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Brief Report

Complete Intraventricular Migration of Ventriculoperitoneal Shunt: Once in a Blue Moon Phenomenon of Shunt Surgery

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Abstract

Shunt surgery is a very common neurosurgical procedure for hydrocephalus. It is associated with numerous complications, and intraventricular shunt migration is one of rarest. Various mechanisms have been described to explain this rare entity. Hereby we present an index case of this rare complication of shunt surgery in which patient presented with tuberculous meningitis with hydrocephalus having intraventricular shunt migration and will discuss possible mechanisms responsible for it. A 1-year old male infant, previously diagnosed case of tuberculous meningitis with hydrocephalus with right-sided ventriculoperitoneal shunt in situ, presented to the emergency department with bulging fontanelles secondary to shunt malfunction. Left-sided ventriculoperitoneal shunt was inserted. After few months, patient turned up again with left-sided shunt malfunction and right-sided intraventricular migrated shunt. Endoscopy-assisted removal of intraventricular migrated shunt and simultaneous third ventriculostomy was done. Patient improved in postoperative period. Being an extremely uncommon complication, intraventricular migration of shunt described as "once in a blue moon" phenomenon. It can be avoided by proper surgical technique with adequate-sized burr hole. Removal of shunt is preferred for prevention of infection.

Keywords

- hydrocephalus
- ventriculoperitoneal shunt
- intraventricular migration

Introduction

Ventriculoperitoneal (VP) shunt surgery is very common neurosurgical procedure performed for hydrocephalus across all age groups. However, shunt surgery is attended with numerous adverse outcomes like shunt obstruction, migration, infection, viscus injury, and perforation. While intracranial migration of shunt is one of the rare occurrences,[1] complete intraventricular migration is rarer entity. As very few cases have been reported of complete intraventricular migration of VP shunt, we aptly refer to it as "once in a blue moon" phenomenon of shunt surgery. Hereby, we report a clear case of this phenomenon along with a summary of possible underlying mechanical causes.

Case Illustration

A male infant presented to emergency room with complaints of persistent crying and vomiting. His parents gave similar history of similar episodes 6 months earlier, for which they had consulted a private practitioner where diagnosis of obstructive proximal hydrocephalus was made. A right-sided VP shunt surgery was done for same and

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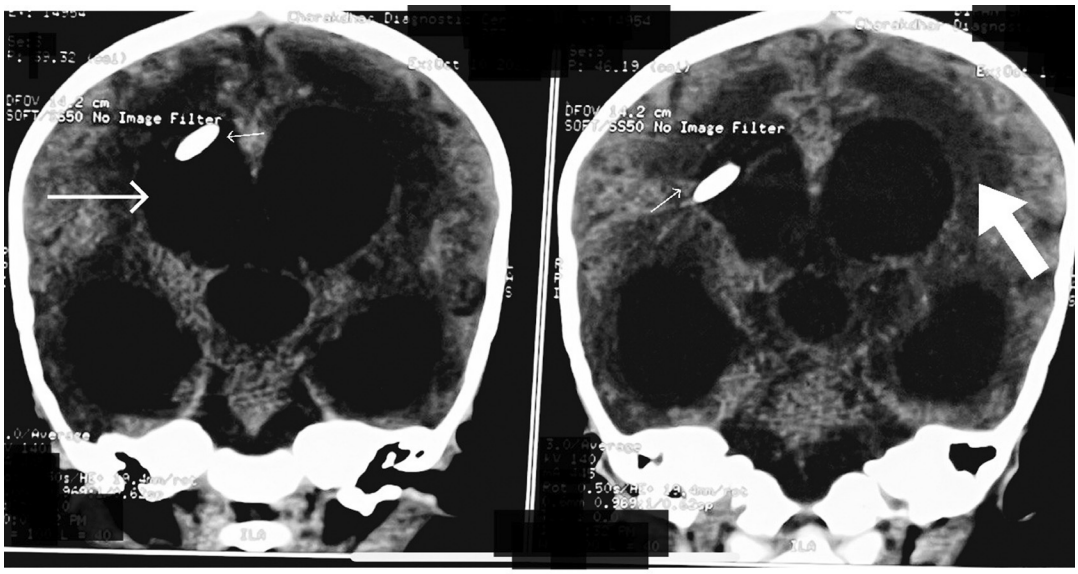

Fig. 1 Coronal sections of the computed tomography scan of head showing a right-sided shunt system (small arrows) with massive ventriculomegaly (thin arrow) with transependymal edema (thick arrow).

