Morphological and Functional Analysis of Endovascular Repair with Embedded Modular Branched Stent Graft for Aortic Arch Aneurysm

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Disclosure

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I have the following potential conflicts of interest to report:

☐ Consulting
☐ Employment in industry
☐ Stockholder of a healthcare company
☐ Owner of a healthcare company
☐ Other(s)

☐ I do not have any potential conflict of interest
• **Background**

**Treatment of Aortic Arch Aneurysm**
- Surgery is highly invasive
- Interventional treatment
- Ensure blood supply to branches

**Embedded Modular Branched Stent Graft (EMBSG)**
- Embedded ascending aortic stent graft with a branch port
- Aortic arch stent graft and branch stent graft

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**Aim**

Aim to evaluate the therapeutic effect of EMBSG to treat aortic arch aneurysm based on morphological analysis and hemodynamic simulation.
3 patients with aortic arch aneurysm and treated with EMBSG were included.
Segmentation and patient-specific model reconstruction were conducted based on CTA images.
Centerline of each 3D reconstructed model was extracted and key positions were decided.

Morphological parameters including tortuosity, percentage of area reduction and curvature change were computed.
Hemodynamic Simulation

Image data

Reconstruction

Discretization

Analysis
Hemodynamic Simulation

- Low and vertical flow in aneurysm can be seen before treatment and after operation, velocity increased significantly.
- Pressure patterns were different in three patients, sharp decrease in patient I, dramatical increase in the ascending aorta in patient II, slight change in patient III.
Hemodynamic Simulation

- Pressure drop from the ascending aorta plane to descending aorta plane.
- Patient I and Patient II have the significant change of pressure drop after EMBSG implantation.
- Patient I and Patient II also have significant area reduction.
Hemodynamic Simulation

- Time-averaged wall shear stress (TAWSS), oscillatory shear index (OSI) were computed.
- Elevation of TAWSS after treatment appeared in patient I and Patient II.
Conclusion and Discussion

- EMBSG could induce the curvature change of aortic arch.
- Significant area reduction of aortic arch after treatment indicates promising results for aortic arch aneurysm treatment.
- EMBSG might provide a new option for aortic arch aneurysm treatment.
- Hemodynamic simulation might be an effective tool to guide stent-graft design.
Thank you for listening
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