

Research Overview

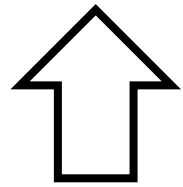
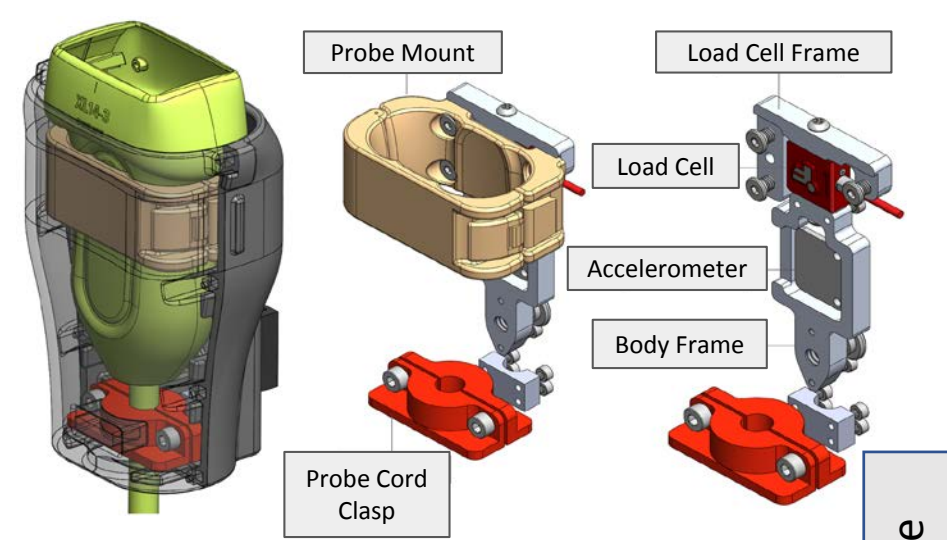
Charles G. Sodini

CICS Review

May 5, 2021

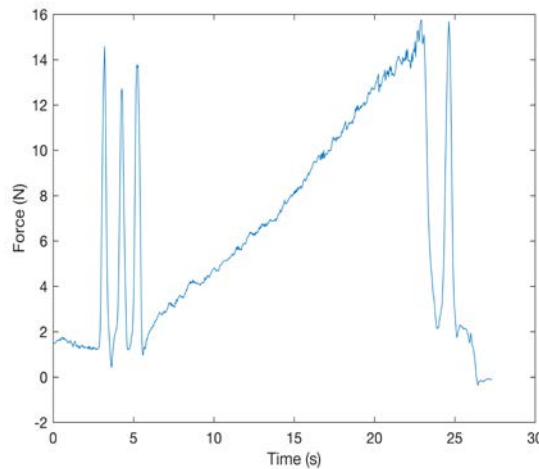
Force-coupled Ultrasound Application to a Generalized Venous Computational Model

