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# Our experience in the management of infantile hydrocephalus: A study on thirty-five regrouped cases in Yaounde, Cameroon

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## ABSTRACT

**Background:** Hydrocephalus is a frequent central nervous system disorder in children, and despite its importance, it has not been sufficiently studied in developing countries. **Patients and Methods:** A prospective and descriptive study on 35 cases of infantile hydrocephalus was carried out in the neurosurgery unit of the Yaounde Central Hospital, from March 2008 to January 2010. **Results:** The mean age of the patients was 6.69±1.58 months, and the majority of them were in the 0-6 months age group (71.43%). The most frequent causes were congenital malformations, with stenosis of the aqueduct of Sylvius being the most represented (31.43%). As radiological workup, a CT scan was done in more than half of the cases (57.15%), and ventriculo-peritoneal shunting was the main surgical method of management used (94.29%). Infectious complications were observed in 22.86% of our cases. **Conclusion:** Hydrocephalus is a frequent disorder in this Cameroonian setting affecting mostly the 0-6months age group. For early diagnosis to be made, the head circumference of neonates should be routinely measured in the labour room and followed-up in all medical visits. To avert complications following surgery, rigorous surgical procedures with effective asepsis and appropriate methods and materials for shunting should be used.

**Key words**: Hydrocephalus, infant, ventriculo-peritoneal shunting

## INTRODUCTION

Hydrocephalus causes secondary distension of the ventricles, due to an increase in the volume of cerebrospinal fluid (CSF), either by excessive production or impaired absorption. It is a frequent pathology in paediatric surgery and the infant is most frequently affected.[1] In Africa, very little information is available on this pathology and it is a societal flaw, since certain traditions and cultures think it is a curse from angered gods or ancestors. Although its diagnosis was difficult in our setting, it has been made easier with the advent of magnetic resonance imaging (MRI) in Yaounde, which adds to the already existing transfontanellar ultrasound (TFU), and the computerized tomography (CT) scan. The natural evolution of this pathology results in severe brain damage, with an increase in intracranial pressure, causing blindness due to atrophy of the optic nerve, memory impairment, deterioration of intellectual capacity, difficulties in movement, and a variety of other signs of cerebral deficit.[1-3] Its management is thus an emergency and ventriculo-peritoneal shunting (VPS) is most efficient, though its use is marred in our environment by its limited availability and the cost of the shunt valves. The aim of this article was to determine the aetiologies, assess management and complications of this pathology in a developing country.

## MATERIALS AND METHODS

This prospective and descriptive study was carried out from March 2008 to January 2010, over a period of 22 months, in the neurosurgery unit of the Yaounde Central Hospital (YCH), on 63 cases. Included in this study were children from 0 to 3 years, transferred from the Yaounde Gynaeco-Obstetric and Paediatric hospital to the YCH for management of hydrocephalus due to a spina bifida (3 cases), and those consulted in the YCH, whose diagnosis and management were done during the study period (32 cases). We excluded all patients from 0 to 3 years who had not been treated surgically (14 cases) as well as hydrocephalus in children and adults (14 cases). We focused on the following parameters:

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age, sex, aetiology, radiological investigations, surgical management and complications. For each child, the diagnosis of hydrocephalus was based on an increase in the head circumference (above 2SD), the setting-sun sign, the 'cracked-pot sign' on percussion, and confirmation from radiologic imaging using a TFU and a CT scan.

