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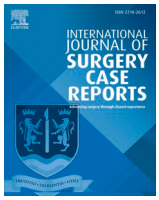

Case report

Complete intraventricular migration of ventriculo-peritoneal shunt: A rare case report

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ABSTRACT

Introduction and importance: A ventriculoperitoneal (VP) shunt is a cerebral shunt used to treat hydrocephalus. This is used to remove the excessive accumulation of cerebrospinal fluid inside the ventricles.
Case presentation: We are reporting a rare case of complete intracranial migration of a ventriculoperitoneal shunt, a potentially fatal complication, presenting to us with hydrocephalous. The baby was taken up for surgery with endoscopic assisted shunt removal and shunt revision.
Clinical discussion: Ventriculoperitoneal shunt is one of the common procedures used in infants and children, however, it is used in all age groups for hydrocephalous. The shunt is associated with multiple large number of complications like obstruction, infection, migration, and separation from the connected site. Etc. Shunt migration is a less common complication of which cranial migration is still less common.
Conclusion: Optimum creation of the sub-galeal space for the shunt chamber, a smaller burr hole, a smaller dural opening, and proper anchorage of the chamber to the pericranium, are some of the measures that may be useful in obviating this complication.

1. Introduction

Shunt Migration may be broadly defined as the translocation of the part/whole of the shunt system (proximal/distal catheter/reservoir/valve) from the compartment where it was intended to be to a new compartment, which may be associated with/without shunt dysfunction.

The case we are presenting is unique due to the very less incidence of the complication (less than 0.1 %) associated with the ventriculoperitoneal shunt [1] which we encountered. We have managed the case at a tertiary care medical school in Eastern India. The current treatment was divided into 2 steps. Due to features of meningitis with shunt exteriorisation, IV antibiotics were given for 1 week and planned to be taken up for shunt revision surgery upon resolution, as per review of a literature [1].

2. Case report

A 7-month old female child was brought to us with the complaint of gradually progressing enlargement of the head and decreased oral intake and recurrent vomiting. The child was a known case of thoraco-lumbar meningomyelocele(T8-L2) with spinal bifida with hydrocephalous and Chiari 2 malformation for which baby was operated 4 months back (in February 2022) and was asymptomatic regarding it. Shunt placement (Low-pressure Chhabra shunt) was carried out and myelomeningocele repair was performed in the same sitting. The postoperative period of the baby was uneventful with satisfactory discharge from hospital on day 7 (post-op). There was no significant drug history, family history and psychosocial history. On regular follow up, the baby's condition was found to be satisfactory. After 4 months, the baby's parents noticed there was a gradual increase in the size of the head circumference which was gradually progressing with decreased oral intake, high-grade fever, and recurrent vomiting for which the baby presented to us in the out-patient department. On examination, the head was found disproportionately enlarged with a bulging and tense anterior fontanel, engorged scalp veins, with the presence of sunset sign. Abdomen and chest was examined but the shunt catheter was not palpable across the chest wall and the anterior abdominal wall. The child was the admitted for further evaluation, started on IV antibiotics initially. On radiological examination, the shunt catheter was not visible on a plain chest and abdominal

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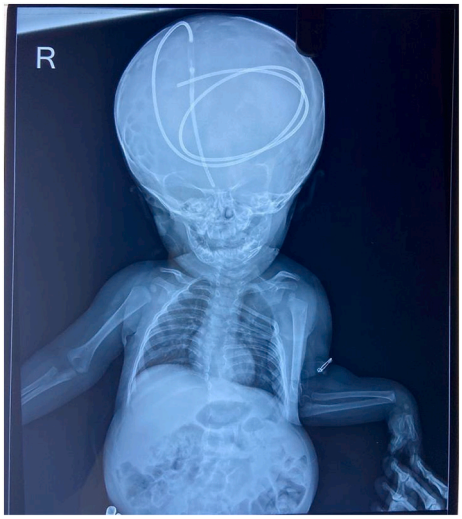

Fig. 1. X-ray skull showing completely migrated and coiled intracranial shunt.

radiographs. X-ray skull [Fig. 1] and computed tomography (CT) of the head [Fig. 2] showed the entire shunt catheter lying inside the cranial cavity, confirming the proximal migration of the shunt catheter. The CT head also showed gross hydrocephalus, with a thin cortical mantle. It was a rare occurrence and many literatures were reviewed for the same. CSF was sent for cultures through lumbar puncture which came out to be sterile. The baby was then planned for endoscope-assisted removal of the migrated shunt with the placement of a new shunt was done. After Pre anaesthetic clearance the child was taken up for surgery under general anaesthesia. The chief operating neurosurgeon (who has an experience of 500 cases of shunt placement) used a zero-degree, rigid endoscope was introduced through the keen's point (previous site of shunt insertion) inside the ventricle where the coiled and migrated shunt was seen. With constant saline irrigation, the shunt was gradually pulled out through the site of insertion. A new shunt (Low-pressure Chhabra) was placed on the same side with a new burrhole made 1 cm medial to the previous site of the burr. The distal end was placed into the abdomen after confirming the flow of CSF. The post-operative period was uneventful. Anterior fontanel remained lax. The baby was afebrile with gradual improvement of her general condition. She was discharged from the hospital on post-operative day 7. Subsequent CECT Head showed no increase in ventricle size. The patient is on a regular follow-up for past 3 months in OPD and is doing well thereafter with no abnormal clinical findings whatsoever.[The work has been reported in line with the SCARE 2020 criteria [13].

