ORIGINAL RESEARCH PAPER

Surgery

EPIDEMIOLOGICAL, THERAPEUTIC AND EVOLUTION ASPECTS OF HYDROCEPHALUS IN CHILDREN IN MADAGASCAR

KEY WORDS: Child, Hydrocephalus, Meningitis, Ventriculoperitoneal shunt

Andrianaivo Radotina Tony*	Department of Neurosurgery, CENHOSOA Antananarivo. *Corresponding Author
Rakotoarivelo Joe Andry	Department of Neurosurgery, CHUJRA Antananarivo.
Ramarokoto Mijoro	Department of Neurosurgery, CHU ANOSIALA Antananarivo
Ratovondrainy Willy	Department of Neurosurgery, CENHOSOA Antananarivo
Rabarijaona Mamiarisoa	Department of Neurosurgery, CHU Tambohobe Fianarantsoa
Andriamamonjy Clément	Department of Neurosurgery, CHUJRA Antananarivo

ABSTRACT

Hydrocephalus is a disorder of the hydrodynamics of the CSF resulting in an increase in the volume of CSF in the cranial cavity. Hydrocephalus is frequent in Madagascar. We conducted a multicenter and retrospective study of operated hydrocephalic children in 3 neurosurgical departments in Madagascar over a 3-year period. We report 71 cases of hydrocephalus in operated children. Infants predominated in 90.1% of cases. Postmeningeal etiology was found in 42.3%. Ventriculo-peritoneal shunting was undertaken in 92.9% of cases. After the operation, the evolution was favourable in 84.5% of cases. Complications were reported. After discharge from hospital, 59.1% of the children were lost to follow-up within the first month. Hydrocephalus in children predominates in infants. Meningitis remains the most frequent etiology. Ventriculo-peritoneal shunting is the technique most commonly used in Madagascar. The result is favourable in the majority of cases.

Introduction

Hydrocephalus is defined as a disorder of the hydrodynamics of the cerebrospinal fluid (CSF) resulting in an increase in the volume of this fluid in the skull [1].

The etiology is multiple, dominated by infectious diseases, particularly meningitis in developing countries such as Madagascar [2].

It is a serious condition, which can compromise the vital or functional prognosis in the absence of correct and early therapeutic management [3].

The present study aims to determine the epidemiological, therapeutic and evolutionary aspects of the surgical management of hydrocephalus in Madagascar in order to improve the management.

Materials and methods

This was a retrospective, descriptive, transversal, multicenter study conducted in 3 Neurosurgery services in Madagascar during a period of 36 months, from January 2015 to December 2017. Patients with age less than or equal to 15 years with hydrocephalus who received symptomatic surgical treatment in one of the three neurosurgical centres and complete and exploitable medical records were included. Non-inclusion criteria were patients with age greater than 15 years, non-operated hydrocephalus and incomplete or untraceable medical records.

The following parameters were studied:

- Epidemiological parameters: frequency, age, gender, etiologies.

- Clinical parameters: clinical signs on admission, result of fundus examination

- Paraclinical parameters: radiological examinations performed and type of hydrocephalus found

- Therapeutic parameters: specific medical treatment and surgical treatment (technique, delay in surgery).

- Evolutionary parameters: post-operative follow-up in hospital, post-operative complications in hospital, average length of hospital stay, follow-up after discharge from hospital.

The data collection was done using the individual survey form. Data entry was done using Excel software. The data were analysed using IBM SPSS Statistics 20.0 software.

Results

During the 36-month study period, 71 cases of operated hydrocephalus were identified at the three neurosurgical centres. From 71 cases in 3 years, we found an annual incidence of 23.66 cases per year, or approximately 2 cases per month.

The mean age was 14.28 months with extremes of 1 month and 11 years. We found a male predominance with a sex ratio of 2.08.

Post-infectious aetiology, particularly post-meningitis, predominated (Table I).

The clinical data of the patients are summarised in Figure 1. The fundus examination was normal in 70.4% of cases.
Brain CT was used much more frequently (88.7%) than transfontanellar ultrasound (11.3%). The quadriventricular form was the most common form in 69% of cases.

Medical treatment with acetazolamide at a dose of 10mg/kg/day was performed in 51 patients (71.8%).

The type of CSF shunt performed was ventriculo-peritoneal shunt in 92.95% and ventriculo-external shunt in 7.04%. The average time from surgery to hospital arrival was 7.5 days.

