

Present State of the Multilayer Flow Modulator

MEET

June 8, 2014

**Edward B. Diethrich, MD
Phoenix, Arizona**

ARIZONA HEART FOUNDATION



Conflicts Disclaimer

Unpaid Consult-
Cardiatis

ARIZONA HEART FOUNDATION



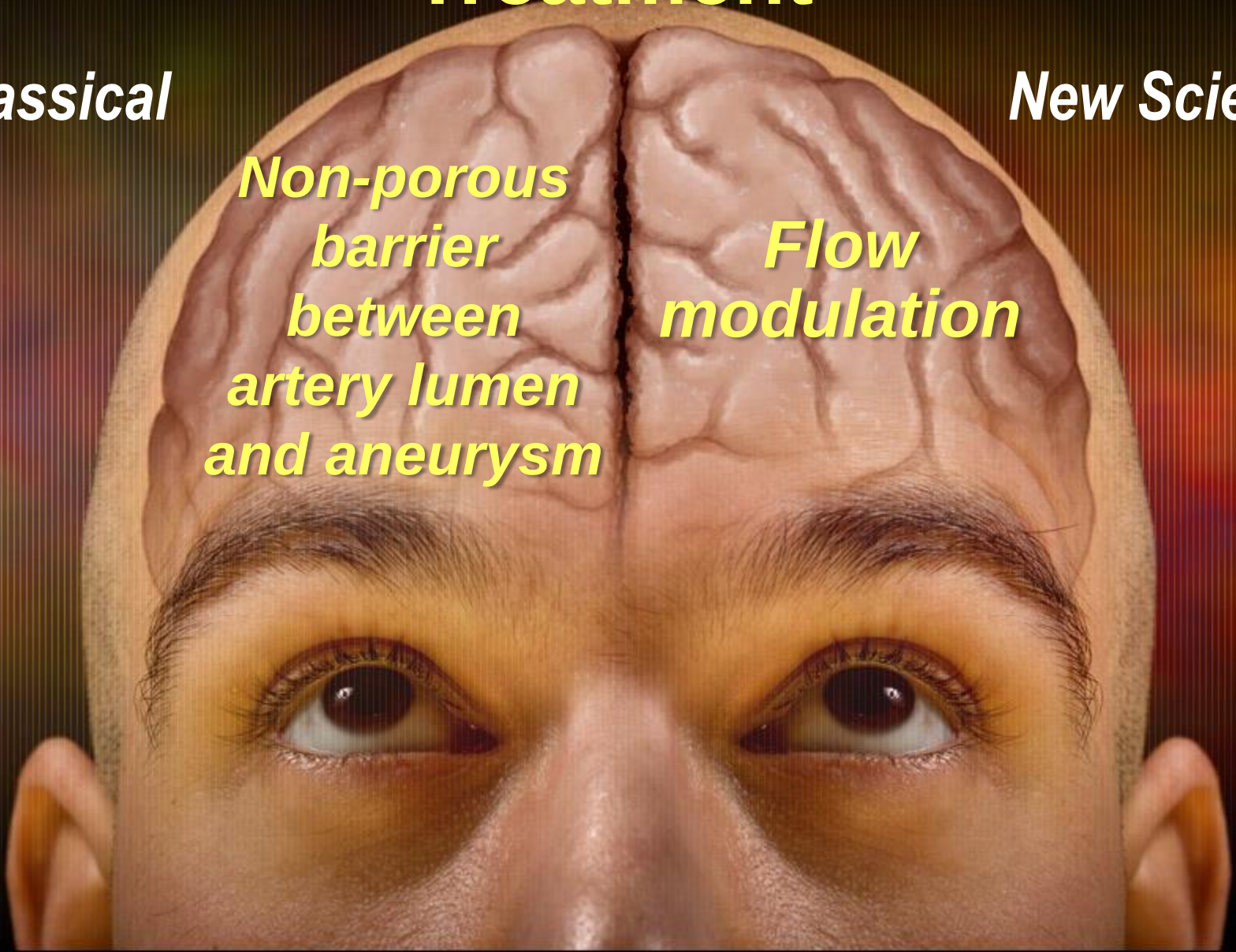
Mindset on Endovascular Aneurysm Treatment

