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The Challenge of Multiloculated Pediatric Hydrocephalus: a case report

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Abstract

Hydrocephalus is an unbalanced condition between the production and absorption of cerebrospinal fluid (CSF). We reported a child with multiloculated hydrocephalus who developed several complications. Our team was challenged to manage his issues during five years of follow up. We performed multicystic cerebral shunts despite the neuroendoscopic evidence.

Keywords: Hydrocephalus; Multiseptate; Infection; Treatment.

Introduction

Hydrocephalus is a disease resulting from an unbalance between the production and the absorption of cerebrospinal fluid (CSF). This disease could be due to a congenital condition or following central nervous infection or hemorrhage. The last condition could damage the cerebral tissues and formed from several intracerebral cystic. Its treatment must be individualized and depends on pathophysiology. For instance, if the CSF is blocked in ventricles, subdural or subarachnoid spaces, it seems that the CSF reabsorption is impaired, on the other hand, if there are several cystics that aren´t connected, the CSF will be cumulated. The consequences will be a dangerous intracranial hypertension (ICH). Conservative approaches and surgeries have been made to improve this situation. However, they are not exempt of collateral effects and

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multiloculated hydrocephalus has been a challenge for clinicians and neurosurgeons [1].

The following case illustrated some of the complications of ventriculoperitoneal shunt (VPS) for multiseptate non-communicating hydrocephalus, and after five years of follow-up, we described the most important issues from this case.

Case report

Female, 2.5 years old, who had diagnosed of multiloculated non-communicating hydrocephalus (in her medical record, post-natal ventriculitis, cerebral palsy, several VPS dysfunctions, and active biventricular shunt were reported) was admitted into the emergency ward due to fever and loss conscientious.

The central nervous system (CNS) CT suggested dysfunction of both VPS and the leukometry suggested infection. The wide spectrum antibiotics were admitted, the VPS system was removed, and an external shunt was placed. The first biochemical results of liquor were: 358.2mg/L of protein, 25mg/dL of glucose, 106.5mEG/dL of chloride and 32.33 cells per mm3. Bacterioscopy and cultures from CSF were negatives.

After four weeks, the new CT was performed, and blood and CFS samples were analyzed. In figure 1, we observed large lateral ventricles and several cystics. The blood and CFS samples were on normal limits, and no bacteria had grown.

Nevertheless, the neurosurgeon's team have huge experience in neuroendoscopy and neuronavigation, and this patient had had 21 previous VPS dysfunctions, a biventricular shunt and two major cystics drainage were proposed. Two previous trepanations were used for ventricular shunt and others were added added others for bilateral cystics.

Each ventricular shunts were connected to its cerebral cystics by T pipe connection. Two high-pressure valves were used and connected to bilateral peritoneal shunt. The high-pressure valves should avoid CSF over drainage. In post-operative period, the patient had good evolution, we didn´t observe CSF over drained. After a week, the patient was discharged, and every month returned to ambulatory care.

During five years of ambulatory care, we didn't notice further neurologic changes, the patient still has cerebral palsy, is seriously impaired for feeding and behavioring for her age, although the physiotherapy that had been employed. During her follow-up, it was needed an endoscopic gastrostomy, the gastroesophageal reflux procedure wasn´t available for this patient due to the risk of VPS obstruction.

In her medical record, no more VPS dysfunction occurred. In addition, other controls CT had no signs of obstruction.

