

# The Influence of Coughing on Cerebrospinal Fluid Pressure in an In Vitro Syringomyelia Model With Spinal Canal Stenosis



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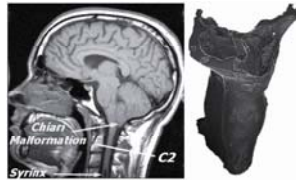
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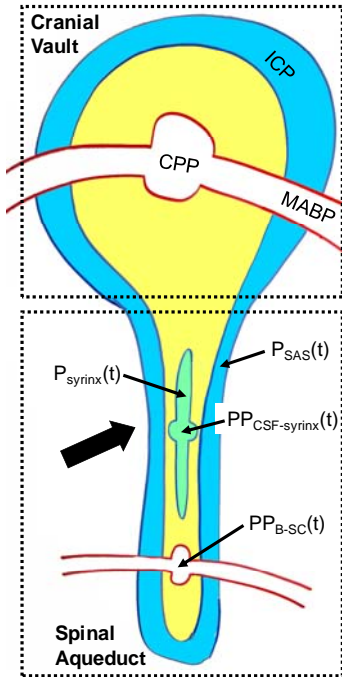
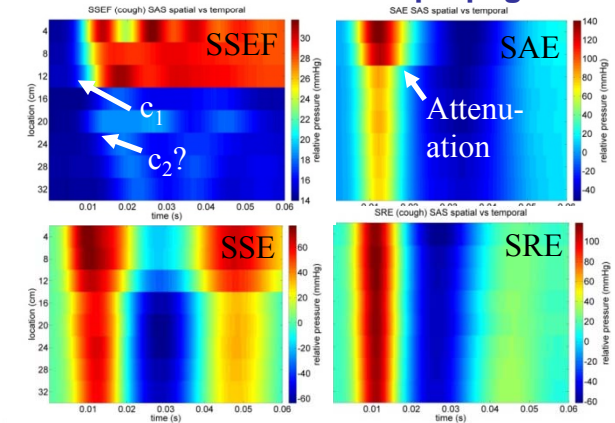
## 1. Healthy



## 2. Pathological



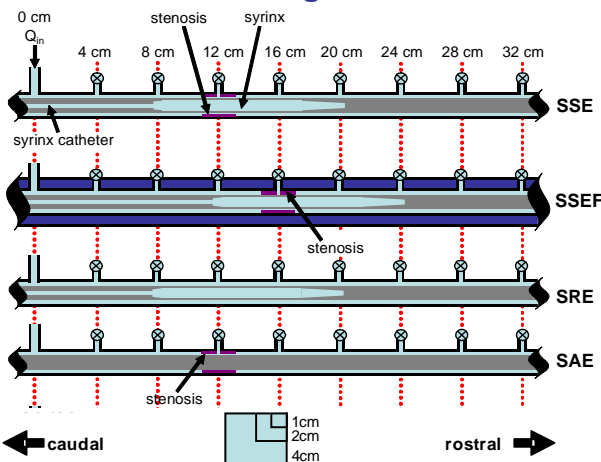
## 5. Results - in vitro wave propagation



## 3. Craniospinal hydrodynamics

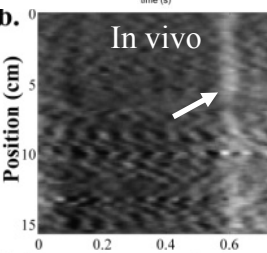
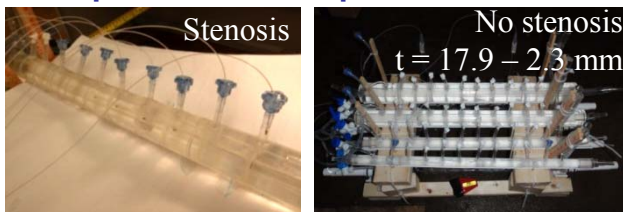
- Need better understanding of fluid transport in the spinal aqueduct

## 4. In vitro modeling



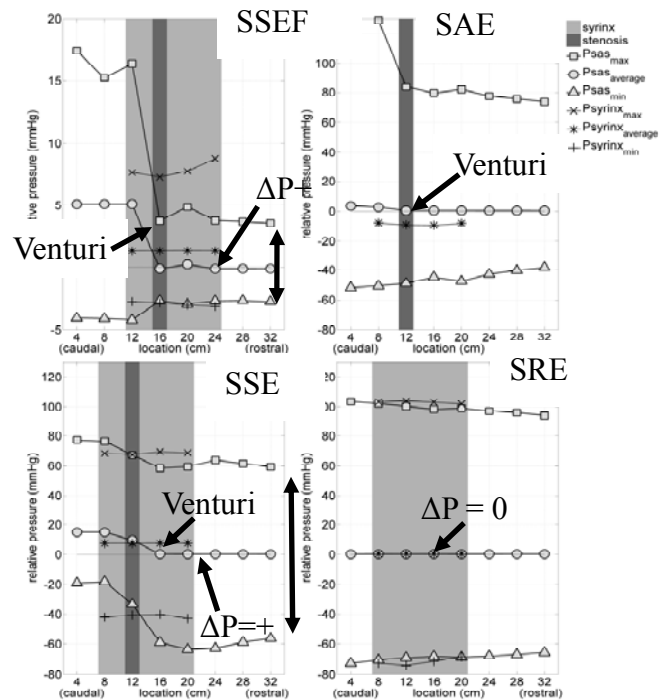
- SSE = Stenosis and syring exp.
- SSEF = SSE exp + flexible
- SRE = Stenosis removed exp.
- SAE = Stenosis alone exp.

## 4. Experimental set-up



experiment	SAS (m/s)
SSEF	23
SSE	155
SAE	169
SRE	399
In vivo	4.6

## 6. Results – longitudinal pressure



## 7. Results – model vs. analytical

Thickness (mm)	$E_{cord}$ (kPa)	$E_{tube}$ (kPa)	$C_{exp}$ (m/s)	$c_1$ (m/s)	$c_2$ (m/s)
17.9	446	1993	40, 51	30.1	54.2
12.0	446	1993	28, 30	26.8	53.3
5.2	446	632	24, 24	10.8	28.8
2.3	446	632	14, 16	7.39	28.4

## 8. Conclusions

- Complex FSI
- In vitro was similar to in vivo
- Tissue properties are important
- Need better analytical and computational models