Classical

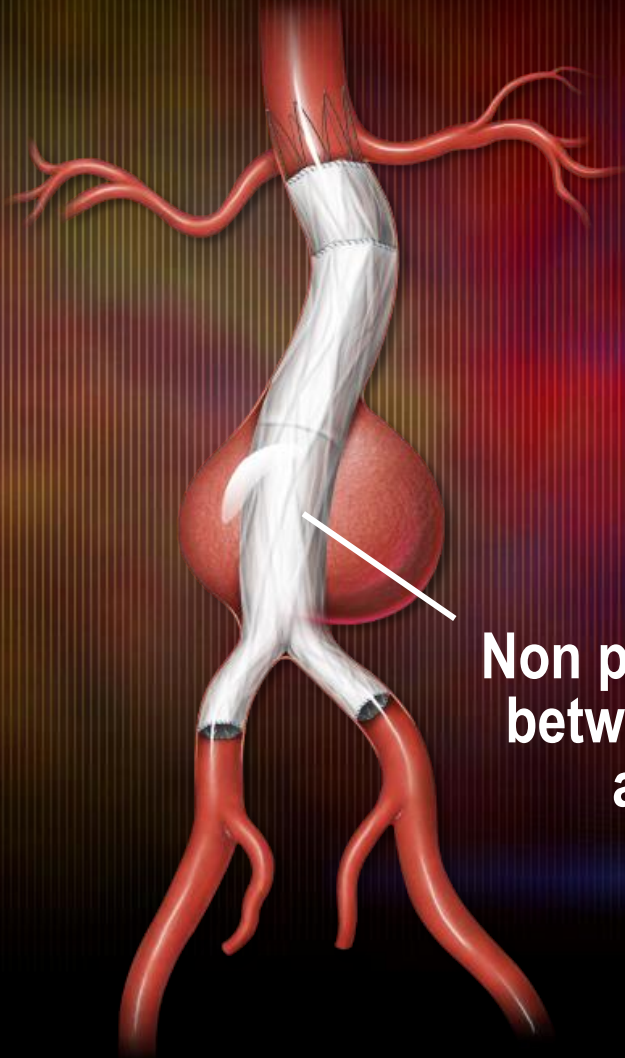
New Science

*Non-porous
barrier
between
artery lumen
and aneurysm*

*Flow
modulation*



**Concept may not be well understood
by most physicians who believe only
in the “Barrier Concept”.**

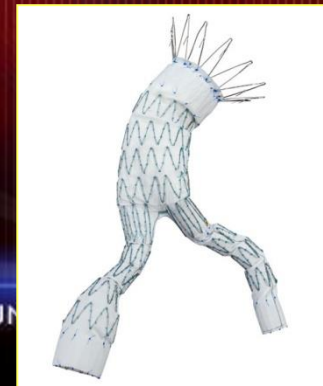
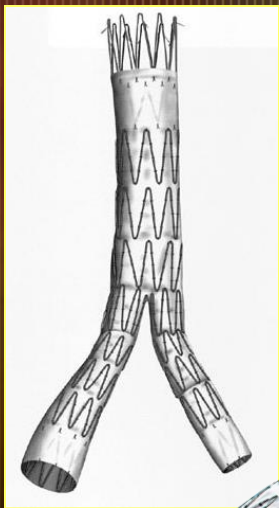


**Non porous material
between aorta and
aneurysm**

ARIZONA HEART FOUNDATION



If we insist on accepting the **Structural Barrier Concept** with its numerous deficiencies like occlusion of vital side branches to visceral and spinal cord blood supply...



