



ESB-ITA2022

XI ANNUAL MEETING - MASSA 6-7 OCTOBER 2022



THE ANNUAL MEETING OF ESB-ITA,
INCLUDING A THEMATIC SYMPOSIUM
AND TWO OUTSTANDING INTERNATIONAL KEYNOTES



XI annual meeting
of the **ESB-ITA**

Massa, 6-7 October 2022

Centro Congressi della Provincia di Massa-Carrara
Via S. Leonardo, 492 - Massa

Day 1: Thursday 6 October 2022

Thematic Symposium "Biomechanics *in and for* clinics"

10:00 - 10:30 **Welcome and registration** (registration stay open all day)

10:30 - 10:45 **Opening**

10:45 - 11:30 **Invited Keynote Lecture** - Chair: A. Gizzi

Pag. I Stéphane Avril (Ecole des Mines de Saint-Etienne)
"Links between cell mechanobiology and tissue mechanics in Human Thoracic Aortic Aneurysms"

11:30 - 13:00 **Oral session** - Chairs: D. Bianchi, F. Danielli

Pag. 1 A. Ramella, F. Migliavacca, J.F. Rodriguez Matas, F. Heim, F. Dedola, T. Mandigers, S. Marconi, M. Conti, S. Allievi, D. Bisacco, M. Domanin, S. Trimarchi, G. Luraghi
A numerical framework to model the Thoracic Endovascular Aortic Repair procedure

Pag. 2 S. Montanari, C. Griffoni, G. Barbanti Brodano, L. Cristofolini
A retrospective analysis of the sagittal balance in the distal lumbar junctional pathology

Pag. 3 A. Mariotti, M.N. Antonuccio, B.M. Fanni, M. Morello, M.V. Salvetti, S. Celi
CFD simulations and uncertainty quantification to investigate aorta coarctations

Pag. 4 M. Lodi Rizzini, V. Mazzi, A. Candreva, C. Chiastra, B. De Bruyne, C. Collet, D. Gallo, U. Morbiducci
Blood flow rotational energy predicts coronary lesions culprit for future myocardial infarction

Pag. 5 A. Pompili, M. Conconi, N. Sancisi, A. Leardini, C. Belvedere
A synergy-based approach to track foot bones motion using different gait analysis protocols

Pag. 6 E. Gasparotti, E. Vignali, D. Haxhiademi, F. Bardi, M. Scolaro, P.A. Del Sarto, S. Celi
Bench to bedside: in-silico and in-vitro evaluation of shocked patients under the ECMO support

13:00 - 14:00 **Lunch**

14:00 - 15:30 **Oral session** - Chairs: K. Calò, A. Gambardella

Pag. 7 S. Bridio, G. Luraghi, F. Migliavacca, D. González, P. Díez, J.F. Rodriguez Matas, A. García-González
A classification model for predictions of thrombectomy outcomes

- Pag. 8 A. Formaggio, M. De Luca, G. Putame, S. Borrelli, A.L. Audenino, M. Terzini
Experimental and computational simulation of a non-invasive closed-loop breathing circuit
- Pag. 9 M.A. Scarpolini, M. Mazzoli, S. Garzia, A. Clemente, A. Monteleone, K. Capellini, S. Celi
Deploying digital twins of the cardiovascular system in clinics: a deep learning-based automatized framework
- Pag. 10 G. Cavazzoni, E. Dall'Ara, L. Cristofolini, M. Palanca
Failure location and failure mode in human vertebrae with metastases
- Pag. 11 V. Ceserani, G.M. Formato, M. Lo Rito, G. Zuniga, M. Agnifili, A. Rosato, F. Secchi, M. Conti
0D hemodynamic model to assess coronary flow at different effort conditions in AAOCA
- Pag. 12 F. Danielli, F. Berti, B.M. Fanni, E. Gasparotti, G. Pennati, L. Petrini, S. Celi
A comprehensive study to develop a numerical model of the left atrial appendage occlusion

15:30 - 16:00 Coffee break

16:00 - 17:00 Oral session - Chairs: B. Belgio, G.M. Di Gravina

- Pag. 13 E. Redaelli, J. Grasa, B. Calvo, J.F. Rodriguez Matas, G. Luraghi
Patient-specific Fluid Structure Interaction simulations of Non Contact Tonometry
- Pag. 14 M.N. Antonuccio, E. Gasparotti, L. Giuggioli, E. Vignali, S. Avril, A. This, L. Rouet, S. Celi
An experimental/computational approach for fluid dynamic characterization of AAA
- Pag. 15 L. Ciriello, F. Berti, L. La Barbera, T. Villa, G. Pennati
How does the interconnection mechanism affect the static response of spinal fixators? A validated FE study
- Pag. 16 S. Zambon, M. Arminio, U. Morbiducci, C. Chiastra, D. Gallo
Impact of wall distensibility on prominent features of carotid bifurcation hemodynamics