Alex Jaffe, Aaron Aguirre, Charles Sodini, Brian Anthony



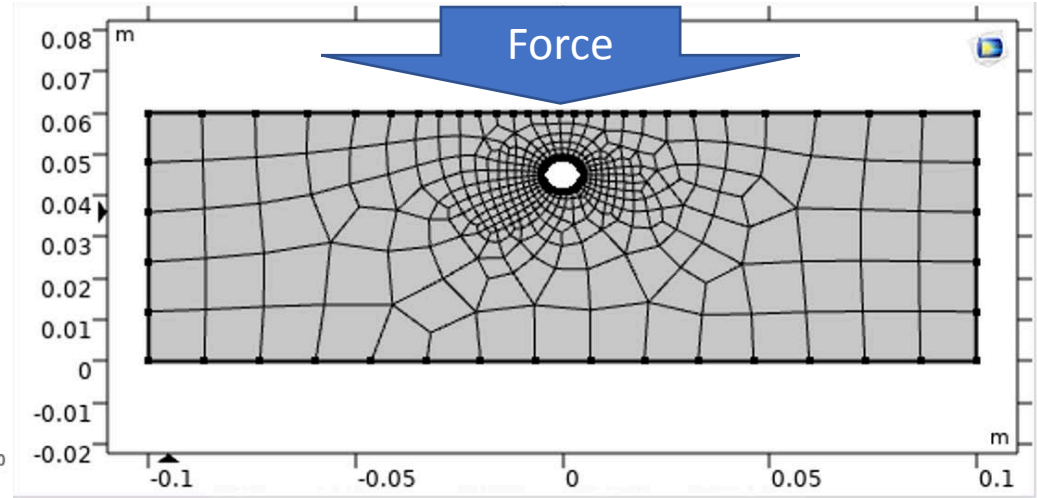
Force-coupled
Ultrasound
Probe
Assembly

Observations

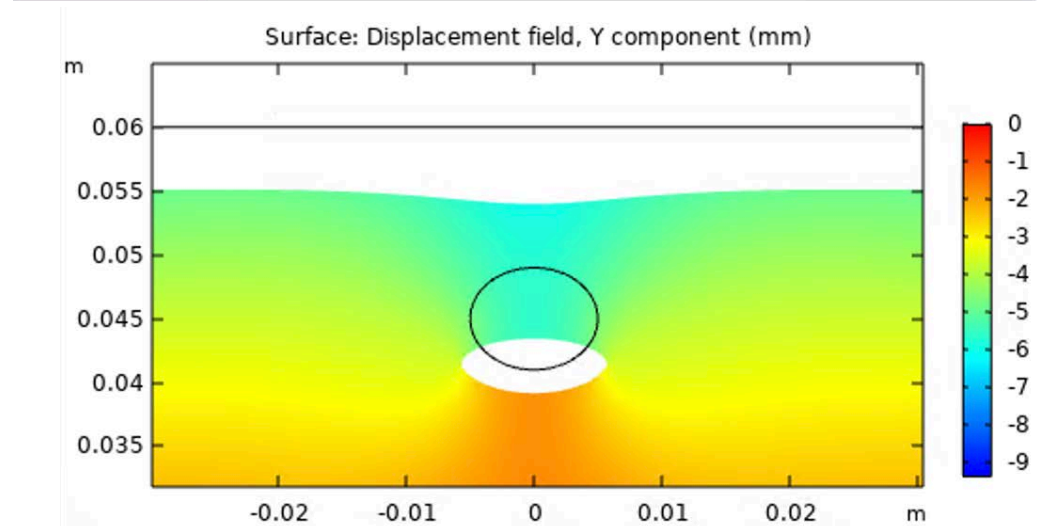
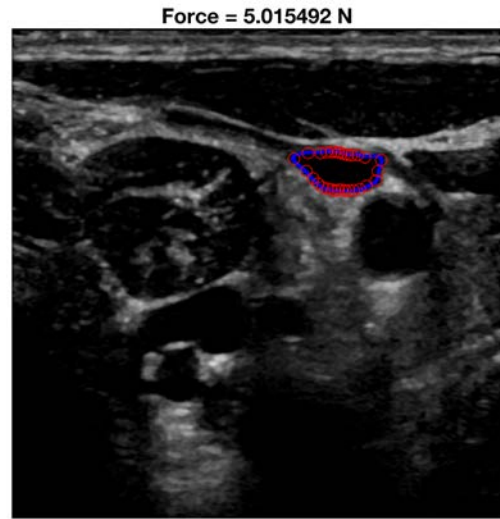