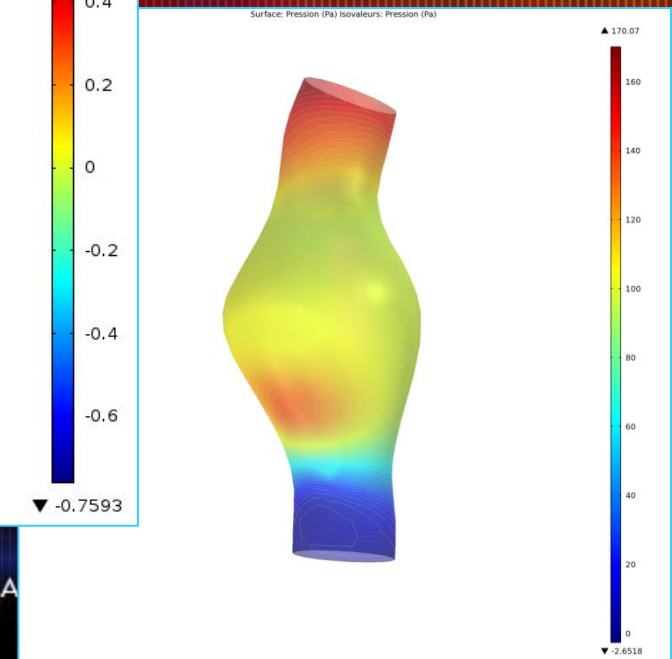
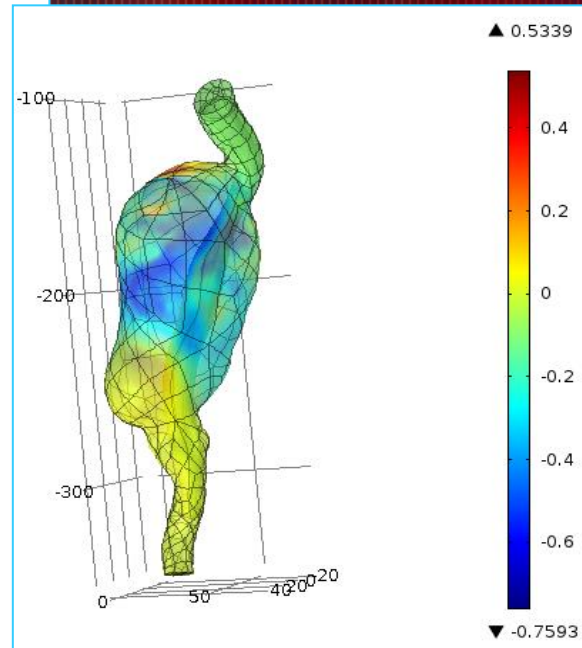
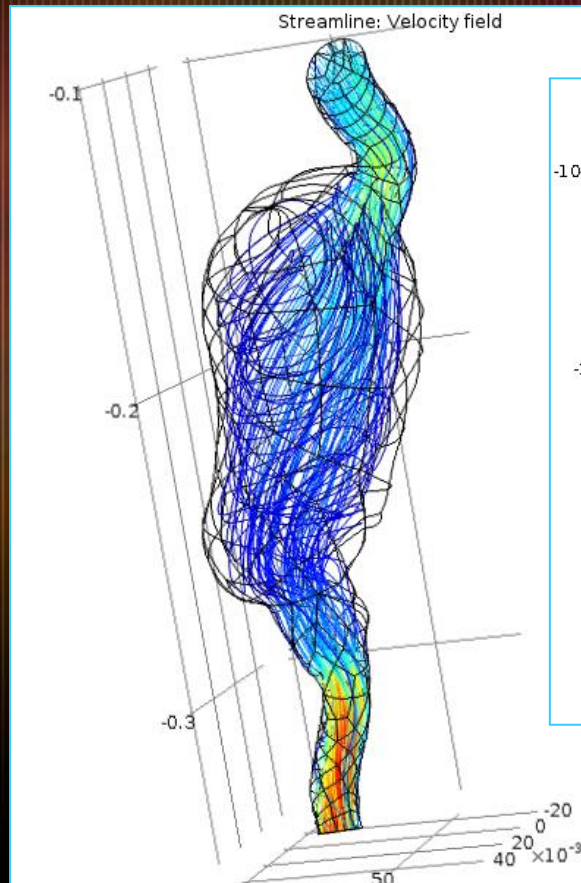
We are no better than this.



ARIZONA HEART FOUNDATION



The science of flow dynamics and computational finite analysis has given us incredible potential to solve complex arterial pathologies

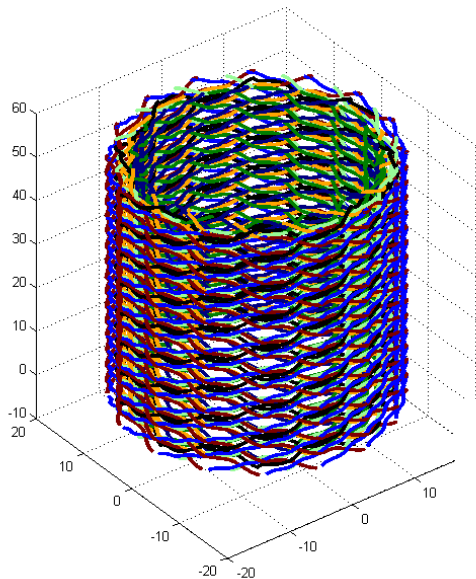
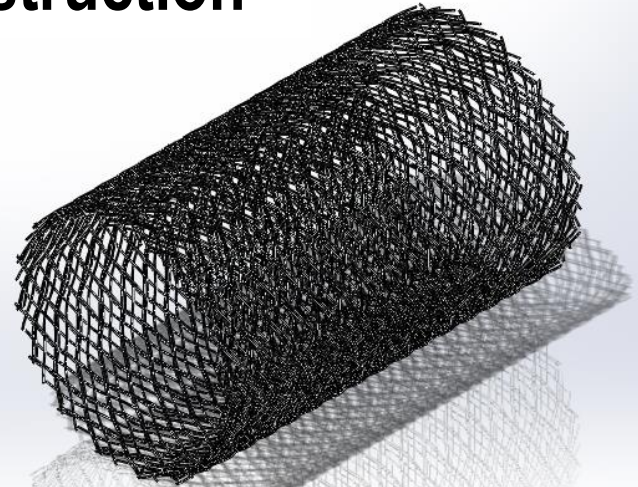


