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Cranial growth restriction, a fundamental measure for success of the endoscopy in children under 1 month of age. Is it possible to improve the outcome?☆

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Abstract

Background: Endoscopic third ventriculostomy has been shown to be efficient for the treatment of non-communicating hydrocephalus. However, it is not recommended as the first option in the treatment of obstructive hydrocephalus in children under 3 months of age, because the success rate is less than 35%.

Methods: We reviewed all the cases of triventricular hydrocephalus treated between 2007 and 2011 in patients under 1 month of age in the case of normal term births or under 1 month of corrected age, in the case of pre-term births. The first treatment option was endoscopic fenestration and a restriction of cranial volume during the two months after surgery.

Results: Ten patients under 1 month of age underwent 13 ventriculostomies for non-communicating hydrocephalus of varying etiology (suprasellar arachnoid cyst (3), stenosis of the Sylvian aqueduct (2), post-infectious meningitis (3), and intrauterine bleeding (2)). Three required surgical endoscopic revision at 3, 4, and 5 months, respectively, after the initial surgery due to progressive ventricular enlargement. One of these three patients presented with Klebsiella pneumoniae ventriculitis as a complication after the second endoscopy. After a mean follow-up of 32 months, none has required a shunt.

Conclusions: In our limited experience in triventricular hydrocephalus in patients under 1 month, the third ventriculostomy technique may be a better option than the shunt in selected cases.

1. Background

Classically, the failure rate in the management of obstructive hydrocephalus with endoscopic third ventriculostomy (ETV), in patients over 6 months of age is high. However, in patients under 6 months of age, in recent years, various workers have achieved a success rate ranging between 34.8% and 67% [1–4].

We propose that a minor external modification in the post-operative management could improve the elastic properties of the skull/brain interface and increase this success rate with the endoscopic technique.

☆ Conflicts of interest: N/A.

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2. Methods

We have reviewed all the cases of neonatal triventricular hydrocephalus treated during the first 30 days of life in normal term births or in the first corrected month of life in pre-term patients, with endoscopic fenestration as first treatment option, between 2007 and 2011 at the Virgen del Rocío Hospital.

For this study, we excluded patients with multiloculated hydrocephalus requiring multiple procedures for communication of the ventricular system as a complication of previous ventriculitis or patients with tetraventricular hydrocephalus on CT scans.

All the patients underwent cranial growth restriction during the first two months after surgery, by means of a light dressing using a fabric adhesive bandage, 1 cm from the orbital rim at the front and at the level of the inion at the rear (Fig. 1).

The series includes different variables: sex and age at diagnosis, which are patient-dependent; cause of hydrocephalus and level of obstruction of the cerebrospinal fluid, which are disease-dependent, and age at which treatment started and ventricular anatomy, which are surgical technique-dependent.

We evaluated the results during follow-up, with serial imaging of the ventricle size and head circumference.

2.1. Follow-up

The patients underwent close clinical and radiological monitoring during the first few months of life.

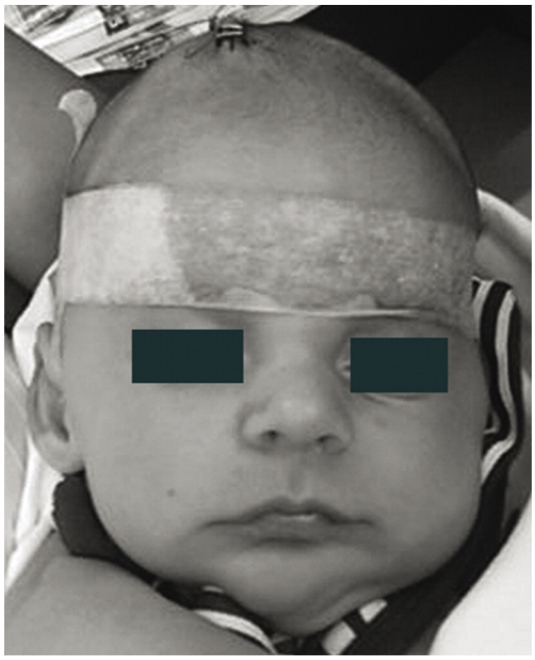

Fig. 1 Example of a slightly compressive cranial bandage.

We performed low-radiation cranial CT scans after 24 h, 7 days, 21 days, 2 months, 4 months, 6 months and 12 months. From then on, scans were performed annually as with the other patients treated after the first month of life.

3. Results

During this period, surgery was performed on 10 patients under 1 month of age with hydrocephalus. Thus, a total of 10 patients (4 females and 6 males) underwent 13 procedures. Three patients (cases 6, 9 and 10) were preterm (25, 30 and 30 weeks of gestation) (Table 1).

The diagnosis of ventriculomegaly was made in-utero in 4 of the 10 patients (cases 1, 2, 5 and 7), during routine prenatal ultrasound checks in the second or third trimester of pregnancy and we confirmed the diagnosis with a CT scan at birth. The remaining 7 patients were diagnosed between the 2nd and 20th day of life (Table 1), with CT scans after an initial abnormal cranial ultrasound.

The etiology was varied: suprasellar arachnoid cyst (2), stenosis of the Sylvian aqueduct (3), post-infectious meningitis (3) and intrauterine bleeding (2): only one of the preterm patients was due to intraventricular hemorrhage (case 9) (Table 1).

The mean time elapsed between diagnosis (intrauterine or without corrected age) and treatment was 23.2 (2–30) days.

The mean age at treatment was 11.8 days of corrected age, with a minimum age of 2 days and a maximum age of 30 days.

The preoperative cranial CT scans show triventricular dilation in all cases. When the endoscope was inserted, no structural anatomic abnormalities were observed. However, in the cases with a post-infectious etiology, an increase in floating particles was observed, while in the cases with a post-hemorrhagic etiology, a slight brown speckling was observed in the ependyma, caused by hemoglobin degradation products.

All patients wore a light fabric tape during the first two months after surgery to restrict cranial volume (Fig. 1).

After a mean follow-up of 32 months (22–49 months), only three patients (cases 5, 9 and 10) required endoscopic revision due to closure of the fenestration after 3, 4 and 5 months (Fig. 2, case 5). At present, all patients are symptom-free, their state of development is appropriate for their age and they have not required implantation of a shunt.

4. Discussion

The success rate of ventriculostomies reported in the classic literature in patients aged between 6 and 24 months varies between 0% and 64%. The reason for the inconsistency in the results published for the different series can be explained by the very varied causes of hydrocephalus in