



# Active CSF Exchange & Removal of SAH to Reduce Shunt Dependency

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**OBJECTIVE:** We hypothesized that by actively removing SAH via minimally invasive active external ventricular drainage (EVD) while actively exchanging CSF, we can reduce pathological outcome of blood in subarachnoid space. This might reduce shunt dependency of SAH patients.

## INTRODUCTION

- Aneurysmatic subarachnoid haemorrhage (SAH) induces cerebrospinal (CSF) circulation disruption with multiple pathways.
- Sterile inflammation increases the CSF production, and SAH itself, blocks the absorption of CSF at microscopical and macroscopical levels.
- Organization of blood in subarachnoid space induces fibrosis and further disturbs normal CSF circulation, which is seen as a need for a permanent shunt to normalize intracranial pressure.

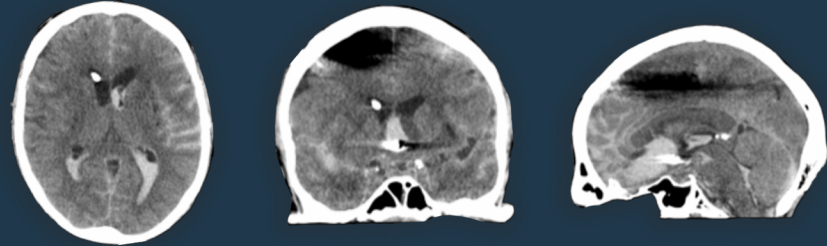
## METHOD

- We identified patients with high probably of shunt dependency with CHES score 6+ which predicts 75% shunt dependency.
- We gathered data from three US and EU centers.
- 15 SAH patients were recognized to have CHES scores 6 or higher, with 3 months follow-ups and which aneurysms were endovascularly treated.
- All the patients suffered from acute hydrocephalus and received active EVD with where subarachnoid space were irrigated and drained passively.
- 7 patients received tPA in irrigation fluid with daily doses of 1,5-3mg, and the rest of the patients irrigated with ringer acetate or NaCl solutions alone.

## RESULTS

- Active EVD allows accelerated removal of SAH.
- Shunt dependency was seen in 2 patients in 3-month follow-ups, which was less than expected with CHES score prediction
- None of the patients suffered from mortality or morbidity related to CSF exchange.

## Pre-Active EVD Treatment



## Post-Active EVD (36 hours of treatment)



## CONCLUSION

- Active CSF exchange is possible via Active EVD, and this accelerated SAH removal.
- This might reduce shunt dependency after SAH.
- Prospective trials are needed to confirm our preliminary findings.