## RESULTS

Thirty-five cases of infantile hydrocephalus were noted, constituting 55.56% of our initial population. Their mean age was 5.57±1.71 months, and the majority of them were between 0 and 6 months old (71.43%). The patient distribution according to their ages is shown in Table 1. The sex ratio was 1:1. The aetiologies were dominated by congenital malformations, with stenosis of the aqueduct of Sylvius being the most represented, with 31.43% of the cases. The distribution according to aetiology is illustrated in Table 2. The CT scan was the main radiological investigation, done on 20 cases, comprising 57.15% of our patients. After the CT scan, the TFU was the second most performed investigation in 13 cases (37.14%). Table 3 summarises patient distribution with respect to radiologic investigations. VPS was done for 33 patients making 94.29% of the sample. The surgical procedures are represented in Table 4. The post-operative evolution over a mean follow-up duration of 9 months (extremes 3-20 months), revealed a decrease in cranial circumference in 23 patients (65.71%) and an amelioration of visual quality in nine patients (25.71%). The most frequent post-operative complications were infections in eight patients (22.86%) with four cases of meningitis. There were four mechanical complications due to shunt obstruction. No shunt migration and no deaths were observed. Table 5 shows patient distribution with respect to post-operative complications.

**Table 1: Patient distribution with respect to age groups**

| Age group (months) | Number | Percentage |
|---|---|---|
| 0-6 | 25 | 71.43 |
| 0-12 | 4 | 11.43 |
| 12-18 | 5 | 14.28 |
| 18- 24 | 1 | 2.86 |

**Table 2: Patient distribution with respect to the aetiologies**

| Aetiology | Number | Percentage |
|---|---|---|
| Stenosis of the aqueduct of Sylvius | 11 | 31.43 |
| Haemorrhage | 7 | 20.00 |
| Dandy Walker syndrome | 6 | 17.14 |
| Meningitis | 4 | 14.28 |
| Spina Bifida | 3 | 8.57 |
| Idiopathic | 2 | 5.71 |
| Agenesis of the foramen of Monro | 2 | 5.71 |

**Table 3: Patient distribution with respect to radiological investigations**

| Radiologic investigations | Number | Percentage |
|---|---|---|
| CT scan | 20 | 57.15 |
| TFU | 13 | 37.14 |
| TFU then CT scan | 2 | 5.71 |
| Total | 35 | 100 |

TFU = Transfontanellar ultrasound, CT = Computerized tomography

## DISCUSSION

In our study, the predominance of this pathology amongst infants and in particular, those in the 0-6 months age group was confirmed. This is similar to the findings of Warf[1] in Uganda, and those of Abena *et al.*,[4] from 1994, in Yaounde. The importance of infantile hydrocephalus had also been stated by Keita *et al.*,[2] in Bamako, with 32.7% of cases, and the predominant 0-6months age group was also found. There was however no significant difference in the sex ratio between males and females in our study, though Keita *et al.*,[2] and Abena *et al.*,[4] had 0.34 and 1.3, respectively, in favour of females. The aetiological diagnosis in this study showed that 31.43% of cases were due to stenosis of the aqueduct of Sylvius, thus making congenital malformations the most common aetiology, responsible for 62.86% of all our determined aetiologies. The next most common aetiology was of vascular origin (20%), with cerebral haemorrhage being the most common, as found by Nko'o *et al.*,[5] who had an incidence of 46% in newborns in Yaounde. Infections were the third most important aetiology (14.28%). This order

**Table 4: Patient distribution with respect to the type of surgical management**

| Surgical technique | Number | Percentage |
|---|---|---|
| VPS | 33 | 94.29 |
| Endoscopic third Ventriculostomy | 2 | 5.71 |
| Total | 35 | 100 |

**Table 5: Patient distribution with respect to post-operative complications**

| Complications | Number | Percentage |
|---|---|---|
| Infectious* | 8 | 22.86 |
| Mechanical** | 4 | 11.43 |
| Total | 12 | 34.29 |