17:00 - 17:45 Invited Keynote Lecture - Chair: D. Massai

- Pag. II Silvia Schievano (University College of London)
"The science behind Wonder"

19:00 - 23:00 Social dinner

Day 2: Friday 7 October 2022

General meeting - Biomechanics in Italy

08:30 - 09:00 **Registration** (registration stay open all day)

09:00 - 10:15 **Oral session** - Chairs: G. Loi, E. Vignali

- Pag. 17 L. Geronzi, M. Sensale, A. Martinez, M. Rochette, P.P. Valentini, M.E. Biancolini
A method to calibrate the mechanical boundary conditions of a high-fidelity thoracic aorta model
- Pag. 18 K. Calò, K. Capellini, G. De Nisco, D. Gallo, S. Celi, U. Morbiducci
Investigating the impact of wall distensibility on aortic flow using a network-based approach
- Pag. 19 F. Bardi, M.N. Antonuccio, E. Gasparotti, M. Aguirre, S. Avril, E. Vignali, S. Celi
LED illuminated PIV velocity field characterization in a patient specific aortic aneurysm phantom
- Pag. 20 L. Antonini, G. Poletti, G.S. Karanasiou, D.I. Fotiadis, L. Petrini, G. Pennati
Deployment Simulations of Coronary Stents: Digital Analysis of "What if" Scenarios
- Pag. 21 E. Torta, G.C.A. Caridi, C. Chiastra, U. Morbiducci, D. Gallo
Smartphone-based in vitro approach for PIV and PTV analyses in coronary arteries

10:15 - 10:45 **Coffee break**

10:45 - 12:00 **Oral session** - Chairs: L. Antonini, M. Terzini

- Pag. 22 G. Loi, F. Scocozza, F.L. Ronzoni, G. Cusella, F. Auricchio, G. Ceccarelli, M. Conti
Bioreactor design to burst in-vitro skeletal muscle differentiation of 3D bioprinted constructs
- Pag. 23 P. Gaziano, G. Vairo, M. Marino
Computational modelling of tissue growth in bioprinted scaffolds
- Pag. 24 B. Masante, G. Putame, A.T. Lugas, M. Tosini, I. Roato, F. Mussano, M. Terzini, A. Audenino, D. Massai
A customized flexible substrate for investigating cell response to controlled uniaxial stretch

Pag. 25 N. Guazzelli, L. Cacopardo, A. Ieva, A. Corti, A. Ahluwalia
Integrated Strategies for the Design of Core-Shell Structures as Advanced Barrier Models

Pag. 26 R. Reale, A. De Ninno, P. Bisegna, F. Caselli
Impedance-based microfluidic device for erythrocyte deformability analysis

12:00 - 12:45 **Oral session** - Chairs: L. Cacopardo, C.G. Fontanella

Pag. 27 B. Belgio, F. Berti, F. Potere, S. Mantero, F. Boschetti
A Novel Method for Characterizing Retinal Biomechanics

Pag. 28 A. Berardo, I. Toniolo, P. Pirini, E. L. Carniel
Patient-Specific Stomach Models to Mimic Endoscopic Sleeve Gastroplasty

Pag. 29 F. De Gaetano, M. Pagnanelli, R. Ponce, M. Panico, G. Capretti, G. Nappo, A. Zerbi, M.L. Costantino
Mechanical characterization of pancreatic suture threads and pancreatic tissue

12:45 - 13:45 Lunch

13:45 - 14:45 Posters (same location as lunch)

14:45 - 15:30 Master thesis Award - Chairs: M. Conti, M. Marino

Pag. 53 A. Brambilla
Fracture mechanics approach for fatigue life prediction of NiTi stent-like components considering experimental measurements and numerical simulations

Pag. 54 B. Masante
Perfusion and electromagnetic stimulation bioreactor for bone tissue engineering: optimization, characterization and validation tests

Pag. 55 M. Mazzoli
Statistical Shape Analysis of the Thoracic Aorta with supra-aortic vessels: development of a Non Rigid Registration Algorithm and correlation with CFD simulation results

15:30 - 16:00 Coffee break

16:00 - 16:45 **Oral session** - Chairs: G. Marchiori , M. Lodi Rizzini

Pag. 30 I. Rota, L. Ciriello, G. Negrini, M. Bonacina, T. Villa, D. Gastaldi
Experimental and numerical mechanical assessment of patient-specific subperiosteal implants

Pag. 31 V. Betti, M.L. Ruspi, G. Galteri, E.F.A. Ognisanto, L. Cristofolini
Statistical shape modelling of the femoral canal for the design of osseointegrated prostheses for amputees

Pag. 32 A. Gambardella, M. Bontempi, F. Salamanna, M. Maglio, R. Capozza, A. Visani, M. Fini
3D-Mapping of the mechanical properties of the bone tissue via atomic force microscopy

