Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Towards a better understanding of the flow mechanisms involved in blunt traumatic aortic rupture GHASSAN MARAOUCH, CURTIS H. HORTON, EDUARDO MALORNI, JOSEPH FANABERIA, GIAN-CARLO MIGNACCA, LORENZO MERCURI-BASTIEN, LYES KADEM, Concordia University, MARK COHEN, PMG Technologies — Blunt traumatic aortic rupture is a heart injury that can occur in falls, automobile accidents, and sporting injuries involving impact to the thorax. Despite its severity and high morbidity rate, the research still does not provide a consistent description of the mechanism of rupture. In this study, a crash testing dummy with an in-vitro pumping heart, 3D printed ribcage, and ballistic gel damping layer was developed to reproduce a realistic response to thoracic impact. Testing was performed using a standardized pendulum used for calibration of crash test dummies, with the location of impact being the middle of the sternum. Different impact severities were tested by adjusting the kinetic energy at impact with the initial height of the pendulum. Measurements on the dummy include instantaneous aortic pressure waveforms during impact and accelerations at the spine and sternum. The results of this experiment show that aortic pressure experiences significant changes in magnitude during simulated impact. This work could help contribute towards a better understanding of the mechanisms leading to blunt traumatic aortic rupture and the development of preventative measures.

Ghassan Maraouch
Concordia University

Date submitted: 01 Aug 2019 Electronic form version 1.4