We found a simple follow-up in 84.5% of cases, a complicated follow-up in 15.5% of cases and 1 case of death. The mortality rate was 1.40%. The average length of hospitalisation was 19.09 days, ranging from 4 days to 3 months.

Of the seventy-one patients, eleven cases had a complicated outcome:

- three cases (4.22%) of infectious complication with two cases of post-DVP meningitis and one case of infection of the valve pathway
- two cases (2.81%) of mechanical complication with one case of anal externalization of the valve, and one case of distal drain kinking;
- six cases (8.45%) of other complications with three cases of respiratory infection, one case of unexplained hyperthermia and two cases of malnutrition.
- Among the eleven children with complicated follow-up, one of the children with a respiratory infection died and the other children had a favourable evolution after medical and/or surgical treatment
- The distribution of the children according to their return to the follow-up consultation is shown in Table II.

Table I: Distribution of children with hydrocephalus according to the etiology of the hydrocephalus

Etiology	Number n=71	Frequency (%)
Post-infectious	30	42.3
Malformation	10	14.1
Tumor	6	8.5
Idiopathic	25	35.2

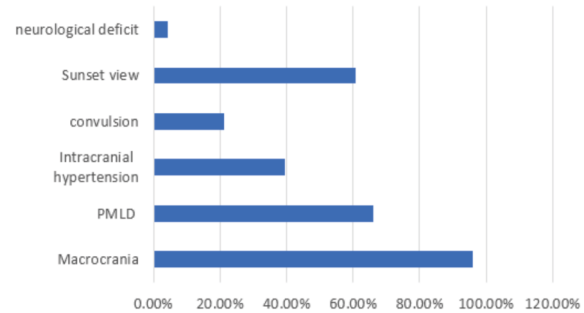

Figure 1: Distribution of children with hydrocephalus according to the clinical signs presented

Table II: Distribution of children by return to follow-up consultation

Follow-up consultation after the exit from the hospital	Number n=71	Frequency (%)
1 month	29	40.84
6 months	15	21.12
More than 1 year	4	5.63

DISCUSSION

In our study, recruiting 71 children operated on in the three neurosurgery departments of Madagascar over a period of 3 years, our median age was 14.28 months with an extreme age of 1 month and 11 years. The age range of 1 to 24 months is the most represented with 64 children (90.1%). Our results are comparable with those of the literature [2,4,5].

Infectious and idiopathic causes are the most common etiology in developing countries [6], as in our study. This could be explained by the predominance of infants in our study. Indeed, at this age, the child is immunologically vulnerable on the one hand, and on the other, protection by vaccination is not always present, especially in poor countries. The high frequency of the idiopathic cause could be explained by the lack of etiological investigation in our country. This is why no aetiology was found for hydrocephalus in 35.2% of cases.

Macrocrania is the most common sign of hydrocephalus in infants in the literature [7], as well as in our study. This could be explained by the predominance of infants in the study population and also by the fact that most parents do not consult until the late stage.

Imaging is important for diagnosing hydrocephalus in both positive and etiological terms [1].

The quadriventricular form is the most frequent form in developing countries [8], as in our study. This form predominates because in these countries meningitis is the most common cause. Whereas the aetiology in rich countries is largely dominated by malformative and tumour etiology, compressing the fourth ventricle, logically giving a predominance of triventricular hydrocephalus [7].

In Madagascar, as in developing countries, ventriculoperitoneal shunting is the most commonly used technique regardless of the form of hydrocephalus [2,7]. According to several authors, ventriculocisternostomy is currently the treatment of choice for non-communicating hydrocephalus in developed countries due to the lower complication rate compared to the ventriculoperitoneal shunt valve [9,10,11].

In our study, during the immediate postoperative period, the majority of cases had a favourable outcome. Our result is comparable to the literature [8].

Surgical management of hydrocephalus is not immune to complications. In our study, complications appeared in the majority of cases before the first month after the operation, with a predominance of infectious complications, even with prevention efforts. This confirms the data in the literature [7,12].

In our study, after discharge from hospital, hydrocephalic children are lost to follow-up in the majority of cases. This could be explained on the one hand by the lack of discussion with the parents about the importance of the follow-up consultation, and on the other hand by the distance from the specialised referral centres for the follow-up consultation.

CONCLUSION

Hydrocephalus in children predominates in infants. As in other developing countries, infectious meningitis is the most frequent cause. The clinical picture is dominated by macrocrania, a sign of the delay in diagnosis and management. DVP is the most common surgical technique used in our series.

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