3. Discussion

CSF shunting is commonly prenoted with large number of complications [1], shunt migration being one of them. It could be classified based on: the compartment of migration (total intracranial/subgaleal/breast/thorax/abdominal wall/hollow viscus/genitourinary), the direction of migration (cranial/caudal), the component of the shunt

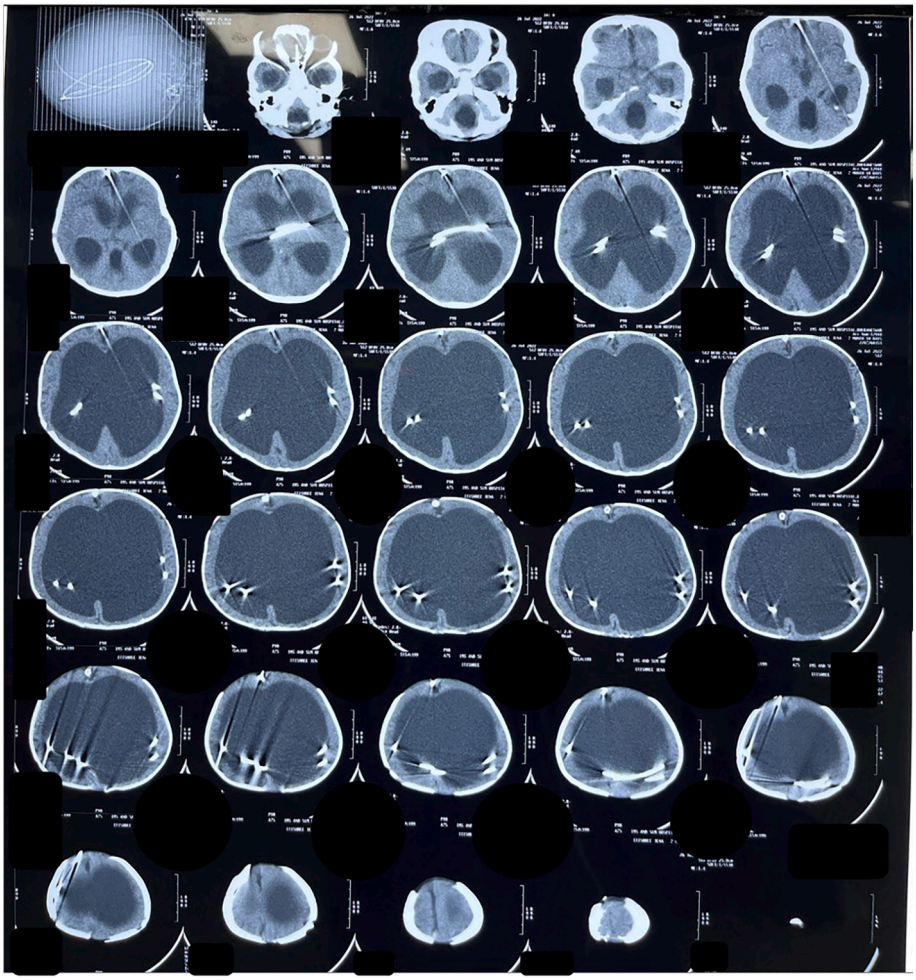

Fig. 2. Non-contrast Ct brain showing complete migration of ventriculo-peritoneal shunt with gross hydrocephalous with thin rim mantle of cortex.

system that migrates (proximal catheter/distal catheter/valve/reservoir/entire shunt system) [1].

The intracranial and subgaleal migration of the shunt system are referred to as "upward migration" based on the description by Mclone et al., in 1989 [2]. The earliest report of intracranial migration was by Scott et al., in 1955 [3]. Incidence of complete intracranial/subgaleal migration was reported to be 0.1–0.4 % of the total shunt-related complications [4]. Local symptoms in the form of subgaleal swelling, seizures, and visual disturbances (intraparenchymal migration) have been reported [5]. Most (69.2 %) migrations occur within 3 months after the shunt placement. Theories associated with shunt migrations occurring within 3 months may favour the mechanism of a sudden fall in intracranial pressure (sucking effect), a sudden increase in intra-abdominal pressure (pushing effect), faulty fixation, and a retained memory of the tube [6].

Children are more prone to shunt migration than adults because of the shorter distance the catheter has to travel from the caudal to the cranial end and the growth spurt in them which favours the pulling out of the shunt. A malnourished child is at a higher risk because the subcutaneous fat is inadequate to hold the tube in position similarly, in a child with cortical atrophy, the brain matter cannot hold the proximal catheter inside the brain effectively. Repeated head movement in children (flexion-extension) produces a windlass effect/ratchet movement which helps in pulling the catheter upward considering the shunt systems that were utilized, shunts without reservoirs/uni-shunt systems are more prone to developing a shunt migration [7–9]. The surgical technique may also help in the upward migration in the following ways [10,11]: Placement of a large burr hole or a large dural opening encourages shunt migration [9] or multiple subcutaneous passages encourage shunt displacements; and failure to anchor the shunt system to the pericranium leads to shunt migration due to the lack of tethering of the shunt tube. To avoid upward shunt migration, anchoring the shunt tubing under the pericranium is considered an important step. Optimum creation of the sub-galeal space for the shunt chamber, a smaller burr hole, a smaller dural opening, and proper anchorage of the chamber to the pericranium, are some of the measures that may be useful in obviating this complication [12].

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

1. Dr. Ram Chandra Deo – Surgery and its procedure
2. Dr. Abhijit Acharya – Main author of case reporting
3. Dr. Satya Bhusan Senapati – Review of literature
4. Dr. Souvagya Panigrahi – Compilation of data
5. Prof (Dr) Ashok Kumar Mohapatra – Discussion & analysis

Research registration

N/A.

Guarantor

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Declaration of competing interest

None among all the authors.

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