16:45 - 17:45 **General Assembly and Awards**



Posters

On exhibit both days; poster session on Friday 7 October (13:45-14:45)

Poster # - Page

- 1 - Pag. 33 N. Curcio, A. Rosato, D. Mazzaccaro, G. Matrone, M. Conti
Patient-specific Biomechanical Assessment of Carotid Plaque Vulnerability
- 2 - Pag. 34 D. Carbonaro, S. Zambon, A. Corti, D. Gallo, U. Morbiducci, A. Audenino, C. Chiastra
Self-expandable transcatheter aortic valve mechanical performance: Impact of Nickel-Titanium super-elastic material properties
- 3 - Pag. 35 D. Gunashekar, D. Gastaldi, G. Pennati, P. Vena
Polymers in Drug Coated Balloon Angioplasty and its Coating Morphology
- 4 - Pag. 36 S. Garzia, M.A. Scarpolini, K. Capellini, V. Positano, A. Monteleone, F. Cademartiri, S. Celi
AI-based pipeline for features extraction and hemodynamic analysis from 3D PC-MRI
- 5 - Pag. 37 A. Corti, A. McQueen, F. Migliavacca, C. Chiastra, S. McGinty
Investigating the effect of drug release on in-stent restenosis: a multiscale model
- 6 - Pag. 38 S. Todros, M. Magnussen, D. Scaglioni, A. Urciuolo, N. Elvassore, P.G. Pavan
Computational modelling of cardiomyocytes contraction for regenerative medicine
- 7 - Pag. 39 G.M. Di Gravina, R. Pinos, C. Scielzo, M. Conti
Computational modelling of a milli-scale perfusion bioreactor for vascular applications
- 8 - Pag. 40 E. Stratakos, P. Ravipati, L. Vincenzi, E. Pedrinazzi, A.F. Pérez, L. Petrini, S. Mantero, G. Pennati
Novel experimental set up to determine the optimal drug-coated balloon angioplasty parameters
- 9 - Pag. 41 B. Bisighini, M. Aguirre, B. Pierrat, D. Perrin, S. Avril
Towards a real-time simulator of flow diverters deployment based on model order reduction
- 10 - Pag. 42 V. Betti, L. Cristofolini, H. Jónsson, M.K. Gíslason, P. Gargiulo
An in silico method to evaluate bone remodelling after total hip arthroplasty: a six years longitudinal study
- 11 - Pag. 43 S. Borrelli, F. Argentieri, G. Putame, A.L. Audenino, M. Terzini
Musculoskeletal model evaluates the effect of spinal fixation length on vertebral joints
- 12 - Pag. 44 G. Marchiori, M. Maglio, M. Berni, A. Grassi, S. Zaffagnini, C. Falsina, N.F. Lopomo, A. Visani, M. Baleani, M. Fini
Development of a contrast-enhanced microtomography protocol for meniscal tissue
- 13 - Pag. 45 D. Bianchi, C. Falcinelli, L. Molinari, A. Di Martino, A. Gizzi
Fracture risk assessment in healthy and pathological human vertebra: a computational study
- 14 - Pag. 46 B. Masante, C. Massini, S. Gabetti, F. Mochi, C. Del Gaudio, A. Schiavi, A. Audenino, D. Massai
Permeability test bench for characterizing tissue engineering scaffolds: design and validation
- 15 - Pag. 47 P. Signorello, L. Cacopardo, N. Guazzelli, A. Ahluwalia
Replicating the alveolar interface in-vitro using spherical, transparent and stretchable membranes
- 16 - Pag. 48 B. Fantaci, M.Á. Ariza-Gracia, I. Cabeza-Gil, J. Grasa Begoña Calvo
Do corneal mechanical properties play a role in Photorefractive Keratectomy outcome?
- 17 - Pag. 49 S. Pettenuzzo, F. Toschetti, A. Berardo, E. Belluzzi, A. Pozzuoli, P. Ruggieri, C.G. Fontanella
Biomechanical characterization of plantar skin
- 18 - Pag. 50 M.V. Mascolini, M. Todesco, R. Boscolo Berto, V. Macchi, A. Porzionato, R. De Caro, C.G. Fontanella, E.L. Carniel, A. Berardo
Mechanical characterization of soft tissues from the lower urinary tract in male: a case study
- 19 - Pag. 51 L. Bonaldi, A. Berardo, C. Stecco, C.G. Fontanella
Biomechanical characterization of human superficial fascia from abdomen: A case study
- 20 - Pag. 52 M. Pelosin, S. Todros, S. Barbon, E. Stocco, V. Vindigni, A. Porzionato, P. Pavan
Analysis of the mechanical behaviour of native and decellularized human diaphragmic tissue

Local organizers

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