

Neurapheresis

<http://www.neurapheresis.org>

The Neurapheresis™ system (Minnetronix Inc, St. Paul, Minnesota) has been developed to filter CSF and remove blood products.

It has been hypothesized that early and rapid filtration of **blood** from **cerebrospinal fluid** (CSF) in post-**subarachnoid hemorrhage** patients may reduce hospital stay and related adverse events.



Khani et al. formulated a subject-specific computational fluid dynamics (CFD) model to parametrically investigate the impact of a novel dual-lumen catheter-based CSF filtration system, the Neurapheresis™ system (Minnetronix Neuro, Inc., St. Paul, MN), on intrathecal CSF dynamics. The operating principle of this system is to remove CSF from one location along the spine (aspiration port), externally filter the CSF routing the retentate to a waste bag, and return permeates (uncontaminated CSF) to another location along the spine (return port). The CFD model allowed parametric simulation of how the Neurapheresis system impacts intrathecal CSF velocities and steady-state streaming under various Neurapheresis flow settings ranging from 0.5 to 2.0 ml/min and with a constant retentate removal rate of 0.2 ml/min. simulation of the Neurapheresis system was compared to a lumbar drain simulation with a typical CSF removal rate setting of 0.2 ml/min. Results showed that the Neurapheresis system at a maximum flow of 2.0 ml/min increased average steady-state streaming CSF velocity 2X in comparison to lumbar drain (0.190 ± 0.133 versus 0.093 ± 0.107 mm/s, respectively). This effect was localized to the region within the Neurapheresis flow-loop. The mean velocities introduced by the flow-loop were relatively small in comparison to normal cardiac-induced CSF velocities ¹⁾.

It is being investigated for safety and feasibility in the Extracorporeal Filtration of subarachnoid hemorrhage via Spinal Catheter (PILLAR) study. We report the first case using this novel device.

A 65-yr-old female presented with a ruptured left posterior communicating artery aneurysm. Following placement of a ventriculostomy and coil embolization of her aneurysm, the patient underwent placement of a lumbar dual lumen catheter for CSF filtration as part of the PILLAR study. In this case, a total of 9 h of filtration during 31 h of catheter indwelling resulted in 309.47 mL of processed CSF without complication. Computed tomography images demonstrated an interval reduction of subarachnoid hemorrhage immediately after filtration. The patient was discharged home on postbleed day 11 and at 30 d showed good recovery.

Safety of the Neurapheresis procedure was confirmed in this first case, and it will continue to evaluate the safety of the Neurapheresis system through the PILLAR trial ²⁾.

Smilnak et al., provided the first publication demonstrating the direct ability to rapidly clear, both in vitro and in vivo, the otherwise slowly removed fungal pathogen that directly contributes to the morbidity and mortality seen in Cryptococcal Meningitis (CM)³⁾.

References

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³⁾

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