

Joint Biomedical Engineering Seminar Series

MU ▪ MCW ▪ UWM

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Noon-1pm

Olin Engineering 202

Marquette University

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Abstract

Computational Analysis of Stent-Graft Designs for Endovascular Repair of Complex-Abdominal Aortic Aneurysms

Abdominal Aortic Aneurysm (AAA) is the permanent dilation of the terminal aorta and if left untreated, it can be fatal. While most of the AAAs are confined below the level of renal arteries, it was recently estimated that approximately 40% of AAA patients have the aneurysm sac extending to and above the level of renal arteries. Such AAAs are clinically known as Complex-AAA and due to the involvement of the renal arteries, patients with Complex-AAA cannot be treated using traditional endovascular stent-grafts. In order to make endovascular repair of Complex-AAAs feasible, specialized stent-graft designs, namely Fenestrated (FSG) and Retrograde Stent-Grafts (RSG) were proposed. Both FSG and RSG have unique design features which have the potential to maintain sufficient post-operative blood perfusion to the kidneys. Although the aforementioned stent-grafts show promising short- to mid-term clinical results, the question of their long-term durability remains unanswered.

The aim of this presentation is to elucidate hemodynamic performance of FSG and RSG using Computational Fluid Dynamics (CFD) in order to predict their long-term performance. Key hemodynamic indices which will be presented during this talk include renal flow rate waveforms under varying physiologic conditions, risk of post-operative thrombus formation and displacement forces acting on these devices.

These numerical results can help aid clinicians during the surgical decision making process as well as evaluating the likelihood of post-operative device failure. This presentation will also highlight the interdisciplinary research that has arisen between engineering and medicine and why CFD simulations are becoming increasingly more popular amongst clinicians and stent-graft manufacturers alike.

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Olin Engineering Center is located at 1515 W. Wisconsin Ave, Milwaukee, WI. Parking is available in Structure 1 on 16th Street between Wisconsin Ave. and Wells Ave. Refreshments will be served.