

The Role of Surgery in The Management of Hydrocephalus

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Hydrocephalus is one of the commonest problems faced and treated by a Neurosurgeon. In this prospective study which was conducted in Neurosurgical Unit I, Lahore General Hospital Lahore, one hundred consecutive patients are included. The study shows that hydrocephalus is mainly the disease of infants and young children (less than 10 years), with a male preponderance. Family and cousin marriages also contribute to the occurrence of congenital hydrocephalus. Out of 100 patients 59 were under the age of one year, 20 were between the age of 2-10 years and 21 were between 11-60 years of age. 70% were male and only 30% were female. 65% belonged to poor socioeconomic status. In all patients diagnosis was established with history, physical examination, and CT scan prior to surgery. The results of surgery will be discussed in detail and major complications will be highlighted.

Key words: Hydrocephalus, papilloedema, ventriculoperitoneal shunt

Hydrocephalus is defined as the excessive accumulation of cerebrospinal fluid (CSF) within the cranial cavity and more specifically within the ventricular system. It is the result of an imbalance of CSF formation and absorption of sufficient magnitude to produce a net accumulation of fluid in the ventricular system¹. This accumulation of CSF may lead to an elevation of intracranial pressure. Hydrocephalus is one of the commonest problems faced and treated by a Neurosurgeon but it should be carefully distinguished from cerebral atrophy in which the accumulation of CSF is secondary to loss of cerebral substance rather than a primary defect of CSF formation or absorption². CT Scan is helpful in confirming the diagnosis and also differentiating from the cortical atrophy. Intracranial pressure monitoring can also differentiate between these two conditions³. Hydrocephalus occurs as an isolated congenital disorder in approximately 1/1000 live births⁴. Hydrocephalus may be congenital or acquired. Congenital hydrocephalus is usually the result of an intrauterine infection or maldevelopment of aqueduct of Sylvius. Acquired hydrocephalus may be caused by infection, neoplasm or haemorrhage. The outcome of hydrocephalus is determined by the aetiology and timely diagnosis and treatment which is mainly surgical¹. The mandatory treatment of hydrocephalus is diversion of CSF flow by some shunting procedure and treatment of the cause, if possible.

Material and Methods

This prospective study includes one hundred consecutive patients with hydrocephalus who required surgery. This study was conducted in the department of Neurosurgery Lahore General Hospital Lahore from January, 1993 to December, 1993. It included patients of all age groups with all types of hydrocephalus.

Results

Age incidence

Out of 100 patients 59% were infants (less than 1 year) and another 20% were between 2-10 years. The remaining 21% were between 11-60 years. The youngest patients was of 14 days and the oldest was of 60 years (Table 1).

Table 1 Age Incidence

Age	n=	%age
< 1 year	59	59
2 - 10 years	20	20
> 10 years	21	21

Table 2. Sex incidence 70% were males and 30% were females with male to female ratio 2.45:1

Sex	n=	%age
Male	70	70
Female	30	30

Socioeconomic status 65% belonged to low socioeconomic class while 35% were from good socioeconomic class.

Family History

In patients with congenital hydrocephalus 5.45% had a family history of congenital hydrocephalus.

Cousin Marriage

In infants with congenital hydrocephalus parents were first cousins in 27% of cases while in another 9% the parents were near relatives.

Parity of the mother

In patients with congenital hydrocephalus the mother was multiparous in 55% of cases and primigravida in 45% of cases.

Actiology

Aetiologically the patients were grouped into two types, congenital and acquired. Out of the total 100 patients, 55% belonged to congenital variety while 45% were of acquired variety.

Clinical features

Out of 100 patients, 79% were children upto the age of 10 years and 21% were between 11-60 years. Most of the children (80%) presented with large sized head, 19% presented with vomiting, 14% had fits, 11% came with headache. Less common presentations were focal deficits, deterioration of vision and deterioration of conscious level. Among the adult group, 90% presented with headache, 80% had vomiting, 30% came with deterioration of conscious level. Papilloedema was present in 70% of adult patients.

Investigations

Although the diagnosis in most of the cases is on history and physical examination, further confirmation is made with cranial ultrasonography and CT scan. CT scan was performed in every patient to establish the final diagnosis before surgery.

Treatment

Ventriculoperitoneal shunt was done in all the cases. Pudenz medium pressure shunt was used in the majority of cases.

Follow up

One year follow up was done. The incidence of major complications such as shunt obstruction and shunt infection was 18% and 6% respectively.

