

JOSEPH BRUNET

39 rue Pointe Cadet, 42000 Saint-Étienne, France, joseph.brunet@emse.fr

EDUCATION

École des Mines de Saint-Étienne, France

Nov 2017 - Mar 2021

Ph.D. in Biomechanics

Paris Descartes University, France

Sep 2016 - Oct 2017

Master of Science - MS, Biomedical Engineering - Major in Biomechanics

École Nationale Supérieure d'Arts et Métiers, France

Sep 2014 - Oct 2017

Master's Degree in Mechanical Engineering

RESEARCH EXPERIENCE

PhD Researcher | École des Mines de Saint-Étienne, France

Nov 2017 - Present

Funded by the European Research Council

Advisors: Pierre Badel, Éric Maire

Thesis: Understanding the mechanisms of aortic dissection: finite element modeling and *in situ* experimentation with X-ray tomography

- Collection and manipulation of arterial tissue from pigs and rabbits
- Tensile and peeling tests to assess the elastic and fracture properties of the tissue
- Development of a tension-inflation device fitting inside an X-ray tomography setup and its computer interface
- In situ 3D imaging of the dissection of pressurized arterial segments by X-ray microtomography and synchrotron-based phase-contrast imaging
- Modeling of the observed failure phenomena using the extended finite element method

Research intern | Medtronic, France

Jul 2017 - Nov 2017

Experimental and numerical study on meshes for abdominal hernia repair

- Uniaxial, biaxial, and indentation tests on different type of textiles
- Modeling the observed mesh behaviors with a nonlinear, anisotropic, plastic model

M.S. Researcher | École des Mines de Saint-Étienne, France

Jan 2017 - Jul 2017

Advisor: Pierre Badel

Thesis: Investigation of shear delamination during rupture of arterial medial tissue using cohesive numerical model

PUBLICATIONS

Brunet, J., Pierrat, B., Badel, P. A parametric study on factors influencing the onset and propagation of aortic dissection using the extended finite element method. *IEEE. Trans. Biomed. Eng.*, 2020.

Brunet, J., Pierrat, B., Adrien, J., Maire, E., Curt, N., Badel, P. A Novel Method for In Vitro 3D Imaging of Dissecting Pressurized Arterial Segments Using X-Ray Microtomography. *Exp. Mech. Sp Iss: Experimental Advances in Cardiovascular Biomechanics*, vol. 61, pp. 147157, 2020.

Brunet, J., Pierrat, B. and Badel, P. Review of current advances in the mechanical description and quantification of aortic dissection mechanisms. *IEEE Rev. Biomed. Eng.*, vol. 14, pp. 240-255, 2021.

Brunet, J., Pierrat, B., Adrien, J., Maire, E., Badel, P. A combined experimental-numerical lamellar-scale approach of tensile rupture in arterial medial tissue using X-ray tomography. *J. Mech. Behav. Biomed. Mater.*, vol. 95, pp. 116-123, 2019.

CONFERENCE PRESENTATIONS

Investigation of notch propagation in an in-vitro dissection model using X-ray microtomography. Oral presentation delivered at the **45th Congress of the Société de Biomécanique**, Online, October, 2020

A numerical design of experiment approach to understand aortic dissection onset and propagation. Oral presentation delivered at the **44th Congress of the Société de Biomécanique**, Poitiers, France, October, 2019

Chairman of the session "Macro-scale biofluids", **44th Congress of the Société de Biomécanique**, 2019 at University of Poitiers, France

A new approach combining experiment and numerical simulation using cohesive interface to model tensile failure in arterial medial tissue at the meso-scale. Poster presentation delivered at the **8th World Congress of Biomechanics**, Dublin, Ireland, July, 2018.

Characterization and modelling of rupture in arterial medial tissue under tension from in situ experiments with X-ray tomography. Oral presentation delivered at the **15th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering**, Lisbon, Portugal, March, 2018

TEACHING EXPERIENCE

Teaching Assistant, École des Mines de Saint-Étienne *2018 - 2020*

Courses: Experimental mechanics, Finite element method

Supervisor of master students - Industrial and research projects

Tutor for students in difficulty, Saint-Exupéry middle school, Macon *2015 - 2016*

Courses: Mathematics and physics

ACADEMIC SERVICE

PhD student representative *2018 - 2020*

Board of the Doctoral School of Science, Engineering and Health of the University of Lyon

PhD student representative *2018 - 2020*

Board of SAINBIOSE laboratory (INSERM)

President of the Saint-Étienne Doctoral Students' Club *2018 - 2019*

REFERENCES

Baptiste Pierrat, PhD

Department of Biomechanics

École des Mines de Saint-Etienne, France

Phone: +33 4 77 49 97 38

Email: baptiste.pierrat@mines-stetienne.fr

Stéphane Avril, PhD

Department of Biomechanics

École des Mines de Saint-Etienne, France

Phone: +33 4 77 42 01 88

Email: stephane.avril@mines-stetienne.fr