CASE REPORT

Pediatric intrathoracic migration of ventriculoperitoneal shunt catheter post TB meningitis: A case report

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SUMMARY

Ventriculoperitoneal shunt (VPS) is a common procedure in neurosurgery for Cerebrospinal Fluid (CSF) diversion. It is associated with various complication. One of the rarer complications is migration of the shunt catheter. The incidence is higher in the paediatric population, up to 71.2% compared to adults 28.8%. We present a case of a 1 year 4 months old boy post TB meningitis with intrathoracic shunt migration 2 months after implantation of VPS.

The child presented with upward gaze palsy, on and off productive cough and fever. He had a ventriculoperitoneal shunt inserted 2 months before, when he was diagnosed and treated for TB meningitis. Radiological imaging revealed the distal catheter tip was at the right lung with pneumothorax. The shunt was removed and after confirming that there is no active infection, a new ventriculoperitoneal shunt was reinserted.

INTRODUCTION

Ventriculoperitoneal shunts (VPS) are one of the commonest surgical procedures performed in neurosurgery. Complications arising in this procedure can be divided into both mechanical and non-mechanical. Shunt migration is defined as translocation of part of or the entirety of the shunt system from the compartment where it was intended to a new compartment.[1] The most accepted theory for this is that children have a more vigorous peristaltic activity and smaller peritoneal space thus causing a relatively higher intra-abdominal pressure, predisposing them to shunt migration.[2] Displacement into the thorax can be attributed to congenital defects, erosion and perforation of the diaphragm.

We present a case of paediatric intrathoracic migration of the VPS post tuberculosis (TB) Meningitis.

CASE REPORT

A 1 year 4 months old boy with a history of post TB meningitis hydrocephalus was admitted to the Hospital Kuala Lumpur, Kuala Lumpur, Malaysia after his mother noticed that he developed an upward gaze palsy. Further history from his mother also revealed that he experienced on and off productive cough for 1 week. A VPS was inserted 2 months earlier, after he was diagnosed with TB meningitis. During the physical examination, he had bilateral upward gaze palsy, a spike of fever, and minimal crepitation over the right lower zone on chest auscultation. Otherwise, he was active. The patient had no papilledema or signs of respiratory distress, and the shunt was functioning well at bedside testing (determined by compressibility and a good refilling time of the shunt reservoir). A brain CT showed slight worsening of the hydrocephalus, probably due to suboptimal shunt drainage. In view of his cough and fever, a diagnosis of respiratory tract infection had to be ruled out, and a chest X-Ray was ordered. The chest X-ray showed the tip of his distal VPS catheter at the level of the 5th anterior rib bone (Figures 1A and 1B).

CT thorax confirmed that the distal catheter had pierced the posterior right hemidiaphragm with its tip located at the lateral segment of the right middle lobe with a small loculated pneumothorax and surrounding consolidation. The right lower lobe had collapsed (Figures 2A and 2B).

In view of the abnormal placement of the distal VPS catheter without evidence of CNS infection, we decided to externalize the VPS. The paediatric surgical team was on standby in case of any intraoperative complications. Fortunately, we were able to remove the distal catheter easily via a subcutaneous incision over the chest wall and pulling it out slowly via the subcutaneous route. The child's symptoms improved but CSF analysis from the catheter was positive for Coagulase Negative *Staphylococcus* (CONS). The VPS was removed, replaced by a temporary extraventricular drain. We did not prescribe any new antibiotics except for his regular anti-TB medications. Since the removal of the VPS, repeated CSF analyses were cleared of infection, and a left VPS was inserted one week later. He was subsequently discharged well 3 days after surgery. He remained asymptomatic during his follow-up 6 weeks later.

DISCUSSION

The incidence of shunt migration appears to be higher in the paediatric age group (71.2%) compared to adults (28.8%). Based on a literature review by Harischandra et al, common sites of migration include the bowel (35%), bladder (8%), scrotal (14%), abdominal wall (14%), intracranial/subgaleal (11%), chest/thoracic (8%), cardiac/major vessels (7%) and breast (3%).1 Obrador et al reported the first patient with a distal catheter migration into the thoracic cavity in 1977 in a 14 month-old child.3 The incidence of migration is highest in the first 6 months after surgery with a decline in incidence as time progresses.[1] However, it could occur as early as 5 days after surgery to as long as 16 years. In our patient, the migration occurred 2 months after the first VPS procedure.