Discussion

Hydrocephalus is one of the commonest problems faced and treated by a Neurosurgeon. As 59% of the patients were upto one year of age and another 20% were between 2-10 years, making a total of 79% up to 10 years of age. It shows that hydrocephalus is mainly the disease of infants and children. Male to female ratio in this study was 2.45:1 while in Mansoor's study⁵ it was 2:1. In a study by Elawad⁶, conducted in Saudia Arabia, it was 1.45:1. It shows that the disease is increasing in males. This study shows a positive family history of congenital anomalies in 5.45% of patients of congenital hydrocephalus. This fact is also supported by Mansoor⁵ and Elawad⁶. The reason noted by Elawad was cousin marriages for generations as the strong tribal system still has firm ties. This study also indicates that the parents were first cousins in 27% of cases of congenital hydrocephalus, while in another study⁵ it was 34%. This fact indicates that this factor of cousin and family marriages should be taken seriously and family counselling by medical profession and by the media should be considered in an attempt to decrease the incidence of congenital hydrocephalus. On comparing the presenting features it is evident that the signs of raised

intracranial pressure and its effects (Headache, Vomiting, Papilloedema) are more prominent in adults because there is less space to dissipate the increasing pressure while in children head size increases to compensate the pressure effects. A very rare presentation of hydrocephalus in a 50 years old man has been reported in the form of sialorrhoea only with no other complaints of raised intracranial pressure. The condition improved by CSF shunt⁷.

Skull X-rays can be helpful in the diagnosis of hydrocephalus by the presence of split sutures and "hammered silver appearance"⁸. Erosion of posterior clinoids by raised intracranial pressure can also be seen on X-rays⁹. Various shunt complications such as disconnected components of the shunt and secondary craniocynostosis can also be diagnosed on X-rays^{8,10,11}.

Ultrasonography is specially valuable in antenatal diagnosis of hydrocephalus as it is non-invasive and has no radiation hazards for the foetus and mother. It is also useful in diagnosing hydrocephalus in infants (5,8,12).

CT scan is the investigation most commonly used to diagnose hydrocephalus. The underlying cause for hydrocephalus such as tumors, cysts etc. can also be seen on CT scan (8,13,14,15, 16, 17).

CT scan is also used to diagnose post-operative shunt complications such as shunt obstruction, intracranial haematoma and slit ventricle syndrome (8, 18). MRI is superior to CTscan in diagnosing hydrocephalus especially in cases of intraventricular septations and cystic lesions (14) but it is expensive and not freely available.

In all the patients included in this study VP shunt was done after complete clinical and radiological evaluation. While putting in the ventricular catheter a free-hand method was used to pass it into the ipsilateral frontal horn. Its length was measured beforehand with the help of CT scan. As accurate placement of ventricular catheter is very important for the system to work adequately, different techniques have been described in the literature.

A technique using posterior ventricular guide (PVG) for parieto-occipital catheter has given 92% accurate catheter placement in comparison to the free hand catheter placement having a good catheter position in 51.1% cases only¹⁹.

Another technique for accurate placement of coronal ventricular catheter has been described which utilises external bony landmarks as the guide. A satisfactory placement of the catheter was achieved in 93.2% cases²⁰. Ventricular catheter can also be accurately placed stereotactically²¹.

Ventricular catheter placed in the frontal horn has a better longterm outcome as it lies anterior to the choroid plexus and has lesser chances of obstruction⁴. Although the peritoneum is the preferred site for CSF shunting, ventriculoatrial shunt still has a role in situations where VP shunt is contraindicated such as peritonitis, repeated abdominal surgeries, abdominal adhesions etc.^{4,22}

Some less commonly (rarely) done shunting procedures include lumboperitoneal shunt²³.

ventriculopleural shunt^{4,23}, Torkildsen shunt²³, ventriculo-uretral shunt²⁴ and ventriculo-gallbladder shunt⁴ but all these shunting procedures have serious complications.

As far as post operative complications are concerned, shunt infection is the most difficult to treat. Infection is most commonly introduced at the time of operation. Staphylococcus epidermidis is the causative organism in 70% cases and Staph. Aureus in 7% cases²⁵. Over-drainage, leading to different intracranial haematomas¹⁸, can be prevented/ treated by variable-resistance valves²⁶, use of Z-flow shunt²⁷ or the "Sigma" shunt²⁸. Slit ventricle syndrome can be treated by conversion of the shunt into a higher pressure²⁹.

We conclude that hydrocephalus is mainly the disease of infants and young children with male predominance. It is not as simple a problem to deal with as it appears to be. It has serious complications which should be understood and dealt with properly and promptly to reduce the morbidity and mortality of the disease and its treatment.

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