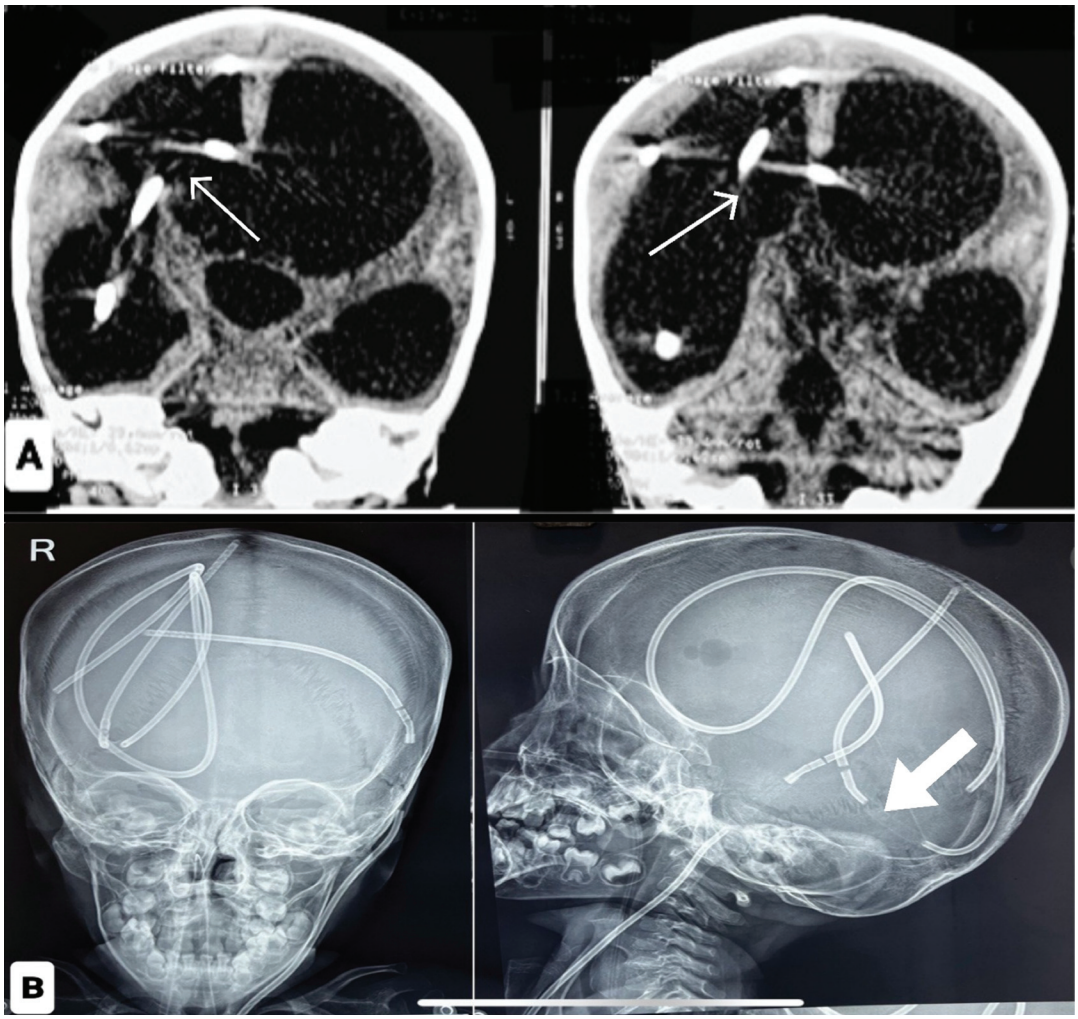

Fig. 2 (**A**) Coronal sections of the computed tomography scan of head showing massive hydrocephalus with transependymal edema, along with multiple shunt systems (thin arrows) with thinned brain cortex. (**B**) Plain radiographs of skull (anteroposterior and lateral view) showing complete intraventricular migration (thick arrow) of shunt tubing with chamber.

cerebrospinal fluid (CSF) study was typical of tuberculosis for which antitubercular treatment was initiated.

