Cardiac- and Respiratory-Induced Motion of Renal Arteries and Stents in Snorkel Endovascular Aneurysm Sealing

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Disclosure

Speaker name: Christopher Cheng

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I have the following potential conflicts of interest to report:

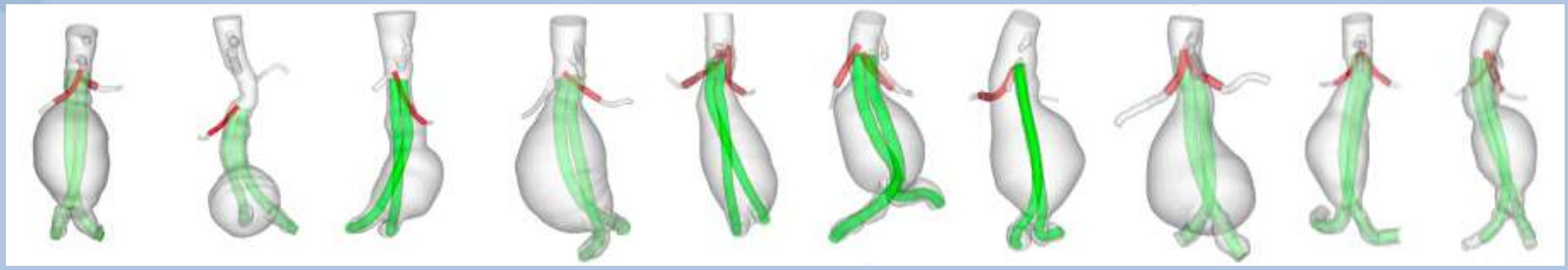
- ■ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Owner of a healthcare company
- ☐ Other(s)

