

Complex Infantile Hydrocephalus with Multiple Shunt Revisions and TB Co-Infection: A Case Report

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ABSTRACT

Hydrocephalus is a neurological disorder caused by excess accumulation of cerebrospinal fluid (CSF) within the brain ventricles, often leading to increased intracranial pressure. This case report details a 5-month-old female infant with congenital hydrocephalus, born through cesarean section due to low amniotic fluid. Her mother noticed an abnormal increase in head size when she was 8 days old. Imaging at 5 months confirmed hydrocephalus, and a ventriculoperitoneal (VP) shunt was placed. Despite undergoing three shunt revisions due to complications such as blockage, no significant neurological improvement was observed. The child also presented with a rash from bandages and was tested positive for tuberculosis (TB), although asymptomatic. This case highlights the diagnostic and therapeutic complexity of managing hydrocephalus in infancy, especially with coexisting infections and repeated surgical interventions.

Key Words: *Hydrocephalus, ventriculoperitoneal shunt, infant neurology, cerebrospinal fluid, tuberculosis, developmental delay, shunt revision, case report.*

Background

Hydrocephalus is a severe neurological condition characterized by abnormal CSF accumulation in the brain's ventricular system, resulting in increased intracranial pressure. It significantly affects neonatal brain development and presents a major clinical challenge. Congenital hydrocephalus occurs in about 1 per 1,000 live births and is often associated with other risk factors, such as consanguineous marriage.

In this case, we report a 5-month-old female infant with a history of congenital hydrocephalus born to first-cousin parents. The mother noted head enlargement by day 8 of life. The child was born via cesarean section, advised by the doctor due to low amniotic fluid. She was diagnosed via imaging at 5 months, and a VP shunt was placed. Unfortunately, she underwent three surgical interventions due to repeated shunt blockages. Post-operative assessments revealed no notable improvement in head control or neurological development. Additional complications included rash at bandage and nappy areas, and a positive TB test

despite no coughing or other typical symptoms. The case underlines the importance of early intervention, continuous follow-up, and comprehensive management when hydrocephalus coexists with infections like TB.

Clinical Findings & Diagnostic assessment

Relevant Physical Examination and Clinical Findings: Uswa Saif, a 5-month-old female, was admitted two weeks ago with hydrocephalus, complicated by recurrent VP shunt blockages, leading to restricted head movement and signs of rising intracranial pressure. Her mother noticed an unusual increase in head size at 8 days of age. On examination, Uswa also had skin rashes, likely due to irritation from bandages and nappies. Although she showed no signs of coughing or respiratory distress, she tested positive for tuberculosis (TB), raising concern for TB involvement in the central nervous system.

Additionally, Uswa was born with a congenital fluid-filled cyst located on the outside of her head, which was surgically removed when she was 8 days old.

Notably, after each shunt surgery, she experienced significant weight loss.



Figure 1: *Picture showing child with hydrocephalus*

Diagnosis Methods and Challenges:

The diagnosis of hydrocephalus was based on clinical signs, including increasing head size and poor head control, likely confirmed through CT or MRI imaging. Despite three VP shunt surgeries, her condition remains unresolved, and she is now being prepared for a fourth surgery. Her positive TB test, without classical symptoms, raised suspicion for TB meningitis, a known cause of hydrocephalus in infants, particularly in high TB-prevalence regions.

Diagnostic Reasoning and Differential Diagnosis:

The combination of persistent hydrocephalus, recurrent shunt malfunction, and TB positivity suggests post-TB meningitis communicating hydrocephalus. Other possible diagnoses include:

- Shunt malfunction or infection
- Congenital aqueductal stenosis
- Hydrocephalus secondary to another CNS infection

Prognostic Characteristics:

- **Early Onset Hydrocephalus:** Diagnosed in the first few weeks of life, often linked with severe hydrocephalus and developmental delays.
- **Multiple Shunt Surgeries:** Three surgeries within five months suggest a complicated course, increasing the risk of long-term neurological deficits and shunt dependency.
- **Consanguineous Parentage:** First-cousin marriage may increase the risk of genetic conditions, potentially affecting the prognosis.
- **TB Positivity:** A positive TB test indicates a weakened immune system, which could complicate recovery, especially postoperatively.
- **Complications (Shunt Blockage, Rash, Hindered Head Movement):** These complications suggest poor treatment tolerance, indicating a need for long-term care and possibly alternative treatments.
- **No Family History of Hydrocephalus:** May suggest a non-genetic cause, though this is not a guaranteed predictor of a better outcome.
- **Congenital Fluid-Filled Cyst:** The presence of a cyst at birth, surgically removed at 8 days of age, might indicate an underlying congenital anomaly contributing to hydrocephalus.
- **Post-Surgical Weight Loss:** Significant weight loss after each surgery suggests postoperative complications or poor nutritional recovery, which could impact overall prognosis.

Therapeutic Intervention & Outcome

Types of Intervention:

Surgical Intervention

Three separate Ventriculoperitoneal Shunt (VP) surgeries were performed to manage hydrocephalus. The shunt is placed to divert excess cerebrospinal fluid (CSF) from the brain's ventricles to the peritoneal cavity.

Pharmacological Intervention

Linqobrian was administered after the 1st surgery.

Administration of Intervention

Surgical Administration

VP shunt procedures were carried out in a hospital.

Three surgeries occurred over 5 months due to repeated shunt failures.

Drug Administration

Linqobrian was administered after the first surgery. It was noted as temporarily effective.