At current presentation, baby had an irritable cry, spontaneous eye opening, and movements of all four limbs. On examination, the fontanelles were bulging with positive sun set sign. Although head size was about 48 cm, the scalp veins were engorged. Clinically shunt was nonfunctional. Computed tomography (CT) head showed ventriculomegaly with shunt tip in ventricle (►**Fig. 1**). CSF studies showed high protein values (112 mg/dL; normal value: 15–60 mg/dL). A left-sided VP shunt was placed. An Ommaya reservoir, for CSF tapping in case of shunt blockage, owing to high protein value, was also placed over right Kocher's point. Patient improved clinically postoperatively and discharged after 10 days. After 3 months patient presented with skin excoriation and signs of infection at Ommaya reservoir site. The Ommaya reservoir was removed and cutaneous closure was achieved after obtaining healthy skin margins. The patient made an emergency department visit 3 months later with complaints of vomiting. On examination, patient was drowsy and the fontanelles were tense. A diagnosis of nonfunctioning shunt on the left side was made and on right side shunt chamber was not palpable. CT head (►**Fig. 2A**) and plain radiographs of skull (►**Fig. 2B**) showed complete intraventricular migration of ventricular catheter along with chamber. CT head (►**Fig. 2A**) also showed thinned cortex and massive ventriculomegaly with significant transependymal edema. CSF was sterile on 48 hours of incubation for any microbial growth. Patient was planned for endoscopic third ventriculostomy (ETV)