☐ I do not have any potential conflict of interest

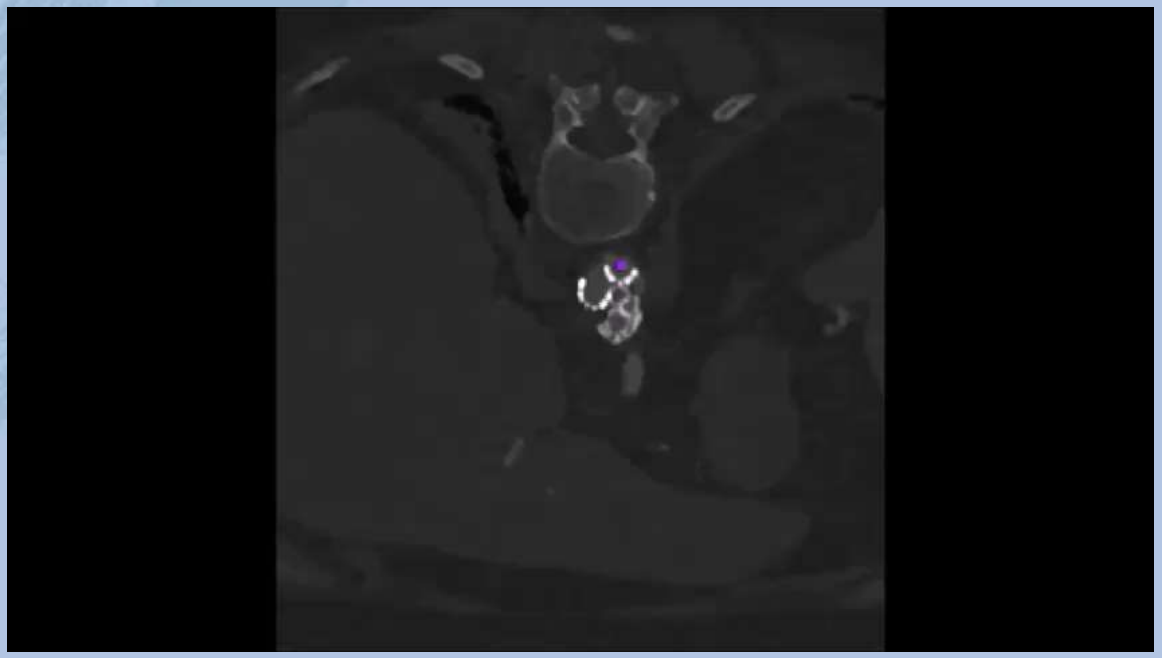
Objective and Imaging

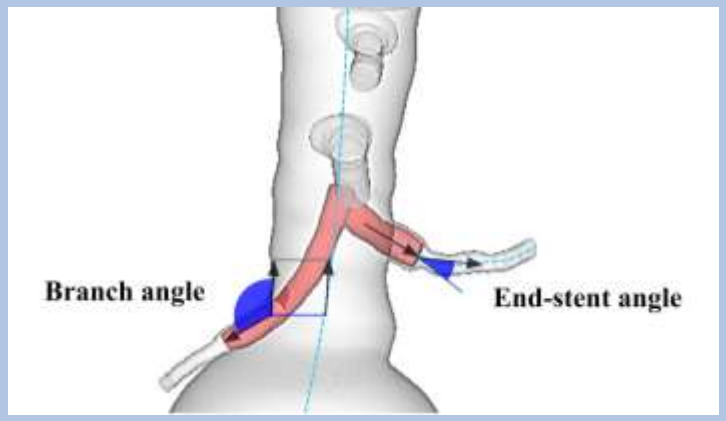
Quantify cardiac- and respiratory-induced renal artery and stent deformation in AAA patients treated with Sn-EVAS

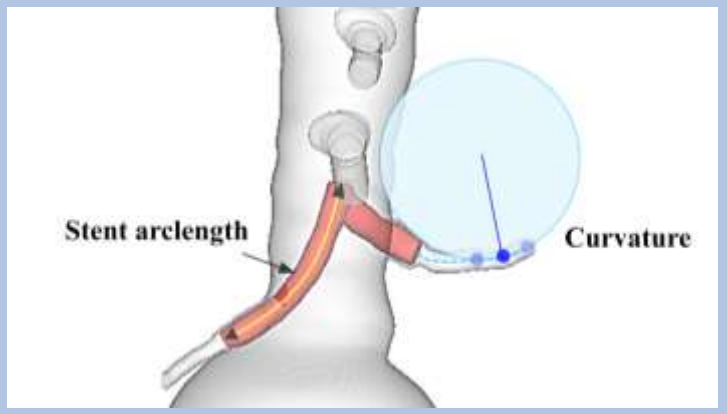
10 patients underwent cardiac-resolved CTA during inspiration and expiration breath-holds



Modeling and Quantification



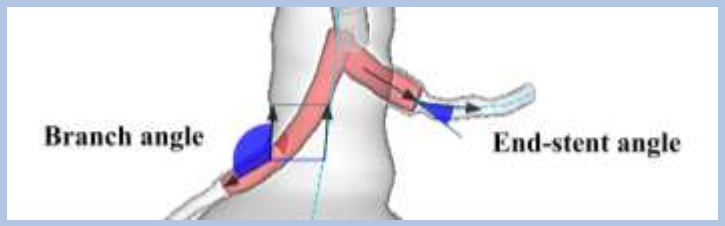


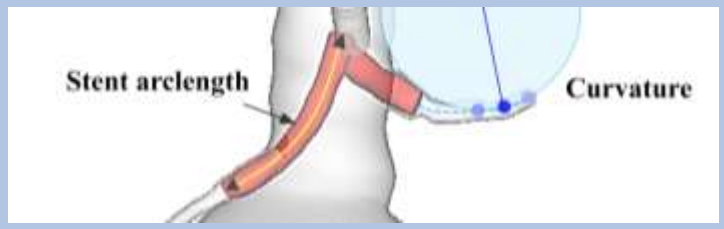


Results – Renal Snorkel Stent

(Values in Mean±SD)	Cardiac Deformation (Diastole to Systole)		Respiratory Deformation (Inspiration to Expiration)	
	Right	Left	Right	Left
ΔArclength (%)	0.1±0.8	-0.4±1.2	0.3±1.8	-0.2±1.4
ΔAvg C (cm^{-1})	0.02±0.03	0.01±0.03	0.01±0.04	0.00±0.02
ΔPeak C (cm^{-1})	0.04±0.07	0.02±0.07	0.03±0.14	0.02±0.09
|Max ΔC| (cm^{-1})	**0.13±0.09**	**0.15±0.11**	**0.20±0.10**	**0.18±0.09**

