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Intracranial Migration of Intracranial Migration-A Rare Complication

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Abstract

Ventriculoperitoneal (VP) Shunt, a common and seemingly simple procedure in the Neurosurgery armamentarium, is deviously strewn with complications, the most frequent being mechanical shunt failure and infection.

In the gamut of complications plaguing this common lifesaving procedure, complete intracranial migration is extremely rare at 0.1-0.4% of all shunt procedures.

Here, we are presenting two rare cases of intracranial shunt migration, which were managed by transcranial endoscopic surgery, an approach that is infrequently seen in our search of available literature.

Keywords: Intracranial Migration; Ventriculoperitoneal Shunt; Encephalocele; Malformation; Endoscopic Third Ventriculostomy

Abbreviations

VP: Ventriculoperitoneal; NCCT: Non-Contrast Computed Tomography; EVD: External Ventricular Drain; ETV: Endoscopic Third Ventriculostomy.

Case 1

A 6-month-old female child, previously operated for occipital encephalocele with VP shunt in situ, presented with gradual enlargement of head and decreased oral intake. On examination, she had a tense bulging anterior fontanelle with sunsetting of the eyes. The VP shunt catheter tubing could neither be palpated nor imaged in the entire subcutaneous tract. Radiograph of the skull and Non-Contrast Computed Tomography (NCCT) of the head revealed the entire shunt tubing to be lying in the cranium, confirming the upward migration, and hydrocephalus (on NCCT). Endoscope assisted removal of the migrated shunt was planned. Upon approaching through the Kocher's point, the shunt tip was seen adherent to the choroid plexus and mild intraventricular haemorrhage resulted after shunt retrieval. External ventricular drain (EVD) was placed and procedure abandoned. The child was dull postoperatively and could be revived and died after 24 hours of procedure.

Case 2

An 18-month female child, previously operated for Chiari II Malformation (with VP Shunt placed at 8 months of age) presented with an enlarging head and excessive cry and refusal to feed. On examination, she had delayed responses and sunsetting of eyes with a disproportionately enlarged head. Shunt tube and chamber could not be felt in

subcutaneous tissue. NCCT of the head showed the entire shunt in the cranium (Figure 1). A rigid endoscope was inserted into the ventricle through a fresh burr hole made at right Kocher's point. The entire shunt could be seen coiled within the lateral ventricles (Figure 2). It was retrieved from the ventricle with forceps taking care to free flimsy adhesions. The plan was to place a new VP shunt on the opposite side but the floor of the third ventricle was found to be suitable for Endoscopic Third Ventriculostomy (ETV). ETV was performed and flow of CSF established. The child was closely monitored postoperatively for any deterioration, but she improved clinically and was discharged satisfactorily. A follow up at 6 months did not reveal any fresh complaints.

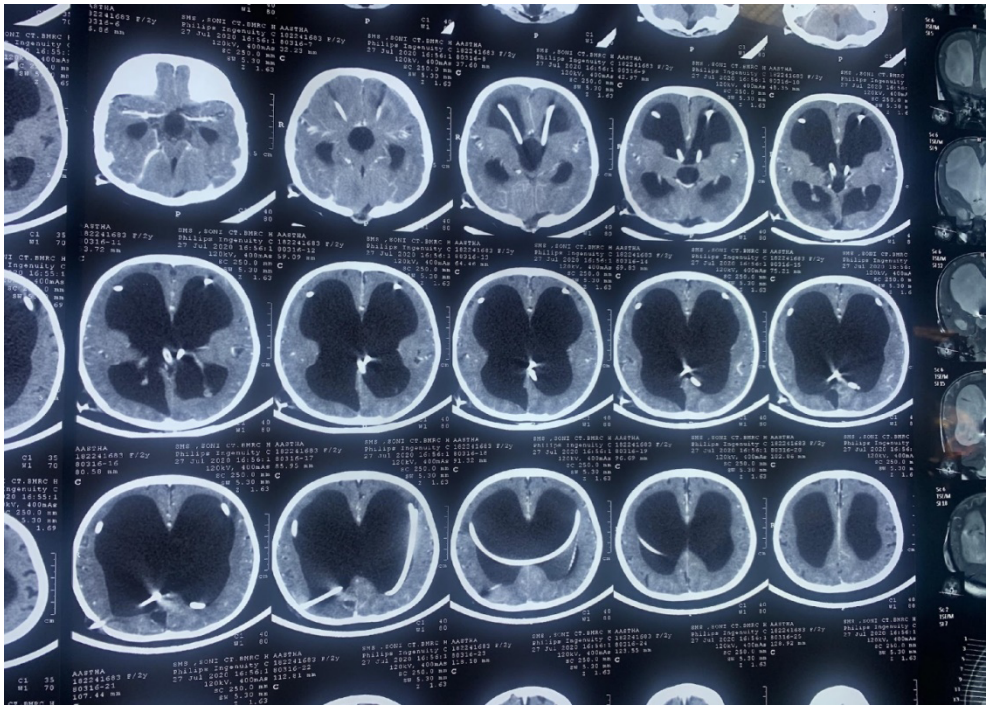

Figure 1: NCCT Brain showing complete intracranial migration of ventriculoperitoneal shunt.

