

## Case Report

# Total Intracranial Migration of VP shunt - A Case Report

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**Conflict of interest:** There is no conflict of interest relevant to this paper to disclose.

**Funding Agency :** was not funded by any institute or any group.

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**Received:** 4th July 2019  
**Accept:** 3rd August 2019

### Abstract

*Ventriculoperitoneal (VP) shunt is a common procedure performed for treating hydrocephalus. Recently, endoscopy has been used in selected cases. Proximal migration of VP shunt is a rare complication. Complete intracranial migration of VP shunt is very rare with very few cases reported in literature. We report a case of complete intracranial migration of a VP shunt which was endoscopically retrieved. The possible mechanisms causing this very uncommon complication and the management are explained.*

**Keywords:** VP shunt, intracraial migration, subgaleal collection

*Bang. J Neurosurgery 2020; 9(2): 168-172*

### Introduction

The most common treatment of hydrocephalus is ventriculo-peritoneal (VP) shunting.<sup>1</sup> Shunt failure due to infection and obstruction are frequent complications that occur in 40% - 70% of cases.<sup>2</sup> Proximal migration of VP shunt is a rare complication. Complete

intracranial migration of VP shunt is very rare with very few cases reported in literature.<sup>3-16</sup> Here, we report a case of complete intracranial migration of a VP shunt which was endoscopically retrieved. The possible mechanisms causing this very uncommon complication and the management are explained.

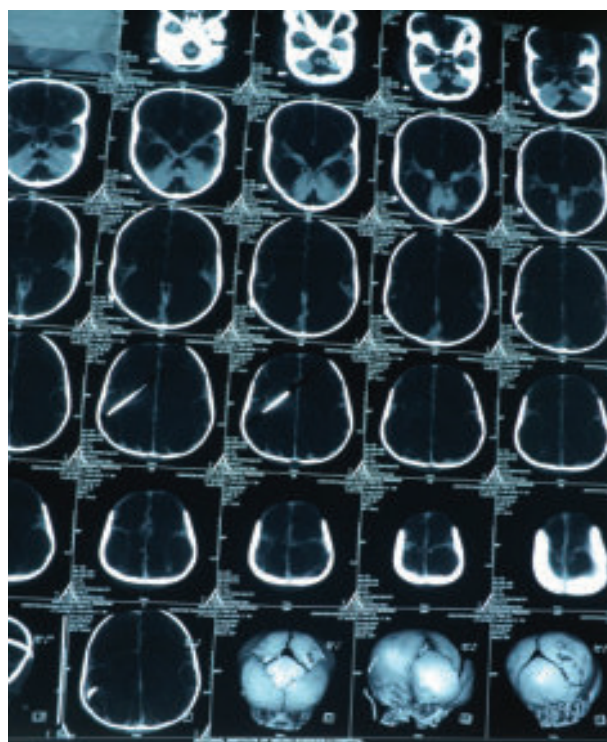
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**Case Report**

The patient is a 10 month old girl who presented with progressive swelling of scalp around the proximal incision of her previous shunt surgery. She was shunted (medium pressure Chhabra VP shunt via right parieto-occipital burr hole) one and a half month ago due to congenital severe hydrocephalus with Dandy Walker malformation and an enlarged head.[Figure 1] In the 4<sup>th</sup> postoperative week, she developed subgaleal swelling beneath the proximal incision at the burr hole site. The swelling was progressive and became associated with a wide and tense fontanel

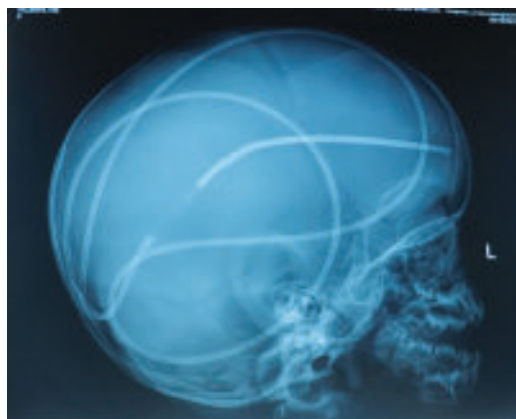
and persistent vomiting for 2 weeks prior to admission. On physical examination there was a wide and tense fontanel. There was a tense large pseudomeningocele at the burr hole site without any fluid leakage.[ Figure 2] No part of the shunt tube or chamber was felt in subcutaneous tissue. X-ray of the skull showed entire shunt in the cranium [Figure 3]. A brain computed tomography (CT) scan confirmed bilateral subdural hygroma with severe cerebral atrophy and coiling of the peritoneal catheter, which had migrated into the subdural space. The proximal catheter was inside