External Force

Model Predictions



Vessel Displacement



Extracranial blood flow measurement

Syed M. Imaduddin, Charles Sodini, Thomas Heldt
 Sponsor MEDRC Analog Devices

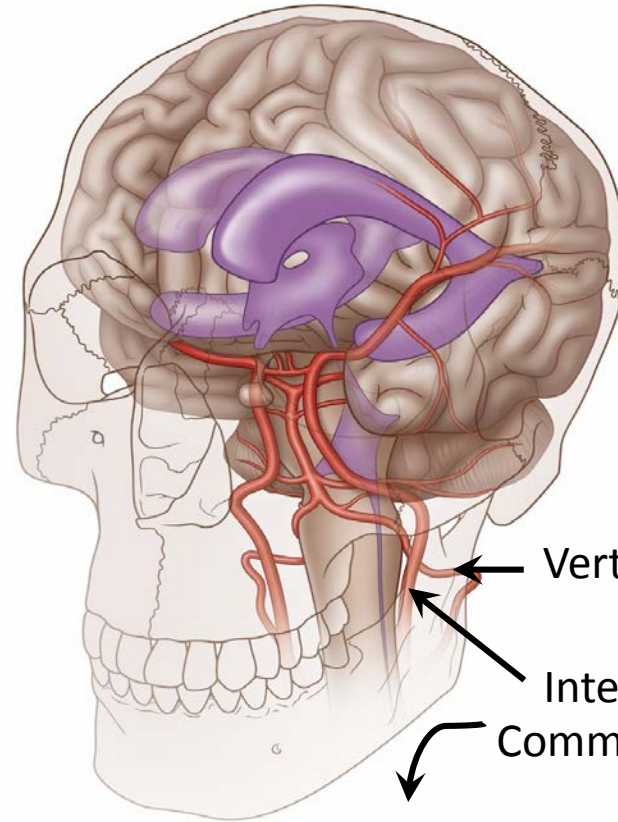
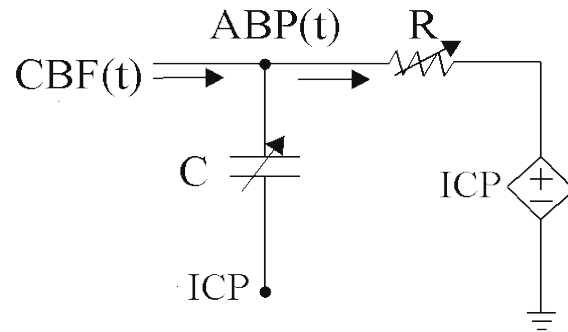
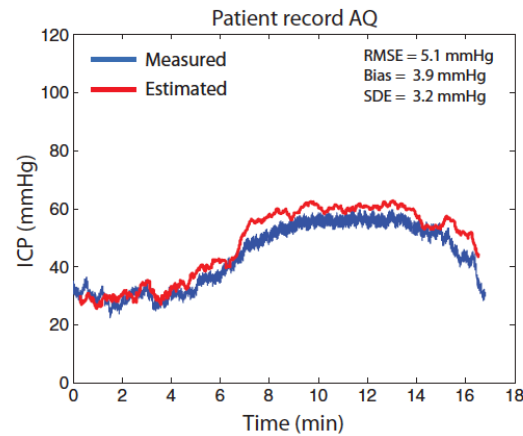


Figure adapted from A. Fanelli et al., *J Neurosurg Pediatr*, 2019

Vessel	Mean diameter (mm)	Mean flow (mL/min)
CCA ¹	5.9 ± 0.7	314 ± 74
ICA ²	4.7 ± 0.5	222 ± 56
VA ²	3.3 ± 0.6	84 ± 38

¹C. Roehrig et al., *Acta Anaesthesiol Scand*, 2017

²M. A. Khan et al., *J Cerebr Blood F Metab*, 2017



Kashif et al. *Science Transl Med* 2012
 Imaduddin et al. *IEEE TBME* 2019
 Fanelli et al. *J Neurosurg:Peds* 2019
 Jaishankar et al. *IEEE JHBI* 2020