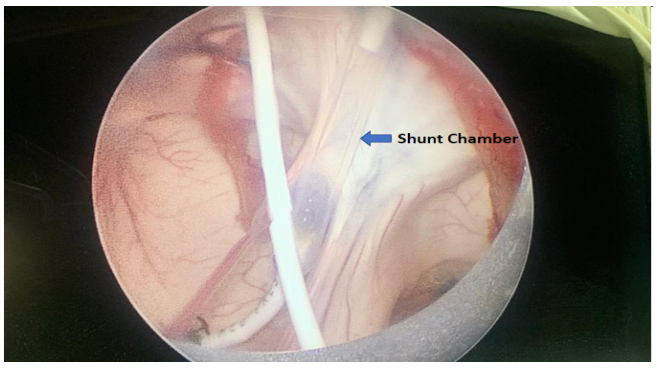

Figure 2: Intraoperative endoscopic image showing complete intracranial migration of ventriculoperitoneal shunt with shunt chamber in lateral ventricle.

Discussion

VP Shunt insertion is a common neurosurgical procedure used to treat different types of hydrocephalus [1-3]. The first VP Shunt procedure was performed as early as 1908 by Kausch.4 Various modifications have allowed us a safe surgery with mostly favourable outcomes but some complications are mechanical failure or blockade, infection, shunt migration and haemorrhage [4].

Only 25 cases of total intracranial shunt migration have been reported [4]. The exact cause of upward shunt migration remains an enigma though various factors have been cited including mechanical factors, patient factors and surgeon factors. Paediatric patients are the commonest ones to suffer, which is partly due to their habitus- shorter distance between cranium and peritoneum, thin cerebral mantle, thinner bones and open fontanelles [4,5].

Mechanical Factors

- Retained memory of shunt may allow it to curl inside the ventricle, and even to extrude from the ventricular space [6,7].

- This is aided by the straighter course of the shunt when inserted through an occipital burr hole [6].
- Trauma [3].

Patient Factors

- Malnutrition, especially in cases of Tuberculous Meningitis [8] and Anaemia.
- Sepsis.
- Thin cortical mantle- lesser force is required for breaching the distance to the ventricles. Inappropriate shunt pressing may increase chances of upward movement.
- Excessive crying increases intra-abdominal pressure as compared to intracranial pressure which leads to a pressure gradient formation which may cause sucking in of shunt which may be aided open and large fontanelles in the formation of a negative sucking pressure [4].
- Peritoneal scarring leads to decreased absorption of CSF and pseudocyst formation leading to increased intraabdominal pressure [8].
- Neck movements coupled with a large potential intraventricular space which may lead the shunt to be sucked in5 due to creation of a Windlass effect [8].
- Sudden decompression (Collapsing cortex) may add on to the pull on the shunt by the ventricular chambers if the stay sutures are not sturdy [5].

Surgeon Factors

- Poor anchorage to subcutaneous tissue- allows for movement of cylindrical shunt chamber on repeated pressing [1,5].
- Multiple explorations for shunt surgery.
- Large burr hole or dural opening- allows for lesser resistance to cylindrical shaped shunt chamber and consequent slippage into the cranium [1,5].

Intracranial shunt migration into the left occipital lobe9 and Sphenoid sinus10 have also been reported but have not been included in this count.

In the usual search of literature, most authors prefer performing a shunt procedure on the opposite side, should such a complication of intracranial migration arise but as per the author, ETV should be considered as a viable option so as to render the patient shunt free.

Conclusion

The usual approach is replacement of VP Shunt in such patients, though ETV has been attempted [5,11]. We suggest endoscopic retrieval followed by Endoscopic Third Ventriculostomy as a procedure, if amenable, to salvage such patients from recurrent shunt migration and shunt related complications aiming for a shunt free life.

Conflict of Interest

None

Funding

None

Declarations

- In both cases, the Chhabra Shunt was used.
- 0 degree rigid endoscope from Karl Storz was used in either case and procedure done through a single burr hole over the Kocher's point.

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