Changes in the Intervention

Surgical Changes

* Initially, a single VP shunt was placed. Due to complications, the intervention was repeated three more times. Surgeries occurred at:

- ✓ 8 days of age (1st)
- ✓ 1 month later (2nd)
- ✓ Earlier this month (3rd)
- ✓ Current admission (4th surgery planned/ongoing)

Explanation

The repeated blockages of the shunt system caused ineffective CSF drainage. Clinical symptoms did not improve, indicating malfunction. Hence, further surgical revisions were necessary.

Pharmacological Changes

Linqobrian was given after the first surgery but not continued further.

Adverse or Unanticipated Events

✓ Shunt Blockages (Primary Complication):

The VP shunt repeatedly became obstructed, requiring multiple surgeries.

✓ No Improvement After Surgery:

Despite four interventions, no significant improvement was seen. This may indicate underlying infection.

Tuberculosis (TB) Diagnosis:

The child tested positive for TB, though had no cough. Not initially diagnosed, which may explain the treatment resistance. Anti-TB therapy likely needed.

✓ Rash from Bandage and Nappy:

Rash is more likely due to prolonged use of medical adhesives or sensitivity.

✓ Impaired Head Movement:

Possibly due to neurological damage, post-surgical discomfort, or increased intracranial pressure.

Discussion

Hydrocephalus is one of the frequent disorders treated in a Pediatric neurosurgical department¹. Hydrocephalus accounts for approximately 0.9–1.5 cases per 1,000 live births. It is imperative that it be diagnosed early on in life as raised intracranial pressure can lead to irreversible brain damage.

Causes for hydrocephalus vary from genetic factors and developmental abnormalities, to latent infections. Some types of hydrocephalus are caused by recessive genes, if both parents carry recessive gene for a condition, for example, in cases of consanguineous marriages, there's a 25% higher risk for the newborn to inherit two copies of the recessive gene to develop the condition². Spina bifida, a neural tube defect can cause CSF flow disruption and lead to its accumulation resulting in Hydrocephalus. Hydrocephalus is also the most prevalent complication of tuberculous meningitis (TBM), mainly affecting young individuals. It is usually a late complication of TBM, as it is characterized by inflammation and obstruction to cerebrospinal fluid flow. Typically, it appears with signs of elevated intracranial pressure which can be visualized by imaging³. Our patient's TB diagnosis, despite the absence of classic symptoms, aligns with literature suggesting that TB can be an underlying factor in hydrocephalus cases in neonates, particularly in areas where TB is prevalent.

A surgically implanted tube known as Ventriculoperitoneal Shunt (VPS) is the Standard treatment for Hydrocephalus⁴. This drains excess CSF from the brain into the abdomen, where it is absorbed into the body's circulation. Studies show that VPS blockage occurs in about 30–40% of cases within the first year. These blockages and infections are common complications among neonates⁵. Our patient had 3 VPS revisions within 5 months highlighting her amongst patients of high incidence early shunt failure. This also shines light upon the challenges faced in managing hydrocephalus in this age group due to rapid

growth and developments being made and perhaps, in our case, the presence of TB also hindered with the shunts healing and functions.

Studies prove that number of shunt revisions have an adverse impact on motor development in children with hydrocephalus⁶. Our patients lack of neurological improvement supports these findings, hence proves that multiple shunt revisions and repeated surgical interventions can adversely affect motor neurodevelopment.

The most crucial step in treating hydrocephalus is early detection and early treatment. This is mostly done through either screening or regular measurement of head circumference. Early detection can reduce risk of brain damage, minimize postop complications and improve overall recovery.⁷ Delayed response after detection can have many downsides such as suboptimal neurological outcomes.

Our case highlights several factors clinicians should keep in mind while managing infantile hydrocephalus. Firstly, shunt complications are common and so close follow ups are advised to ensure regular monitoring of these complications. Secondly, TB screening for hydrocephalus patients, particularly for those from endemic regions, should be made standard practice to combat both conditions effectively. Thirdly, increase awareness about potential risks for children of cousin marriages and how it increases risk of congenital diseases. Lastly, importance of diet and prenatal vitamins especially Folic Acid during pregnancy to decrease the risk of Neural Tube Defects. Most importantly, doctors should know how to counsel parents and prepare them for long term care challenges as well.

Conclusion

This case of complex infantile hydrocephalus underscores the multifaceted challenges faced in pediatric neurosurgical care, particularly in resource-limited settings. The repeated ventriculoperitoneal (VP) shunt failures, lack of neurological improvement, and coexisting asymptomatic tuberculosis (TB) infection demonstrate how standard interventions can be compromised by systemic and infectious factors.

Importantly, the absence of classic TB symptoms in this infant highlights the need for clinicians to maintain a high index of suspicion for latent infections such as TB meningitis, especially in endemic regions.

The key takeaway from this case is the critical importance of early diagnosis, comprehensive imaging, and infection screening in infants presenting with signs of increased intracranial pressure. When such conditions are not promptly and accurately managed, long-term neurological outcomes may be significantly affected.

Recommendations for Future Practice and Policy:

Innovate and refine shunt technologies to reduce the incidence of early failure, particularly in high-risk pediatric populations.

Introduce routine TB screening in infants with unexplained hydrocephalus or multiple shunt revisions.

Incorporate CSF analysis and TB-focused imaging protocols early in the diagnostic process.

Promote caregiver and maternal education to facilitate earlier recognition of hydrocephalus symptoms.

Expand research into TB-related hydrocephalus and evaluate the feasibility of alternative interventions like endoscopic third ventriculostomy (ETV).

Strengthen long-term follow up systems post-surgery, particularly in rural and underserved communities, to ensure timely management of complications.

Ultimately, this case emphasizes the necessity of a multidisciplinary, proactive approach to managing congenital hydrocephalus, one that integrates surgical expertise with infectious disease vigilance and robust public health infrastructure.

Informed Consent: Obtained Verbally from patients mother

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