**Fig.-1:** Initial CT scan brain after VP shunt surgery



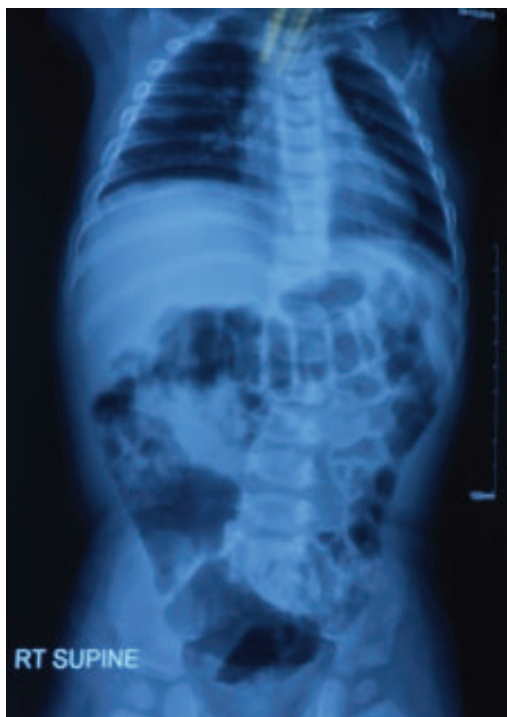
**Fig.-2:** A tense large pseudomeningocele at the burr hole site.



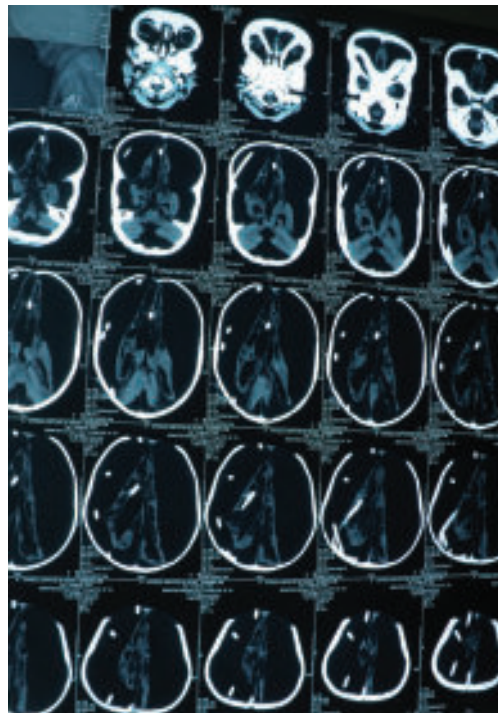
**Fig.- 3 a and b:** X-ray skull showing complete shunt in the intracranial cavity.

the parenchyma [Figure 5]. The proximal incision was opened on 08.10.2016 and a flexible endoscope (Storz) was inserted into the subdural space. The entire shunt could be seen coiled within the right subdural space [Figure 6a]. It was carefully held with

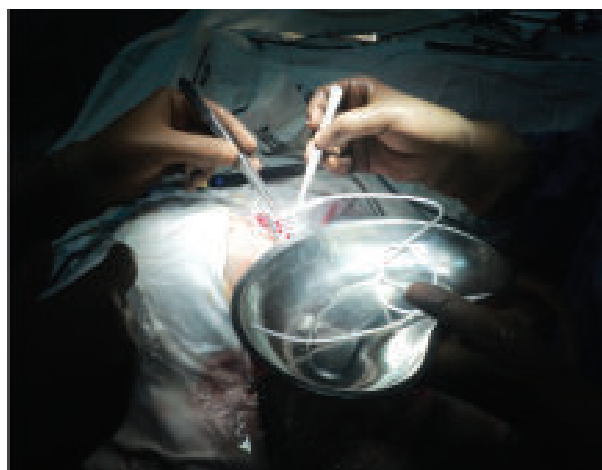
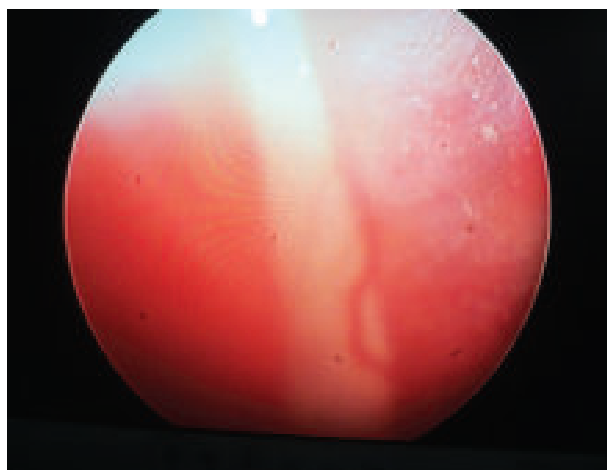
forceps and retrieved from the ventricle taking care to free flimsy adhesions [Figure 6 b]. The postoperative period was unremarkable, The child improved clinically and was discharged after 8 days. She is symptom-free during 3 months follow up.



