pradesh India*

**Address for correspondence:**

Dr. Rajendra K Ghritlaharey,  
Department of Pediatric Surgery,  
Gandhi Medical College and Associated Kamla Nehru and  
Hamidia Hospitals, Bhopal,  
Madhya Pradesh - 462 001, India.  
E-mail: drrajendrak1@rediffmail.com

## References

1. Lifshutz JI, Johnson WD. History of hydrocephalus and its treatments. *Neurosurg Focus* 2001;11:E1.

2. Smith JL. Management of neural tube defects, hydrocephalus, refractory epilepsy, and central nervous system infections. In: Grosfeld JL, O'Neill JA Jr, Fonkalsrud EW, Coran AG, Caldamone AA, editors. *Pediatric Surgery*. 6<sup>th</sup> ed. Vol. 2.: Mosby Yearbook Inc, USA; 2006. p. 1987-2017.
3. Ghritlaharey RK, Budhwani KS, Shrivastava DK, Gupta G, Kushwaha AS, Chanchlani R, *et al.* Trans-anal protrusion of ventriculo-peritoneal shunt catheter with silent bowel perforation: Report of ten cases in children. *Pediatr Surg Int* 2007;23:575-80.
4. Reddy GK, Bollam P, Shi R, Guthikonda B, Nanda A. Management of adult hydrocephalus with ventriculoperitoneal shunts: Long-term single-institution experience. *Neurosurgery* 2011;69:774-81.
5. Surchev J, Georgiev K, Enchev Y, Avramov R. Extremely rare complications in cerebrospinal fluid shunt operations. *J Neurosurg Sci* 2002;46:100-3.
6. Kulkarni AV, Drake JM, Mallucci CL, Sgouros S, Roth J, Constantini S, Canadian Pediatric Neurosurgery Study Group. Endoscopic third ventriculostomy in the treatment of childhood hydrocephalus. *J Pediatr* 2009;155:254-9.e1.
7. Yadav YR, Pande S, Raina VK, Singh M. Lumboperitoneal shunts: Review of 409 cases. *Neurol India* 2004;52:188-90.
8. Ray P, Jallo GI, Kim RY, Kim BS, Wilson S, Kothbauer K, *et al.* Endoscopic third ventriculostomy for tumor-related hydrocephalus in a pediatric population. *Neurosurg Focus* 2005;19:E8.
9. Ghritlaharey RK, Budhwani KS, Shrivastava DK, Shrivastava J. Ventriculoperitoneal shunt complications needing shunt revision in children: A review of 5 years of experience with 48 revisions. *Afr J Paediatr Surg* 2012;9:32-9.
10. Kumar B, Sharma SB, Singh DK. Extrusion of ventriculo-peritoneal shunt catheter. *Indian J Pediatr* 2010;77:336.
11. Bonfield CM, Weiner GM, Bradley MS, Donnellan NM, Engh JA. Vaginal extrusion of a ventriculo-peritoneal shunt catheter in an adult. *J Neurosc Rural Pract* 2015;6:10-6.

Access this article online	
<b>Quick Response Code:</b>	
	<b>Website:</b> <a href="http://www.ruralneuropractice.com">www.ruralneuropractice.com</a>