*Four cases of meningitis and four cases of unexplained post-operative fever,
**The four cases were shunt obstruction

of aetiologies is different from that observed by Keita *et al.*,[2] in Bamako and Warf *et al.*,[6] in Uganda, who found infections as the predominant aetiology of infantile hydrocephalus. This order is also different from that observed by Abena *et al.*,[4] in Yaounde in 1994 who had 56.52% of cases of hydrocephalus caused by infections. This difference in two study groups in the same context can be explained by the improvement of medical imagery and the advent of the MRI, preceded by the TFU and CT scan, which now makes it easier to determine the correct aetiology. As a result, malformation related aetiologies in our context had been underestimated due to the lack of appropriate diagnostic tools. On the other hand, the advent of new molecules and better administration of antibiotics for bacterial meningitis in children have greatly curbed the infectious causes of hydrocephalus in our milieu. The management of malformations shown in our study demonstrates that, the neurosurgery team in Yaounde is quite equipped to face the challenges of managing infantile hydrocephalus in a developing country like ours. The aetiology could not be determined in 7.14% of our cases. The aetiological diagnosis was made using the CT scan in more than half of our cases (57.15%), followed by TFU in 37.14% of cases. The recent acquisition of the MRI is an extra advantage in the precision of the aetiology of this pathology in our milieu, and thus also improves its surgical management. TFU followed by a CT scan was done in only 5.71% of our cases, because it is expensive, and also because the ultrasound sometimes gave good results and the CT scan was no longer necessary. Surgical management was dominated by VPS in 94.29% of cases, using shunt valves of average pressure. This procedure which consists of draining CSF from the lateral ventricules to the peritoneal cavity has been emphasised by several other authors,[6-10] because of the risks of ventriculo-artrial shunting, such as infections, elongation of vessels as the infant grows and the dangers of vascular fluid overload. Lombo-peritoneal shunting (LPS) which drains the CSF from the lumbar cisternae to the peritoneal cavity was not used in this study. As for other internal shunts, endoscopic third ventriculostomy (ETV), still remains the best means of management,[1] particularly in the case of stenosis of the aqueduct of Sylvius, because it drains the CSF to its natural area of absorption. This was done only for two of our patients. For Warf *et al.*,[6] this technique solves the problem of permanent catheterisation and will be beneficial in developing countries due to the higher risk of infections in our surgical units, and the complications related to constant drainage. Although most authors agree on VPS for managing infantile hydrocephalus,[6,7,9] there is still a debate as to which type of valve to use. In our study, the choices were based on the valves which the neurosurgeon or pediatric surgeon had, and the financial possibility offered by the parents. Recent literature proposes the use of valves with varying pressure, with a device for regulating the flow of CSF or an anti-siphon mechanism for fighting against excessive drainage when the patient is in an upright position. These valves with varying pressure have less functional problems related to their hydrostatic properties but they are more expensive. Studying the evolution of the patients in our group showed that infectious complications were the most frequent, affecting 22.86% of our cases. This result is similar to that of the group studied by Braga *et al.*,[8] in Brazil, who found 69% of complications caused by infections for children who benefited from a VPS. For Richards *et al.*,[7] one way of solving the problem of infections is to use catheters impregnated with antibiotics, particularly rifampicin and clindamycin. These catheters have proven their efficiency *in vitro*, against cultures of *Staphylococcus epidermidis*. Mechanical complications (shunt obstruction) occupy the second position, representing 11.43% of complications observed in our study group, which is lower than the 31% observed in the group studied by Braga *et al.*,[8] for the same type of complication and the same management technique. Mwachaka *et al.*,[11] in Kenya noted obstruction as the most frequent complication in 53.8% of their patients. These mechanical complications are linked to the surgical technique, as well as the qualities of the different parts of the shunt pathway. Complications related to the hydrostatic properties of the valves were not observed in this study. A favourable outcome was observed in 65.71% of our cases indicating that it is possible to ameliorate the prognosis of infantile hydrocephalus in our milieu, if the surgical technique is selected carefully, and the materials for the shunt chosen appropriately.

## CONCLUSION

The diagnosis of infantile hydrocephalus should be made early, by routinely measuring the cranial circumference of the newborn in the labour room, and its evolution controlled throughout the neonatal period. The infant between 0 and 6 months is most concerned, and malformations are the most common aetiologies in our milieu. The improvement of the outcome of this pathology in Cameroon depends on rigorously observed surgical procedures with effective asepsis, carefully chosen methods and materials for shunting, as well as

a better availability of shunt valves whose cost has to be considerably reduced.

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