Delta valve

Nonprogrammable valve - Differential pressure valve

Company

Medtronic

see Medtronic Valves

Design

Diaphragm design

Antisiphon device

The antisiphon device, of the Medtronic Delta® valves is a siphon control device that resists siphoning of CSF from the ventricular system. The valve is designed to be closed at its resting state and to not allow CSF to flow through it down a pressure gradient due to the shunt's outlet being below its inlets. Only when pressure builds proximal to the valve to a value in excess of the it's opening presssure will the valve open to allow flow of CSF through the shunt.

Options

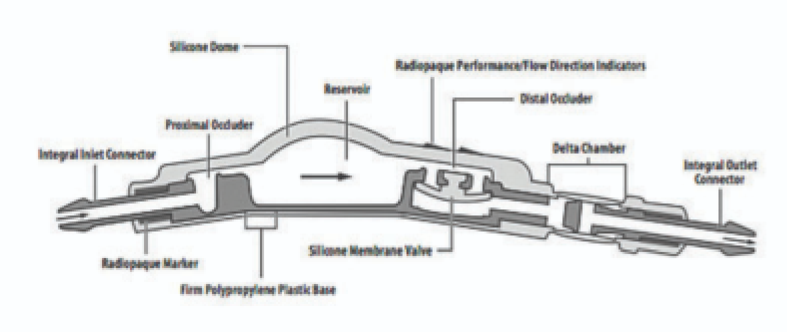
Regular

Neonatal

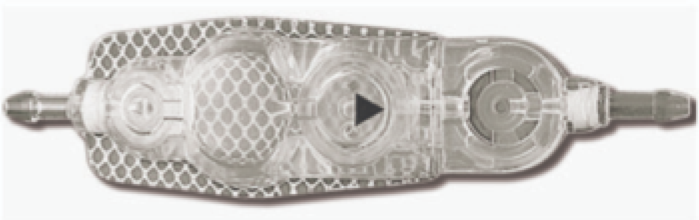
Burr hole

Chamber

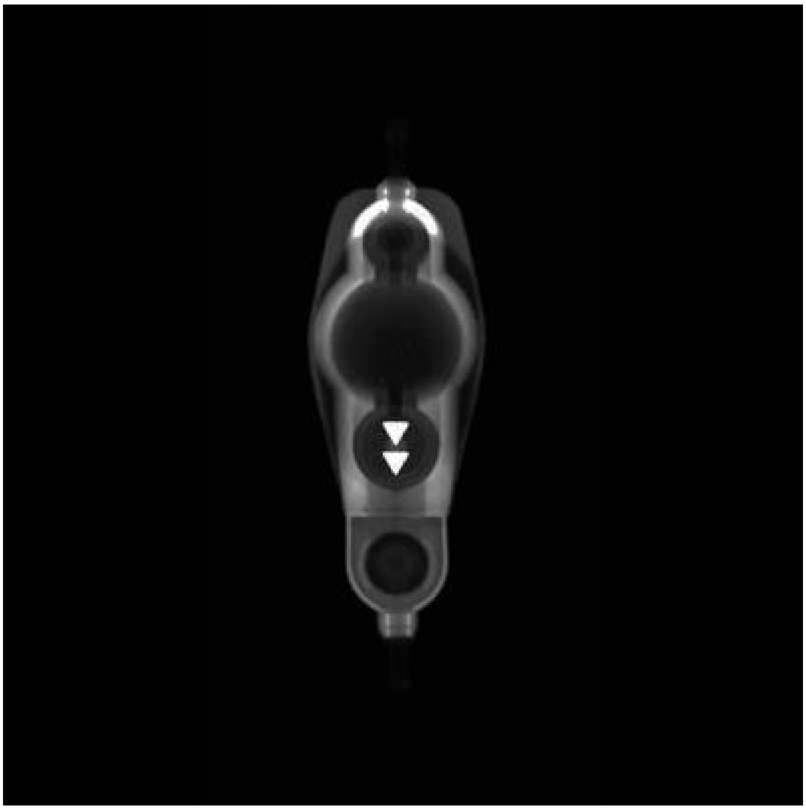
Mechanism



Picture



Xray



The Delta valve is a differential pressure valve with a siphon control device. The valve mechanism is normally closed, but is designed to open in response to positive ventricular pressure, thereby avoiding overdrainage of cerebrospinal fluid (CSF). As a result, the incidence of subdural fluid collections as well as postural symptoms is purportedly reduced. In addition, the valve might reduce the number of obstructions as there would be no negative pressure sucking tissue and debris into the shunt system. In order to assess whether use of the Delta valve reduced the number of shunt-related problems as compared with two other pressure differential valves without an antisiphon component, we performed a retrospective review of all children undergoing CSF diversion procedures at our institution.

Davis et al., reviewed the charts of 1, 193 patients. Cases included 2,325 ventriculoperitoneal (V-P) shunt insertions or revisions from January 1, 1985, to December 31, 1994, performed at our institution. The Delta valve and two pressure differential valves without antisiphon function were exclusively inserted during the following time periods: Holter-Hausner (H-H): January 1, 1985, to August, 1987; Heyer-Schulte (H-S): August, 1987, to June, 1991, and Delta: June, 1991, to December 31, 1994.

Of the cases reviewed, 475 patients underwent insertion of a V-P shunt at the Childrens Hospital of Los Angeles and had a total of 686 shunt operations. Median follow-up was 3 years and ranged up to 10 years. Kaplan-Meier analysis documented that 67% of H-H, 71% of H-S and 70% of the Delta valves were functioning at 1-year follow-up. At 2-year follow-up, 66% of H-H, 64% of H-S and 65% of the Delta valves were functioning. The difference was not statistically significant. The occurrence rate for symptomatic subdural fluid collections was 0.7% (1/130) for H-H, 2.2% (3/139) for H-S and 1.0% (2/206) for the Delta valve ($p = 0.52$). The combined breakage/obstruction rate for the series was 7.7% (10/130) for H-H, 2.9% (4/139) for H-S and 4.9% (10/206) for the Delta valve ($p = 0.19$). No Delta valves malfunctioned secondary to fibrous capsule affecting the antisiphon device.

In conclusion, it appears that performance of the Delta valve was not significantly different from the H-H and H-S valves, two valves without an antisiphon device. There was no significant difference in the occurrence of symptomatic subdural fluid collections based upon valve type, or in the combined valve breakage/obstruction rates based upon valve type [1].

[1]

Davis SE, Levy ML, McComb JG, Sposto R. The delta valve: how does its clinical performance compare with two other pressure differential valves without antisiphon control? Pediatr Neurosurg. 2000 Aug;33(2):58-63. PubMed PMID: 11070430.