It is Not What it Sketched Was

Multilayer-3D



**Virtual
Reconstruction**



**Analytical
Reconstruction**

HEART FOUNDATION



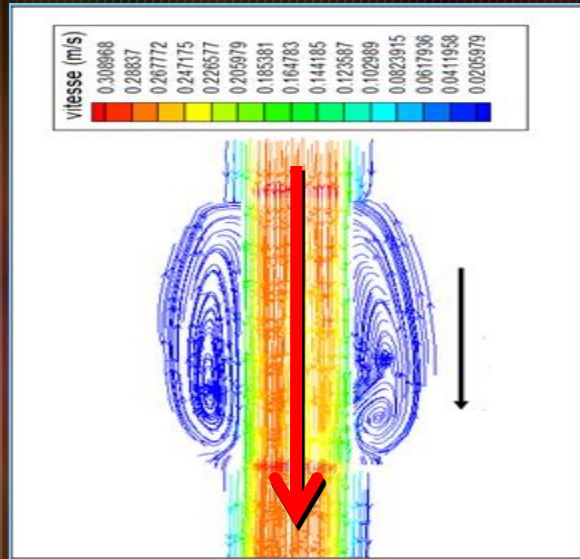
So What Is the Science?

ARIZONA HEART FOUNDATION

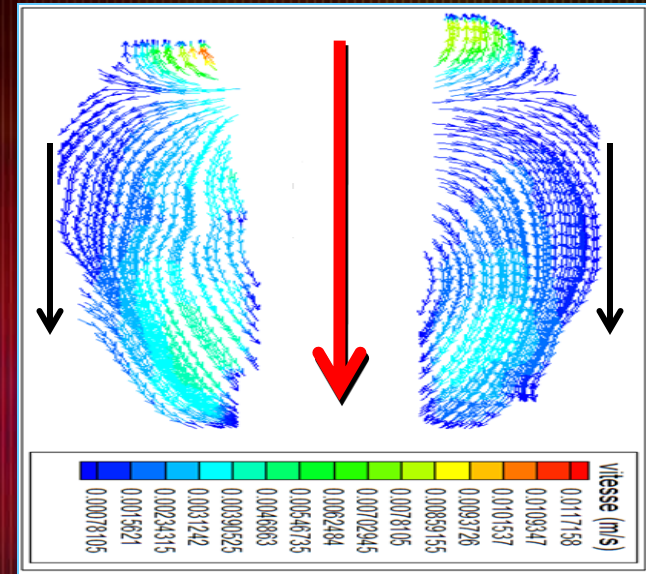


First Basic MFM Principle:

Reduction of Stress by Modifying Damaging Vortex



W/O stent

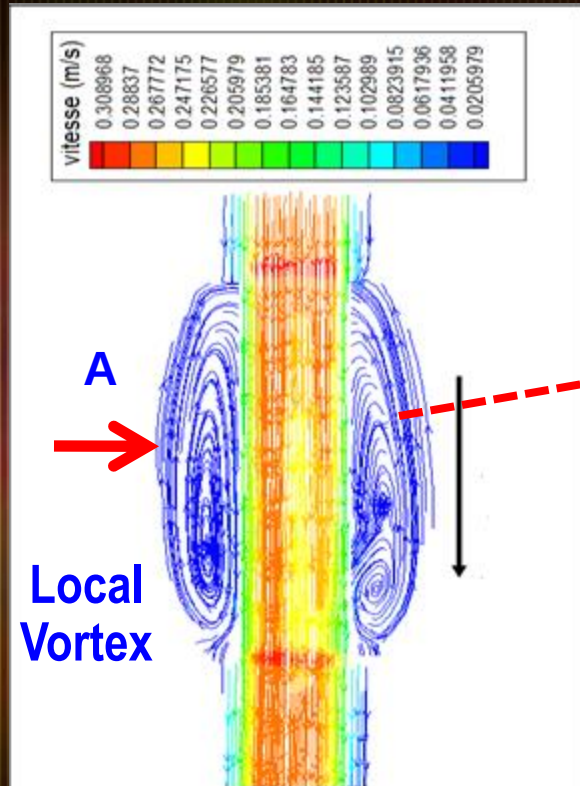


Multilayer flow modulator creates lamination of the flow vortex

It eliminates the damaging flow vortex pressure and redirects its flow in the same direction as the systemic pressure.