Soft-tissue imaging: 4 – 8 MHz

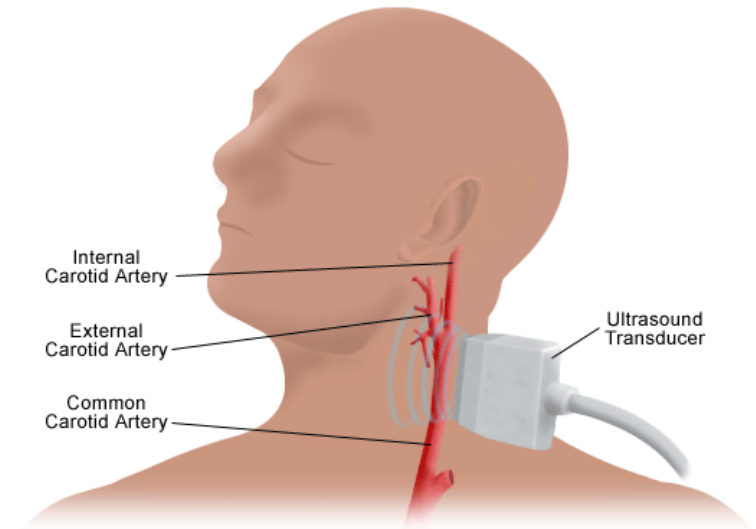
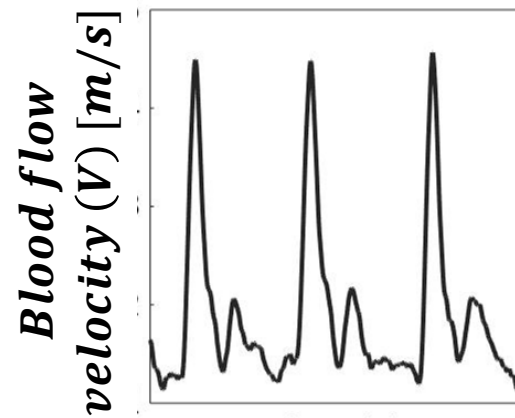
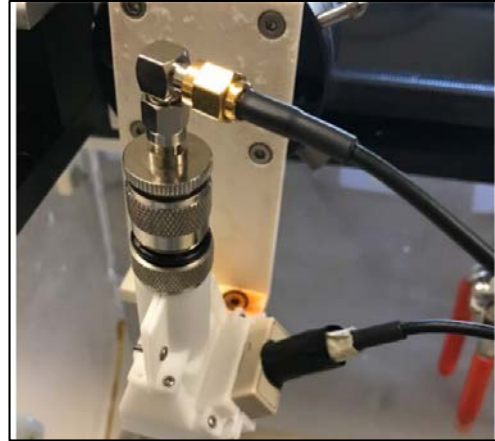
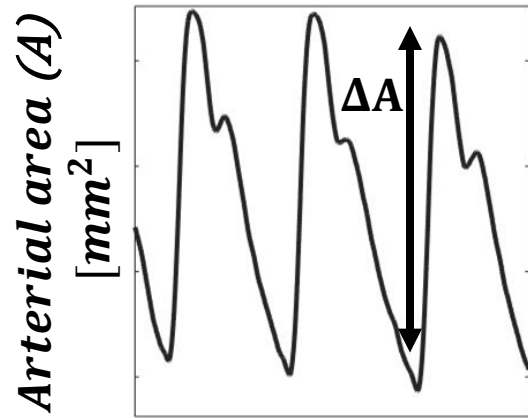


