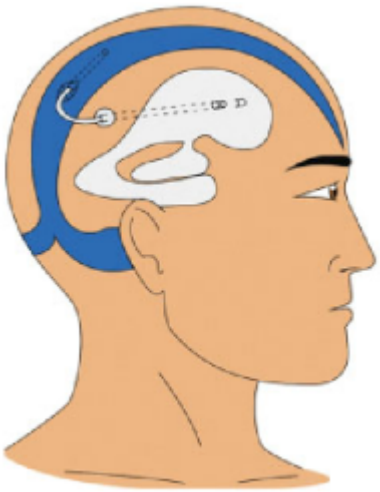
Retrograde VentriculoSinus Shunt



A retrograde ventriculosinus (RVS) shunt is a watertight connection that delivers excess cerebrospinal fluid (CSF) to the superior sagittal sinus (SSS) against the direction of blood flow. This method of CSF shunting utilizes the impact pressure (IP) of the bloodstream in the SSS to maintain the intraventricular pressure (IVP) more than the sinus pressure (SP) regardless of changes in posture or intrathoracic pressure (ITP) and discourages stagnation and clotting of blood at the venous end of the connection. It also utilizes collapse of the internal jugular vein (IJV) in the erect posture to prevent siphonage.

Since the 1950's, hydrocephalus can be treated with cerebrospinal fluid shunts, usually to the peritoneal cavity or to the right cardiac hearth atrium. However, due to their siphon effect, these shunts lead to non-physiological cerebrospinal fluid drainage, with possible co-morbidity and high revision rates. More sophisticated shunt valve systems significantly increase costs and technical complexity and remain unsuccessful in a subgroup of patients. In an attempt to obtain physiological cerebrospinal fluid shunting, many neurosurgical pioneers shunted towards the dural sinuses, taking advantage of the physiological antisiphoning effect of the internal jugular veins. Despite several promising reports, the ventriculosinus shunts did not yet become standard neurosurgical practice.

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50 RVS shunts were successfully implanted using valveless shunting catheters. There were no problems related to incorrect CSF drainage or sinus thrombosis. The results indicated arrest of the hydrocephalic process, normalization of the IVP and proper shunt function [1)].

In 2016 Oliveira et al., published 3 consecutive cases who had previously undergone VPS revision and in which peritoneal space was full of adhesions and fibrosis. RVSS was performed as described by Shafei et al., with some modifications to each case. All 3 patients kept the same clinical profile after RVSS, with no perioperative or postoperative complications. However, revision surgery was performed in the first operative day in 1 out of 3 patients, in which the catheter was not positioned in the superior sagittal sinus. They propose that in cases where VPS is not feasible, RVSS may be a safe and applicable second option. Nevertheless, the long-term follow-up of patients and further learning curve must bring stronger evidence [2)].

Baert et al., from the Department of Neurosurgery of Ghent University Hospital, Belgium implanted the retrograde ventriculosinus shunt, as advocated by El-Shafei, in 10 patients. They reports on the operation technique and long-term outcome, including 4 patients in whom this shunt was implanted as a rescue.

Implantation of a ventriculosinus shunt proved to be a feasible technique, warranting physiological drainage of cerebrospinal fluid. However, only in 3 out of 14 patients, functionality of the retrograde ventriculosinus shunt was maintained during more than 6 years follow-up. In there opinion, these shunts fail because present venous access devices are difficult to implant correctly and get too easily obstructed. After discussing possible causes of this frequent obstruction, a new dural venous sinus access device is presented.

An easy to implant and thrombogenic-resistant dural venous sinus access device needs to be developed before ventriculosinus shunting can become general practice [3].

1)
El-Shafei IL, El-Shafei HI. The retrograde ventriculosinus shunt: concept and technique for treatment of hydrocephalus by shunting the cerebrospinal fluid to the superior sagittal sinus against the direction of blood flow. Preliminary report. Childs Nerv Syst. 2001 Aug;17(8):457-65; discussion 466. PubMed PMID: 11508534.
2)
Oliveira MF, Teixeira MJ, Reis RC, Petitto CE, Gomes Pinto FC. Failed Ventriculoperitoneal Shunt: Is Retrograde Ventriculosinus Shunt a Reliable Option? World Neurosurg. 2016 Aug;92:445-453. doi: 10.1016/j.wneu.2016.05.038. Epub 2016 May 27. PubMed PMID: 27237416.
3)
Baert E, Dewaele F, Vandersteene J, Hallaert G, Okito Kalala JP, Roost DV. Treating Hydrocephalus with Retrograde VentriculoSinus Shunt Prospective Clinical Study. World Neurosurg. 2018 Jun 25. pii: S1878-8750(18)31313-5. doi: 10.1016/j.wneu.2018.06.097. [Epub ahead of print] PubMed PMID: 29953953.