Permanently Subjected to the Pressure of the Local Vortex

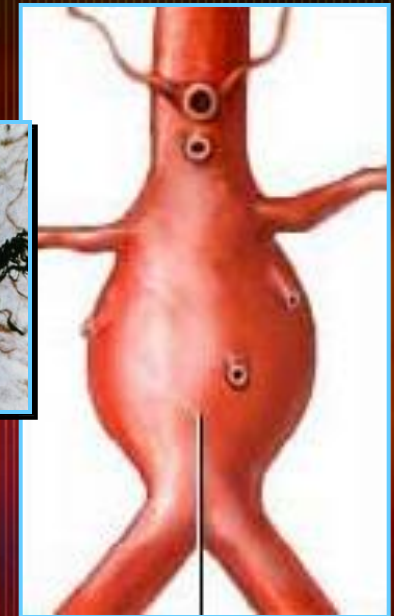


**Fusiform
Aneurysm**

Weakened tissue



The vortex produces
wall damage exerting
only 0.4 mmHg or 50
Pascal



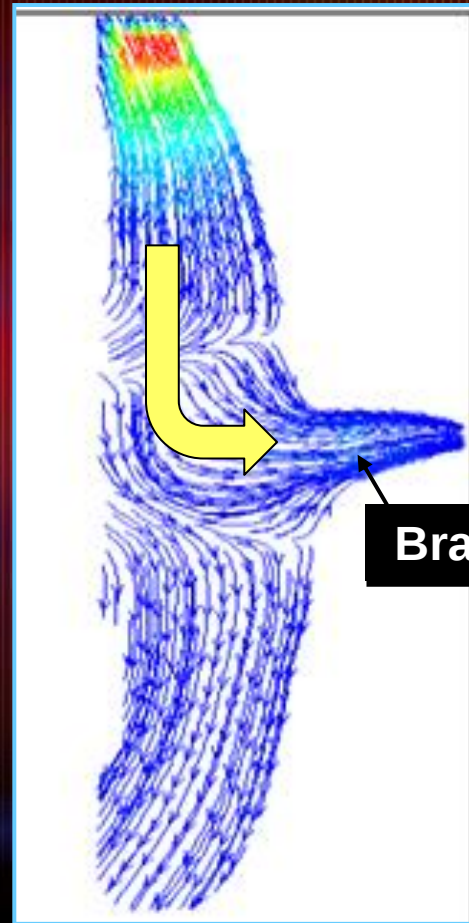
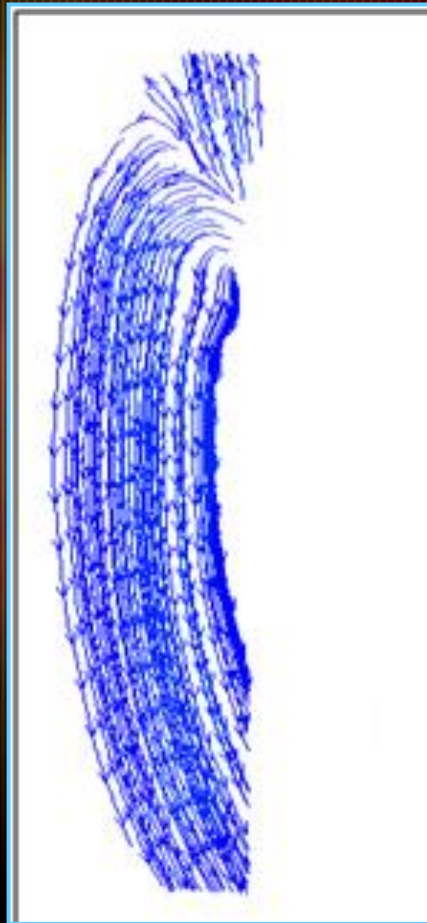
**Abdominal
Aortic
Aneurysm**



Second Basic MFM Principle: Lamination of Flow

The Multilayer Flow Modulator Does Not Allow the Vortex to be Formed.