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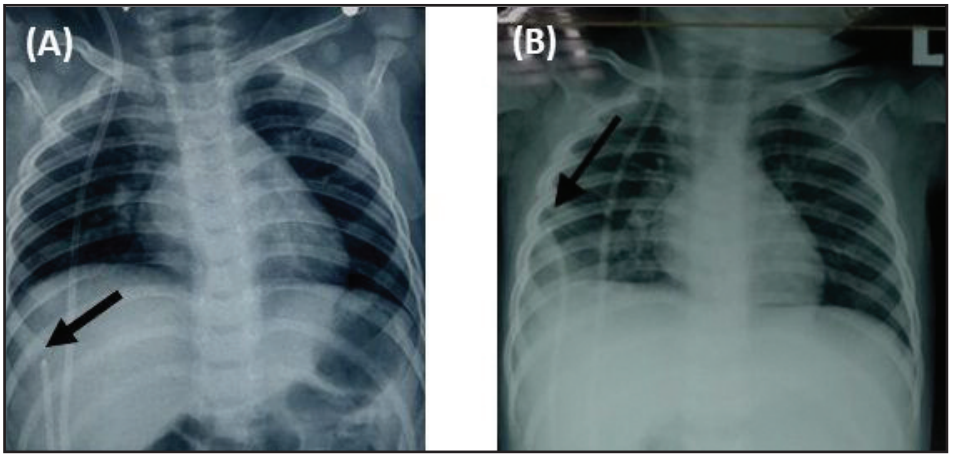

Fig. 1: Chest x-rays of the patient. (A) Chest x-ray post ventriculoperitoneal shunt insertion confirmed the location of the tip of the shunt catheter was at the right hypochondriac region in the peritoneal space. (B) Repeat chest x-ray on admission noted the migration of the catheter tip into the right hemithorax (arrow) at the level of the 5th anterior rib bone. There was no bowel herniation noted.

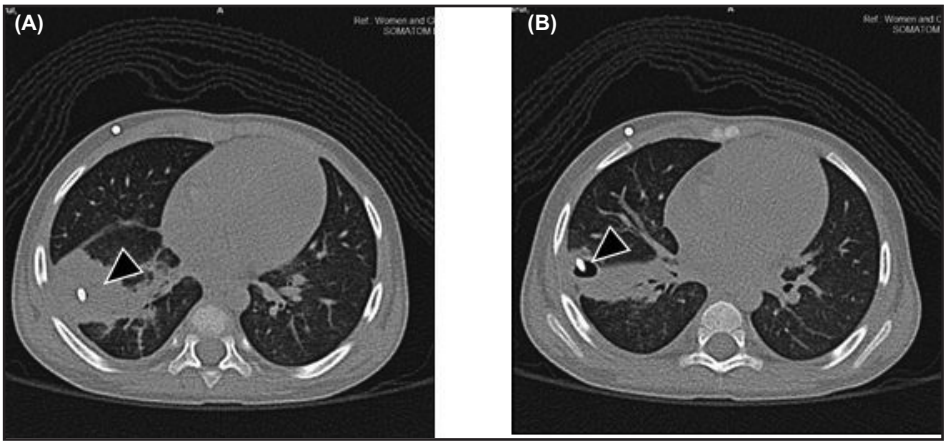

Fig. 2: CT Thorax of the patient in axial view (lung window). (A) CT Thorax scan showed a collapsed right lower lobe (arrowhead) with shunt catheter traversing through the lung parenchyma. (B) CT Thorax scan showed a small loculated pneumothorax (arrowhead) and the tip of the shunt catheter within it.

According to Taub and Lavyne intrathoracic migration of the distal catheter is divided into trans-diaphragmatic (through the diaphragm) or supra-diaphragmatic (through the chest wall).[4] Supra-diaphragmatic migration can be iatrogenic secondary to erroneous tunneling during distal shunt insertion. Trans-diaphragmatic migration has been attributed to the relative positive pressure in the abdomen compared to the negative intrathoracic pressure favoring a migration into the cavity with lower pressure.