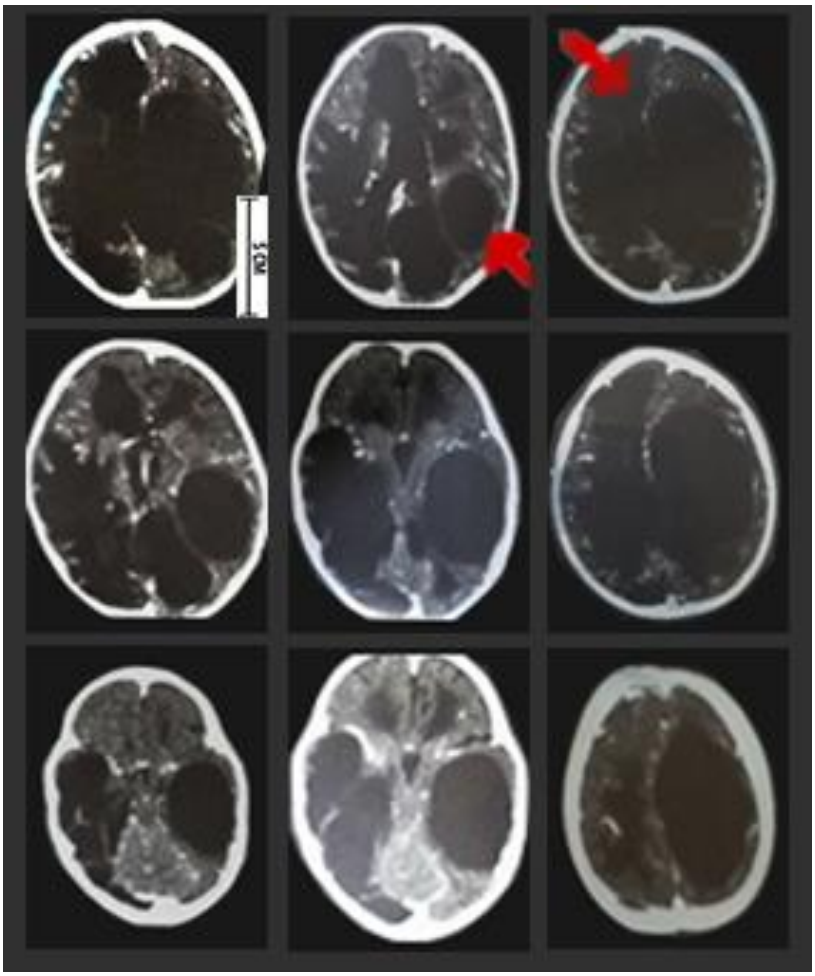

Figure 1. Cerebral Computerized Tomography (CT) with contrast, indicating multiloculated pediatric hydrocephalus. The image was performed after 4 weeks of antibiotics and external shunt. The red arrows point to multiple cysts.

Discussion and Conclusion

Usually, after CNS infection or hemorrhage with cerebral necrosis, we observe in newborns survivors a serious damage of CSF absorption and areas of cicatricial tissues. These tissues could be observed in periventricular leuko-malacia or reorganized in intracerebral cystic lesions.

All these findings could lead to elliptical focus, CSF accumulation, infection spots and poor neurodeve-lopmental outcome. The multi-loculated pediatric hydrocephalus is associated with intracerebral cystic lesions, and the communicating and non-communi-cating hydrocephalus co-exist.

The first step is identification of a warning signal and symptoms in IHC cases. After a correct diagnosis, the next step is choosing the treatment. Pediatrics could choose a transitory or a definitive treatment supported by invasive or non-invasive approaches.

The transitory approaches are based on CSF inhibition or on transitory shunt, as Ommaya reservoir procedure in newborns. The definitive approach is based on definitive shunts or neuroendoscopic surgeries. In these surgeries, it´s possible to remove debris, connect cystic lesions, and conduit better placement of the intracerebral catheters.

The goal is to improve the CSF drainage and avoid over drainage. Besides, it´s usual in these patients have a high rate of shunt dysfunction, infection and hemorrhage. There are multifactorial causes to these post-operative problems. Child below one year old, hyper CSF protein, cellular debris, CSF hypereosinophilia, mechanical obstruction and other issues are involved in multiloculated hydrocephalus shunt failures [2].

In our case report, the patient had various factors for shunt dysfunction. In her medical record, 21 previous VPS dysfunctions were recorded. In literature, we observed a large tendency to neuroendoscopic surgeries, but there isn´t a wide consensus for this problem. It was proceeded a bilarateral peritoneal ventricular shunt added to two large cystic lesion that were drained to each side VPS.

A simple T-pipe conduit allowed this connection and two previous trepanations were used avoiding extra damage in cranial scalp. Our team didn´t have a reasonable response, which would explain no extra VPS dysfunction during 5-year follow-up. In addition, the cerebral palsy status and the feeding problems were predictable. In literature, the goal of the neuro-endoscopic procedure is to form fenestrations and create communication between the maximum possible number of isolated parts of the ventricular system.

In this way, it's possible to create openings in the septal walls, to result in a better CSF drainage, which should be achieved using the minimal number of shunts. When less shunts are used, there is less need for shunt revisions. Ventriculitis, either due to infection or chemical irritation by intraventricular hemorrhage, leads to inflammation and damage of the ependymal.

It´s also indicated pellucidotomy due to excess CSF formation from ependymal tissues, this CSF production would diminish CSF production, and could be done during endoscopy. The neuronavigation with endoscopy could be done during intracranial procedures, especially in patients whose anatomy is distorted. In these cases, it´s predictable difficulties with orientation during endoscopy and/or open craniotomy.

However, a uniform surgical strategy has not yet been developed, and we needed more studies to conclude the best approach to multiloculated pediatric hydrocephalus. A common agreement is that we need to individualize the approach to multiloculated pediatric hydrocephalus for each patient [3].

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