- Significant cardiac-induced bending of the snorkel stent
- Significant respiratory-induced bending of the snorkel stent
- No significant difference between cardiac vs. respiratory deformation

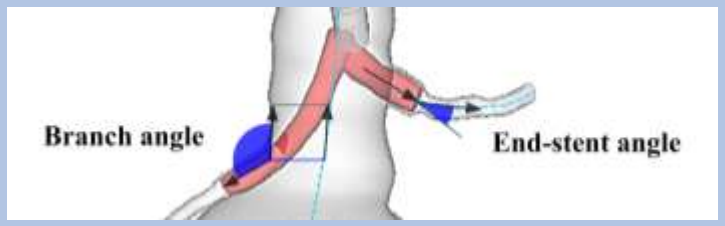


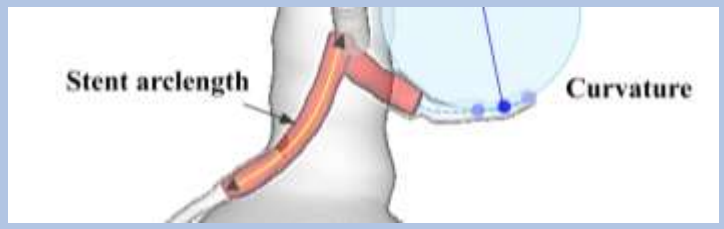


Results – Renal Artery

(Values in Mean±SD)	Cardiac Deformation (Diastole to Systole)		Respiratory Deformation (Inspiration to Expiration)	
	Right	Left	Right	Left
ΔBranch Angle (°)	0±1	0±1	1±4	-3±4
ΔEnd-Stent Angle (°)	-1±2	0±2	3±5	**10±7**
ΔAvg C (cm^{-1})	-0.02±0.02	0.03±0.02	-0.01±0.11	0.06±0.10
|Max ΔC| (cm^{-1})	**0.21±0.18**	**0.28±0.17**	**0.42±0.32**	**0.57±0.25**

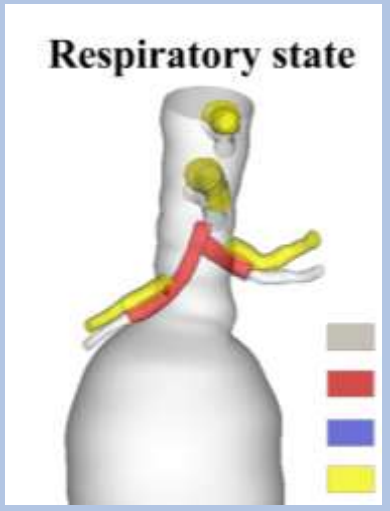
- End-stent angle change greater for respiration vs. cardiac
- Maximum curvature change greater for respiration vs. cardiac
- End-stent angle change greater for LRA vs. RRA for respiratory
- Larger variation in respiratory-induced deformations vs. cardiac





Conclusions

- Balloon-expanded snorkel renal stents used for Sn-EVAS undergo similar magnitude of bending deformations due to cardiac pulsatility and respiration
- The renal artery itself bends significantly more at the distal end of the stent with respiration as compared to cardiac by a factor of 2x.
- The left renal artery experiences greater bending while the right renal is relatively stabilized by the IVC.
- Renal arteries exhibit larger population variance for respiratory vs. cardiac deformations
- Cardiac and respiratory influences may challenge the mechanical durability of snorkel stents of Sn-EVAS similarly, however, respiration may be the primary culprit for tissue irritation, potentially increasing risk for end-stent thrombosis, especially in the left renal artery.



Thank You

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