**Fig.-4:** No shunt catheter is seen on the plain abdomen X-ray.



**Fig.-5:** CT scan brain (non-contrast) showed rt subdural and intraventricular ventriculoperitoneal shunt with severe cerebral atrophy and bilateral subdural hygroma.



**Fig.-6 a:** Operative endoscopic photograph shows shunt in subdural space, b: Operative photograph shows shunt chamber being taken out from lateral ventricle.



**Discussion:**

Cerebrospinal fluid shunting is a common operation performed by neurosurgeons for hydrocephalus. It is a deceptively simple operation with a wide range of complications. They can be summarized into infection, mechanical failure, and functional failure.<sup>17</sup> Although shunt complications are often multifactorial, a non-infectious cause for a shunt complication generally requires shunt revision.<sup>17</sup> Mechanical failure of a shunt system includes disconnected parts and obstruction and migration of the shunt system.

Shunt tube proximal migration ranges from 0.1% to 0.4% of all shunt procedures.<sup>3-10</sup> It varies from migration of ventricular end into ventricle or migration into subgaleal space and others. Heim and Kim have reported migration of ventriculoperitoneal shunt to subgaleal and subdural spaces.<sup>18,19</sup> However, complete intracranial migration of the entire shunt system into ventricle is very rare.<sup>[3–12]</sup>

There are many factors that are proposed responsible for the migration of the shunt. Excessive neck movements producing a windlass effect coupled with a large potential subgaleal space created for chamber positioning or dilated ventricles with negative suctioning pressure or a positive intraabdominal pressure have been thought to be responsible for the migration.<sup>8,10-12</sup> The memory of devices placed in packaging allows the tubing to recoil as explained by Dominguez et al.<sup>20</sup> as a “memory phenomenon”.

Others are either patient-related factors such as younger age, thin cortical mantle, malnutrition, or surgical technicality of creating a large burr hole, wide dural opening, and not anchoring of chamber to pericranium.<sup>3-12</sup> Short distance between ventricular and abdominal end seen in young patients and severe hydrocephalus have been responsible for the migration of shunt inside the ventricle.<sup>6</sup> Furthermore, peritoneal scarring with local cyst formation, non-absorption of cerebrospinal fluid, and constant positive abdominal pressure causing migration of the tube along the fibrous tract of the tunnel may be responsible. Chhabra shunt which has cylindrical chamber as in our case has been implicated in few of the reported cases.<sup>3-12</sup> Parieto-occipital burr hole with a relatively straight course of shunt tunneling may be responsible for migration of the shunt.<sup>6,11</sup>

Optimum creation of subgaleal space for chamber, smaller burr hole and dural opening, and proper anchorage of the chamber to pericranium are some of

the few measures that the authors propose to reduce this complication.

**Conclusion:**

Total intracranial migration of ventriculoperitoneal shunt is a rare complication. The probable reasons for migration are: 1. Malnourished infant with thin cortical mantle, large ventricles having reduced pressure and raised intraabdominal pressure due to excess amount of CSF not absorbed in peritoneum due to varying reasons. 2. Irritable infant with excessive crying, neck movements and a straight course of shunt from occiput to peritoneum. 3. Poor anchorage of shunt chamber along with indiscriminate pressing of cylindrical Chhabra shunt chamber. To prevent it special care must be taken in neonates and infants in making smaller burr holes, smaller chamber area and stronger anchorage of shunt chamber to periosteum. Further instead of using the cylindrical Chhabra chambers that can easily migrate to ventricles, larger spherical chambers may be used and the parents counseled carefully on how to press the chamber.

