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Adjustability of shunt-valves – luxury, progress or necessity?

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from 50th Annual Meeting of the Society for Research into Hydrocephalus and Spina Bifida
Cambridge, UK. 30 August – 2 September 2006

Published: 21 December 2006

Cerebrospinal Fluid Research 2006, **3**(Suppl 1):S57 doi:10.1186/1743-8454-3-S1-S57

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Background

Only the development of biocompatible materials and valves with reliable function over a longer period of time enabled a successful shunt-therapy of hydrocephalus in the fifties of last century. After first reports about successful implantations of these differential-pressure-valves critical articles were published dealing mainly with overdrainage-related complications. Therefore different anti-siphon-units and "flow-regulated" valves have been developed, but now mechanical complications related to under-drainage gained increasing attention. As a consequence, the principle of adjustability of valves has been introduced. But up to now the proof of a superiority of "programmable" devices compared to non-adjustable valves is still missing especially in children.

Materials and methods

As the reason for a necessity to inaugurate adjustability of shunt-valves the authors claim, besides the requirement to avoid over-drainage, the still existing impossibility to determine the optimal opening pressure for the individual patient especially in cases of NPH or LOVA-type hydrocephalus. Furthermore the changing physiological parameters in upright position of children with their growth of length after shunting favor the idea of adjustment. Finally the intraperitoneal pressure is still a "black box" and possible changes of important parameters like CSF-production and -absorption are strong arguments for advantages of adjustability. The causes for the missing proof of the superiority of adjustable valves are multifold and will be explained on the basis of our experience after

implantation of 230 Dual-Switch-valves and 54 adjustable pro-GAVs.

Results

By analyzing our experience and the literature it became evident that not only different inclusion-criteria but mainly discrepant definitions of the most important complications lead to the impossibility of unequivocal distinctions and dissociations of these entities in different series. Furthermore it is necessary to avoid some existing disadvantages of adjustable valves and it is a matter of controversy whether adjustment should be effective only in the lying and/or in the upright position. A possible solution for this dilemma by a new device will be presented.

Conclusion

As a result of our evaluation we conclude that a reliable non-"programmable" hydrostatic device may be preferable to some adjustable valves on the market. But we are convinced that by avoiding discrepancies of definitions in different series and by improving the construction principle of adjustable shunt-valves the superiority of the latter can be proven also for children in the future.