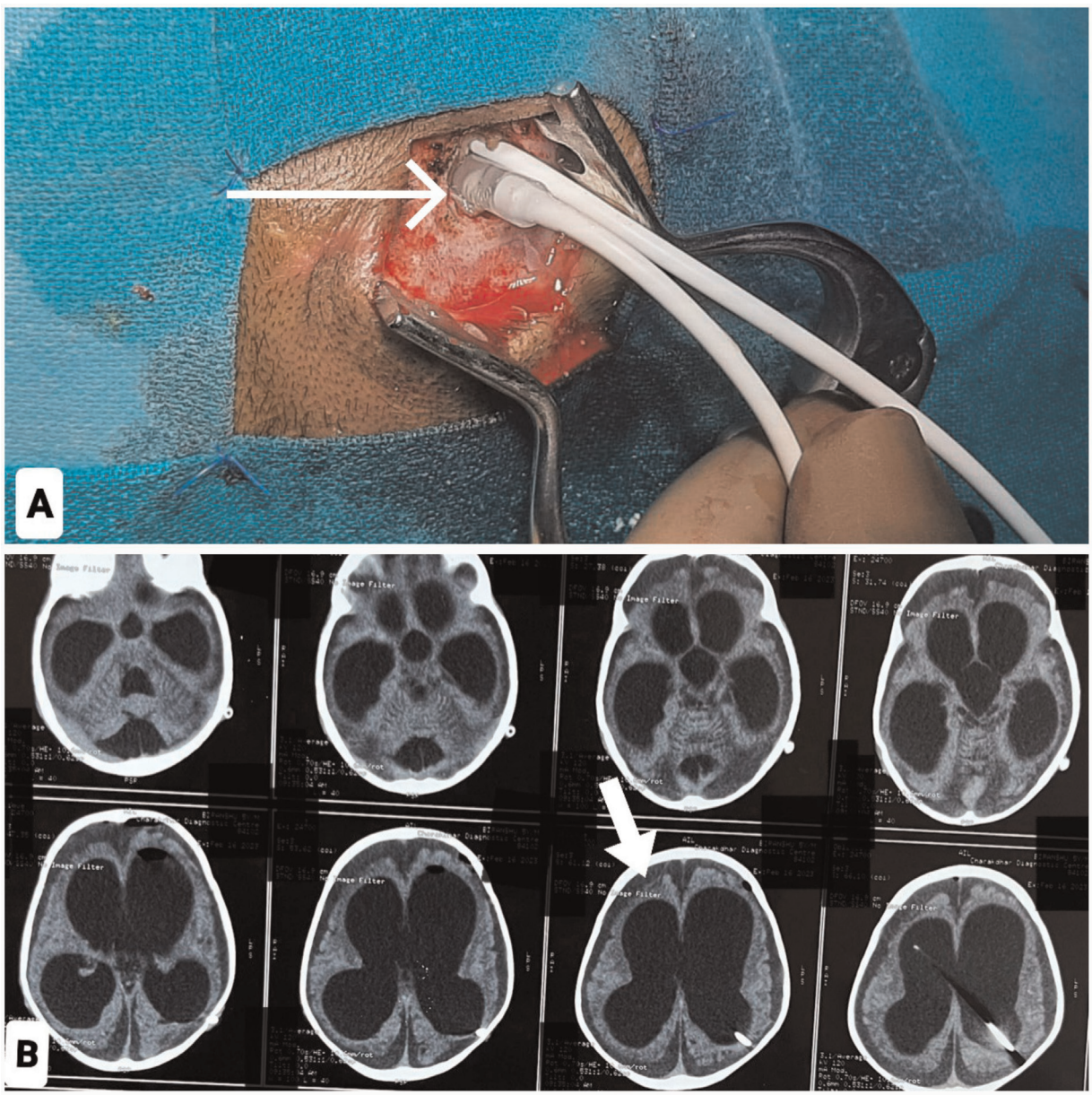

Fig. 3 (**A**) Removal of shunt chamber (thin arrow) along with the catheter through the right Kocher's point. (**B**) Axial sections of the computed tomography scan of the head showing resolution of transependymal edema and mild subdural hygroma along with the left-sided shunt catheter in ventricle (thick arrow).

and removal of migrated shunt. Zero-degree rigid endoscope was inserted into the ventricle through the right Kocher's point. The coiled and migrated part of the shunt with chamber was visualized in right lateral ventricle. Keeping in mind that separation of adhered part of shunt tip to choroid plexus can lead to inadvertent bleeding, shunt was gently removed under constant Ringer's fluid irrigation (►**Fig. 3A**). The distal part of shunt was also removed from the abdominal end. Left-sided shunt system also removed as it was nonfunctional. ETV was done to allow drainage of CSF through ventricular system. The patient gradually improved and repeat CT scan after 7 days of head showed reduction in ventricular pressure as shown by resolution of transependymal edema (►**Fig. 3B**). Functioning of the ETV was confirmed by collapse of fontanelles in the postoperative period. The patient developed subdural hygroma as shown in the postoperative scan after 7 days, probably due to over drainage of CSF (►**Fig. 3B**). The patient was discharged on tenth day in a stable condition.

Discussion

VP shunt surgery is not without complications. Migration of the shunt is a rare complication where it can migrate to various sites like thorax, abdomen, hollow viscera, cranium, or any other potential space like subgaleal or subcutaneous space.[2] Intracranial migration is rare complication following VP shunt procedures (0.1–0.4% of total shunt complications).[1,2] Complete intraventricular migration of shunt is rarest as very few cases have been reported. Shunt migration usually occurs within 3 to 6 months of postoperative period.[3]

There are various mechanisms explained for cranial migration of shunt system.[3–5] Some of these mechanisms were correlated with this case. First is decrease in intracranial pressures with simultaneous increase in intra-abdominal pressure that may have a "pushing effect" on the shunt system. The second cause is a larger burr made on the right side that contributed to the migration of shunt (►**Fig. 4**). Third, another probable, cause is that the patient was cachexic with minimal subcutaneous fat that is a critical factor in holding the shunt tubing in place. The fourth probable cause is the thinned cortex due to which brain matter could not hold the shunt tube in place. The other reason may be faulty fixation of shunt to the pericranium. Placement of Chhabra shunt which has a cylindrical shaped reservoir has been used in most of the previously reported cases of cranial migration of shunt.[5] Catheter memory also may contribute to migration of shunt. Poor neck control in infants leads to repetitive movements that causes "windlass effect" which facilitates shunt migration as described in various reports in literatures.[3–6] Treatment of migrated shunt is done by removal of migrated part via craniotomy or endoscopically and create the alternate path for CSF flow, that is, ETV or shunt revision. Although leaving the shunt system in situ with close observation for asymptomatic cases might be an option, removal of an intraventricular foreign body is always better as it can lead to a surgical site infection.[6]