Flow
Direction



Laminates
flow into
branch
vessels

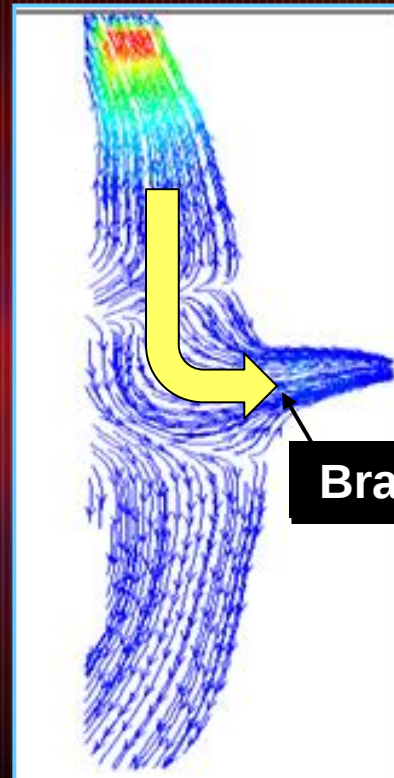
Branch

ATION



Second Basic MFM Principle: Lamination of Flow

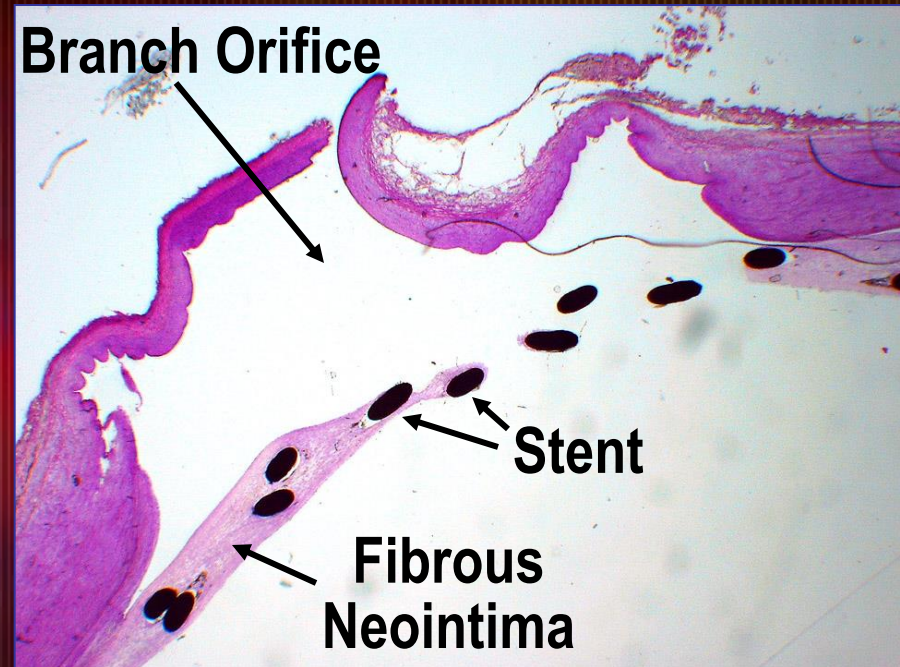
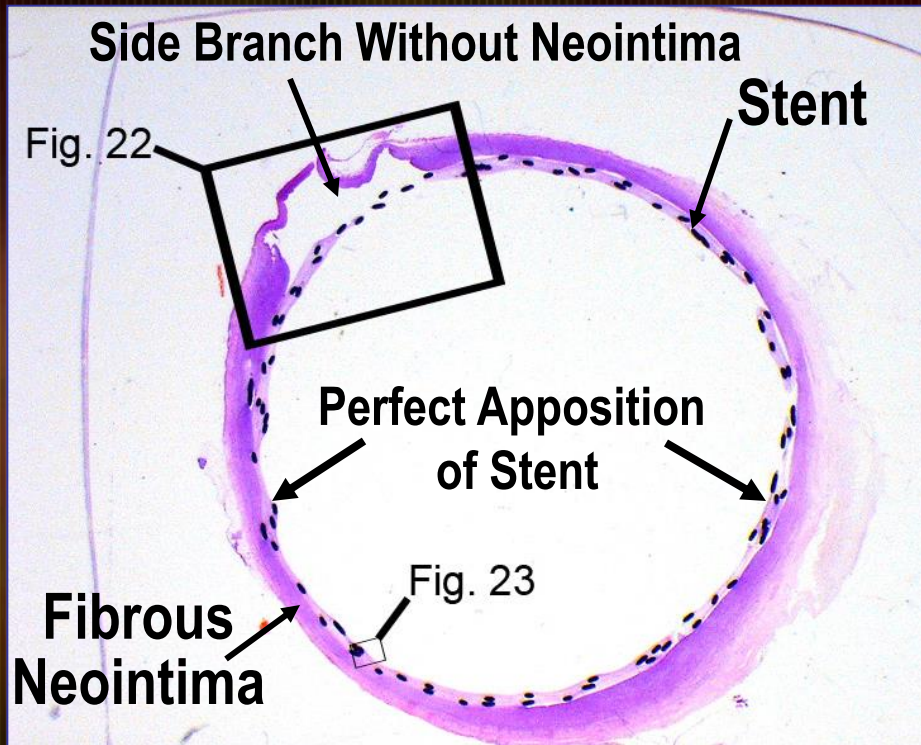
Flow is Directed into Branched Vessels