Migration can also occur through congenital defects in the diaphragm including the foramen of Morgagni or Bochdalek and the right xipho-costal point (from where the superficial epigastric vessels enter).[5]
The presence of chronic abdominal infection or inflammation helps in adhesion of the catheter onto the diaphragm, following which a perforation takes place due to constant friction.[4] The stiffness of the catheter, inflammation, infection, an incision close to the costal margin, and the positive intra-abdominal pressure further increase the risk of perforation.6 We suggest that inflammation followed by adhesion and slow erosion through the diaphragm aided by the pressure gradient is the most likely mechanism which cause the migration in our patient as CT thorax showed no obvious diaphragm defect or no bowel loops/hernias.

Cakin H et al reported a child with Trisomy 21 where symptomatic Morgagni's hernia was brought about 5 months after a ventriculoperitoneal shunt procedure, possibly related to an increase in the intra-abdominal pressure secondary to VPS CSF drainage.[5]

Symptoms of migration inside the thoracic cavity presents predominantly as respiratory symptoms in nearly 78.8% patients, and less often as shunt dysfunction/infection in approximately 15.1% patients.[1] Presentation may also differ between intraparenchymal and intrapleural migration. Coughing and recurrent pneumonia is common in intraparenchymal migration as there is direct irritation of the airway and formation of shunt-bronchial fistula with the accumulation of CSF provides means of bacteria colonization. Pleural effusion, pneumothorax, hydrothorax

caused by an intrapleural migration may cause shortness of breath, reduced in effort tolerance and respiratory distress.[7] Our patient showed both respiratory irritation symptoms and also signs of suboptimal shunt drainage.

Imaging helps to confirm the position of the migrated shunt tip. A anterior-posterior and lateral view X-ray of the chest may be ordered to analyse the course of the distal catheter and also to look at the costovertebral angle (foramen of Bochdalek).[4] With CT scan of the chest and thorax, the role of lateral X-ray has decreased. Only 15% of thoracic cavity migration of the shunt is associated with shunt dysfunction, and so, the role of CT scan of the brain is limited, unless there are signs of hydrocephalus or raised intracranial pressure.

The management of shunt migration depends on the presence or absence of shunt dysfunction and/or infection. In patients with shunt infection, exteriorization of the catheter and treatment with antibiotics is suggested. A direct shunt replacement or revision can be done if there is no evidence of shunt infection on CSF tapping or thoracocentesis(if CSF hydrothorax is present).[1,4] This could be done by reopening the abdominal wound, retrieving the distal end of the peritoneal catheter, and reinserting it in the peritoneal cavity. There is no need to inspect the inferior surface of the diaphragm for a perforation, as this would require a larger incision.

In patients with associated defects in the diaphragm on imaging, a diaphragmatic repair may need to be carried out prior to shunt replacement; or the shunt may have to be converted to a VA shunt.[6] Karapolat et al from thoracic surgery suggested that adherences for catheter to omentum and intraperitoneal soft tissue must be kept in mind when removing the distal shunt and the catheter should not be pulled extensively as to prevent breakage. In cases of adhered catheter where transdiaphragmatic removal is difficult, a thoracotomy maybe needed to remove the shunt entirely.[8]

To date, there has not been any report that links intrathoracic shunt migration to a history of TB meningitis. Naik et al reported a case of complete intracranial migration of VPS in a child 12 months after the insertion of VPS following TB meningitis.[9] In patients with a history of TB meningitis, it is possible that the distal absorption might be reduced in view of high CSF protein content. We hypothesize that a failure of absorption or slower peritoneal absorption of CSF can lead to a relative positive pressure in the abdomen which promotes migration to a space with lower pressure. However, a study done by Tyagi et al concluded that there is no increase in the statistically significant in the complication rate of VP shunt in TB Meningitis patients versus non infective patients.[10]

CONCLUSION

Thoracic complications of VPS are rare but can potentially be serious. Our patient presented post TB Meningitis with intrathoracic migration and associated pneumothorax. With ventriculoperitoneal shunting, it is important to keep in mind the possibility of intrathoracic migration especially if patients present with respiratory symptoms. Further study may be needed to determine the association between TB, infective and non-infective nature associated with shunt migration.

CONFLICT OF INTERESTS

The author declare that they have no conflict of interest.

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