Figure from SWMC Health Library

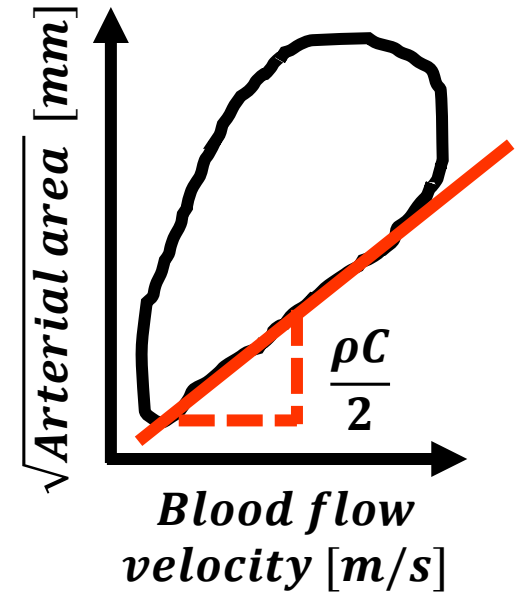
Arterial Blood Pressure Estimation

Anand Chandrasekhar, Hanrui Wang, Aaron Aguirre, Song Han, Charles Sodini, Hae –Seung Lee

Sponsor: MEDRC Philips and Analog Devices

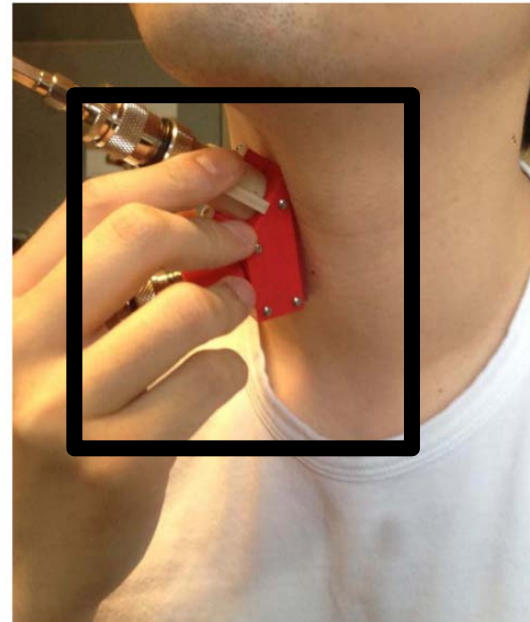
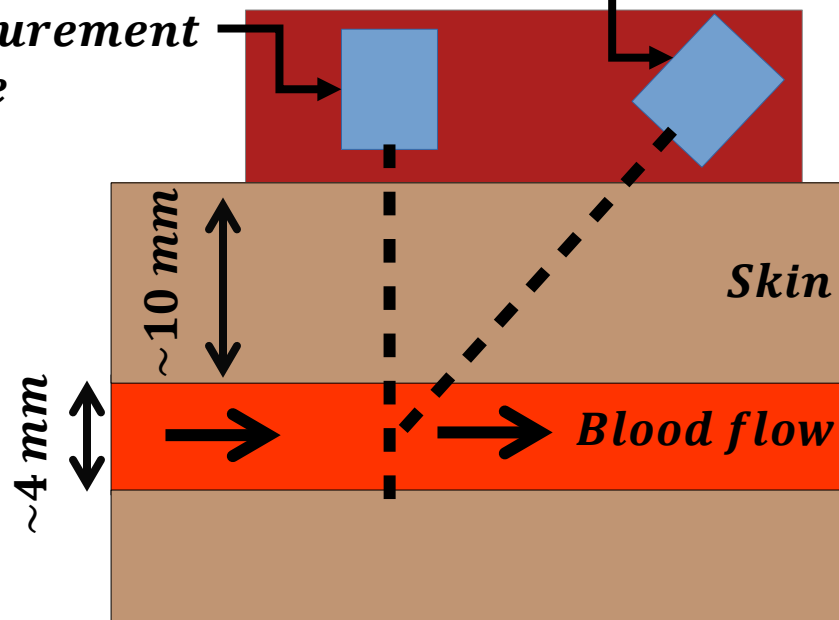


$$\sqrt{A} = \left(\frac{\rho C}{2}\right) V + \text{Constant}$$



Arterial area
measurement
probe

Blood flow measurement probe



$$\text{Pulse Pressure} = \frac{\Delta A}{C}$$

Mean Arterial BP may be
estimated using
Transmission Line Model
Machine Learning Model