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Hydrostatic valves in treatment of paediatric hydrocephalus

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Background

The pathological patterns of overdrainage like subdural haematoma or effusions are not so often in treatment of paediatric hydrocephalus. Slit ventricle, secondary premature suture synostosis and the lost of elasticity and compliance of the brain are specific paediatric problems of overdrainage and have frequently been observed following shunt insertion. In cases with clinical symptoms these complications can be difficult to treat. Hydrostatic valves minimise this risk of overdrainage. This study aims to evaluate the initial experience with a hydrostatic valve system, with emphasis on overdrainage associated complications.

Material and methods

20 children receiving a PAEDI-GAV valve from 4/2003 till 1/2005 in our hospital were included in a prospective study. The valve is a combination of a conventional ball in coin differential pressure unit and a gravitational unit. The pressure levels were individually defined for the patients ranging from 4/14 up to 9/24 cm H_2O. In addition to the analysis of clinical parameters, radiological measurements and shunt revisions we focussed on overdrainage related complications. The developing of the size of the ventricle system was also taken into consideration.

Results

In 6 older children with shunt blockage we replaced a differential pressure valve with a PAEDI-GAV device during shunt revision. 14 newborns and babies with hydrocephalus of different aetiology were treated with a PAEDI-GAV system as a primary v-p shunt. In this group the average CSF protein level at shunt insertion was 0.78 g/l (0.12–1.349 g/l); mean CSF cell count was 4 per 1/3 ml (1–15 per 1/3 ml). Two pre-term newborns with posthaemorrhagic hydrocephalus were treated previously with DRIFT. None of the infants suffered a subdural effusion or haematoma after shunting, but 2 from 6 newborns with devices at a pressure level of 4/14 cm H_2O developed slit ventricles without clinical symptoms. The frontal and occipital horn width ratio decreased from an average of 0.611 to 0.488 at first follow-up. We had to perform 9 revisions in 6 children. Here are included 3 revisions in a newborn with a large interhemispherical arachnoid cyst and 2 revisions in a premature newborn with severe liver cirrhosis- associated ascites. The main cause for revisions was blockage of the ventricle catheter. We did not encounter any valve failure. There were no shunt infections in both groups.

Conclusion

The intra-operative handling of the PAEDI-GAV valve is good. The small dimensions of the device make it suitable for the use in newborns and infants. Selection of pressure levels should be adapted to age and the individual characteristics of the dynamics of the ventricular system.