**References:**

1. Mwachaka PH, Obonyo NG, Mutiso BK, Ranketi S, Mwangombe N. Ventriculoperitoneal shunt complications: A three-year retrospective study in a Kenyan national teaching and referral hospital. *Pediatr Neurosurg*. 2010;46:1–5. [PubMed: 20453556]
2. Shafiee S, Nejat F, Raouf SM, Mehdizadeh M, El Khashab M. Coiling and migration of peritoneal catheter into the breast: A very rare complication of ventriculoperitoneal shunt. *Childs Nerv Syst*. 2011;27:1499–501. [PubMed: 21710231]
3. Acharya R, Bhutani A, Saxena H, Madan VS. Complete migration of ventriculoperitoneal shunt into the ventricle. *Neurol Sci*. 2002;23:75–7. [PubMed: 12235495]
4. Mori k, Yamashita J, Handa H. “Missing tube” of peritoneal shunt: Migration of the whole system into ventricle. *Surg Neurol*. 1975;4:57–9. [PubMed: 1166405]
5. Villarejo F, Alvarez-Sastre C, Gimenez D, Gonzalez C. Migration of an entire one-piece shunt into the ventricle. *Neurochirurgia (Stuttg)* 1979;22:196–8. [PubMed: 388246]
6. Young HA, Robb PJ, Hardy DG. Complete migration of ventriculoperitoneal shunt into the ventricle: Report of two cases. *Neurosurgery*. 1983;12:469–71. [PubMed: 6343910]
7. Abou el Nasr HT. Modified method for prophylaxis against unishunt system complications with presentation of total intraventricular migration of unisystem ventriculoperitoneal shunt. *Childs Nerv Syst*. 1988;4:116–8. [PubMed: 3042135]
8. Eljamel MS, Sharif S, Pidgeon CN. Total intraventricular migration of unisystem ventriculo-peritoneal shunt. *Acta Neurochir (Wien)* 1995;136:217–8. [PubMed: 8748857]

9. Nadkarni TD, Menon RK, Dange NN, Desai KI, Goel A. Cranial migration of complete ventriculoperitoneal shunt assembly. *J Clin Neurosci*. 2007;14:92–4. [PubMed: 16935511]
10. Choudhury AR. Avoidable factors that contribute to the complications of ventriculoperitoneal shunt in childhood hydrocephalus. *Childs Nerv Syst*. 1990;6:346–9. [PubMed: 2257549]
11. Shimizu S, Mochizuki T, Nakayama K, Fujii K. Visual field defects due to a shunt valve migrating into the cranium. *Acta Neurochir (Wien)* 2002;144:1055–6. [PubMed: 12382134]
12. Agarwal A, Kakani A. Total migration of a ventriculoperitoneal shunt catheter into the ventricles. *J Pediatr Neurosci*. 2011;6:88–9. [PMCID: PMC3173929] [PubMed: 21977102]
13. Vikas Naik, Manoj Phalak, Poodipedi Sarat Chandra. Total intracranial shunt migration. *J Neurosci Rural Pract*. 2013; Jan-Mar; 4(1): 95–96.
14. Shahram Shahsavaran, Hamed Reihani Kermani, Ehsan Keikhosravi, Farideh Nejat, Mostafa El Khashab. Ventriculoperitoneal shunt migration and coiling: A report of two cases. *J Pediatr Neurosci*. 2012;May-Aug; 7(2): 114–116.
15. Arvind Malhotra, Mini Malhotra. Ventricular migration of shunt: Chhabra shunt complication. *Int Surg J*. 2015; Nov;2(4):706-709
16. Kyung Rae Cho, Je Young Yeon, Hyung Jin Shin. Upward Migration of a Peritoneal Catheter Following Ventriculoperitoneal Shunt. *Journal of Korean Neurosurgical Society* .2013; Volume 53(6).
17. Al Hinai QS, Pawar SJ, Sharma RR, Devadas RV : Subgaleal migration of a ventriculoperitoneal shunt. *J Clin Neurosci* 2006; 13 : 666-669.
18. Heim RC, Kaufman BA, Park TS. Complete migration of peritoneal shunt tubing to the scalp. *Childs Nerv Syst*. 1994;10:399-400.
19. Kim KJ, Wang KC, Cho BK. Proximal migration and subcutaneous coiling of a peritoneal catheter: Report of two cases. *Childs Nerv Syst*. 1995;11:428-31.
20. Dominguez CJ, Tiagi A, Hall G, Timothy J, Chumas PD. Subgaleal coiling of the proximal and distal components of a ventriculoperitoneal shunt. An unusual complication and proposed mechanism. *Childs Nerv Syst*. 2000;16:493–5. [PubMed: 11007499]