

Oral Presentation

## John D Holter and his century valve

A Aschoff\*

Address: University of Heidelberg, Department of Neurosurgery, Heidelberg, Germany

Email: A Aschoff\* - Alfred\_Aschoff@med.uni-heidelberg.de

\* Corresponding author

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### Background

On December 22th 2003 John D Holter, one of the fathers of the hydrocephalus valves, died. In 1956 within a few weeks he had invented and produced the Holter-valve for his own son.

### Materials and Methods

The author reviewed the literature concerning shunt and valve history since the fifties exhaustively. Additional informations base on unpublished personal correspondence with Holter since 1988 and 4 personal meetings. 31 Holter- and 111 Holter-Hausner-valves have been tested in our laboratory.

### Results

Small trials with valved CSF shunts were made by Nulsen/Spitz in 1949 (3 patients, ball-valve), by Matson/Bush in the early fifties (18 implantations of magnetical ball-valves), by Pudenz/Heyer in 1955 (distal slit valve) and Sikkens/Engelsmann in 1956 (combined ball and slit-valve), but all designs remained prototypes. In 1956 Holter's son presented a MMC-associated hydrocephalus, which was treated by Spitz with serial ventricular punctures. The silicone expert Holter was encouraged by Spitz, to design a new valve. The first prototype built in a few days had a diameter of ca. 10 mm and was oversized. The second prototype, produced in a few weeks incl. of catheters, was accepted by Spitz and implanted. For the first time the valve body, lips and catheters were made by silicone, which was introduced in the Neuro-surgery as a superior shunt material. In summer 1956 Holter initiated the first commercial shunt production worldwide in a garage in Bridgeport (PA). The good handling, the extreme robustness and the hydraulic properties with a tendency to low flow properties were important preconditions in the successful introduction of shunts. In the seventies Holter developed a crucial slit design and founded

a new company (Holter-Hausner). In 1987/88 a problematic charge of a secondary sticking silicone let to dysfunctions, recall and finally to the concourse of the company. It was tragically, that the last work of Holter, who had inaugurated silicone into the Neurosurgery, consisted in the identification of a defective silicone charge.

### Conclusion

The Holter-valve, produced over 44 years, remains a milestone in the history of hydrocephalus and works still in some 100,000 patients.