Laminates flow
into branch
vessels

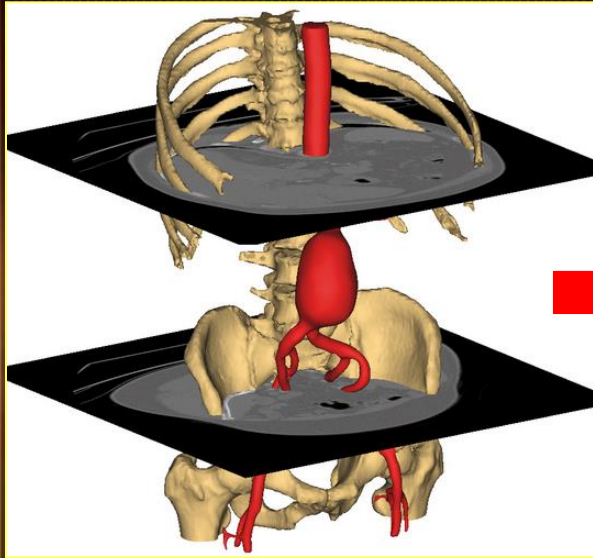


Histology



How is the Data Obtained?

CT Scan



Clinical data (DICOM)

Mimics (3D)



Reconstruction 3D
geometric mesh

Comsol (FEA)