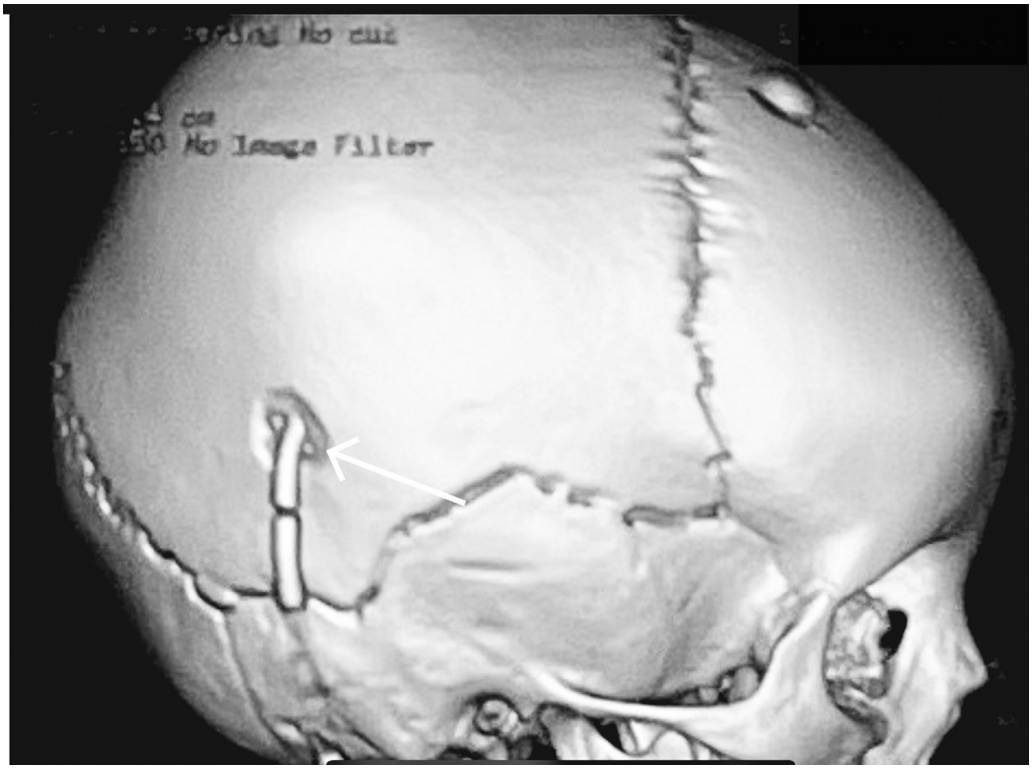

Fig. 4 Axial sections of the computed tomography scan of head showing large right-sided burr hole (thin arrow) through which shunt migrated into ventricle.

The authors describe a case with a series of events leading to complete intraventricular migration of a VP shunt in a patient of tuberculous meningitis and this article is probably the first which describes the possible mechanisms of complete intraventricular migration of shunt along with best management plan.

Conclusion

Being an extremely rare complication of shunt surgery, complete intraventricular migration of shunt can be described as "once in a blue moon" phenomenon. It can be avoided by proper surgical techniques with creating adequate-sized burr holes. Removal of the shunt is better option to avoid surgical site infections.

Conflict of Interest
None declared.

References

1 Nadkarni TD, Menon RK, Dange NN, Desai KI, Goel A. Cranial migration of complete ventriculo-peritoneal shunt assembly. J Clin Neurosci 2007;14(01):92–94
2 Harischandra LS, Sharma A, Chatterjee S. Shunt migration in ventriculoperitoneal shunting: a comprehensive review of literature. Neurol India 2019;67(01):85–99
3 Deo RC, Acharya A, Senapati SB, Panigrahi S, Mohapatra AK. Complete intraventricular migration of ventriculo-peritoneal shunt: a rare case report. Int J Surg Case Rep 2022;101:107772
4 Chatterjee S, Kaushik S. Coiling of ventriculo-peritoneal shunt in the subdural space: a possible etiology. J Pediatr Neurosci 2006;1 (01):31
5 Sharma RK, Bansal M, Agrawal M, Gupta A, Sinha VD. Complete intracranial migration of a ventriculoperitoneal shunt: rare complication of a common procedure. Neurol India 2015;63 (01):106–107
6 Vajramani GV, Jones G, Bayston R, Gray WP. Persistent and intractable ventriculitis due to retained ventricular catheters. Br J Neurosurg 2005;19(06):496–501