Fluid & mechanics
analysis

ARIZONA HEART FOUNDATION



Clinical Proof



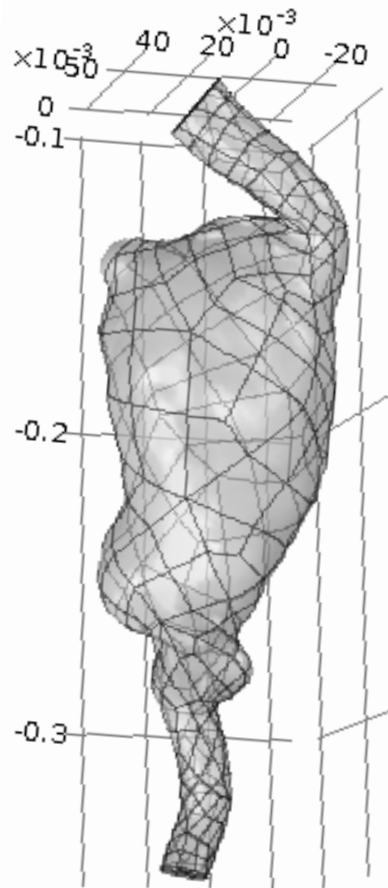
Dr. Portocarrero
Nancy, France

ARIZONA HEART FOUNDATION

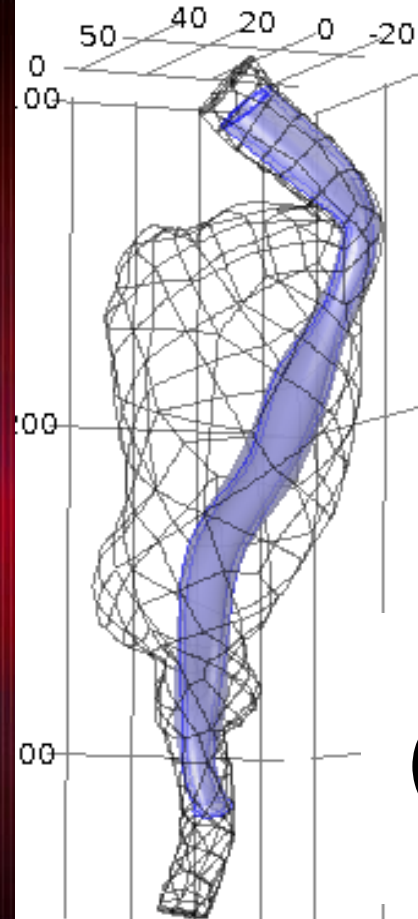


Geometry Reconstruction

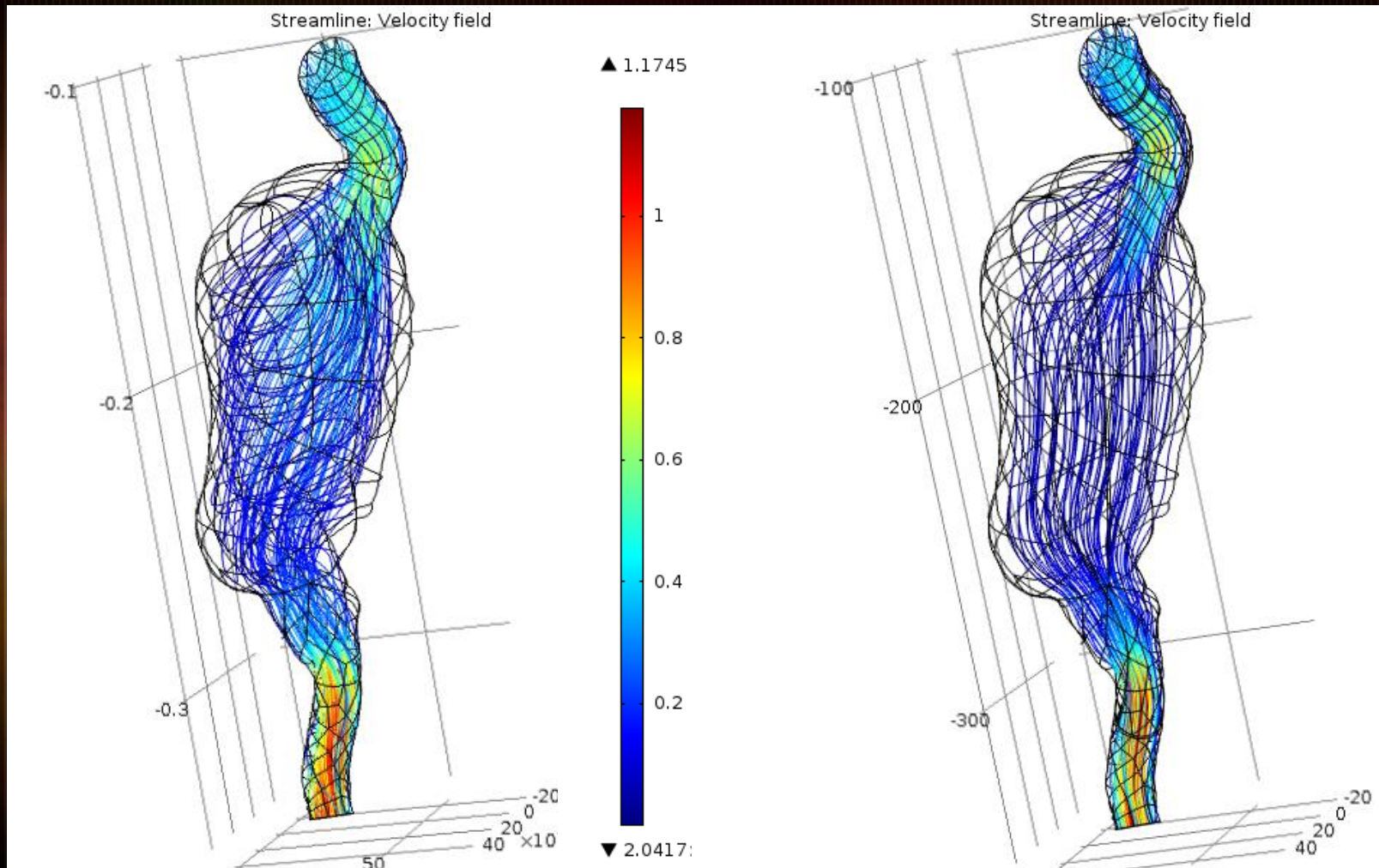
Without
MFM



With MFM
(equivalent
element)



Velocity Field Streamline



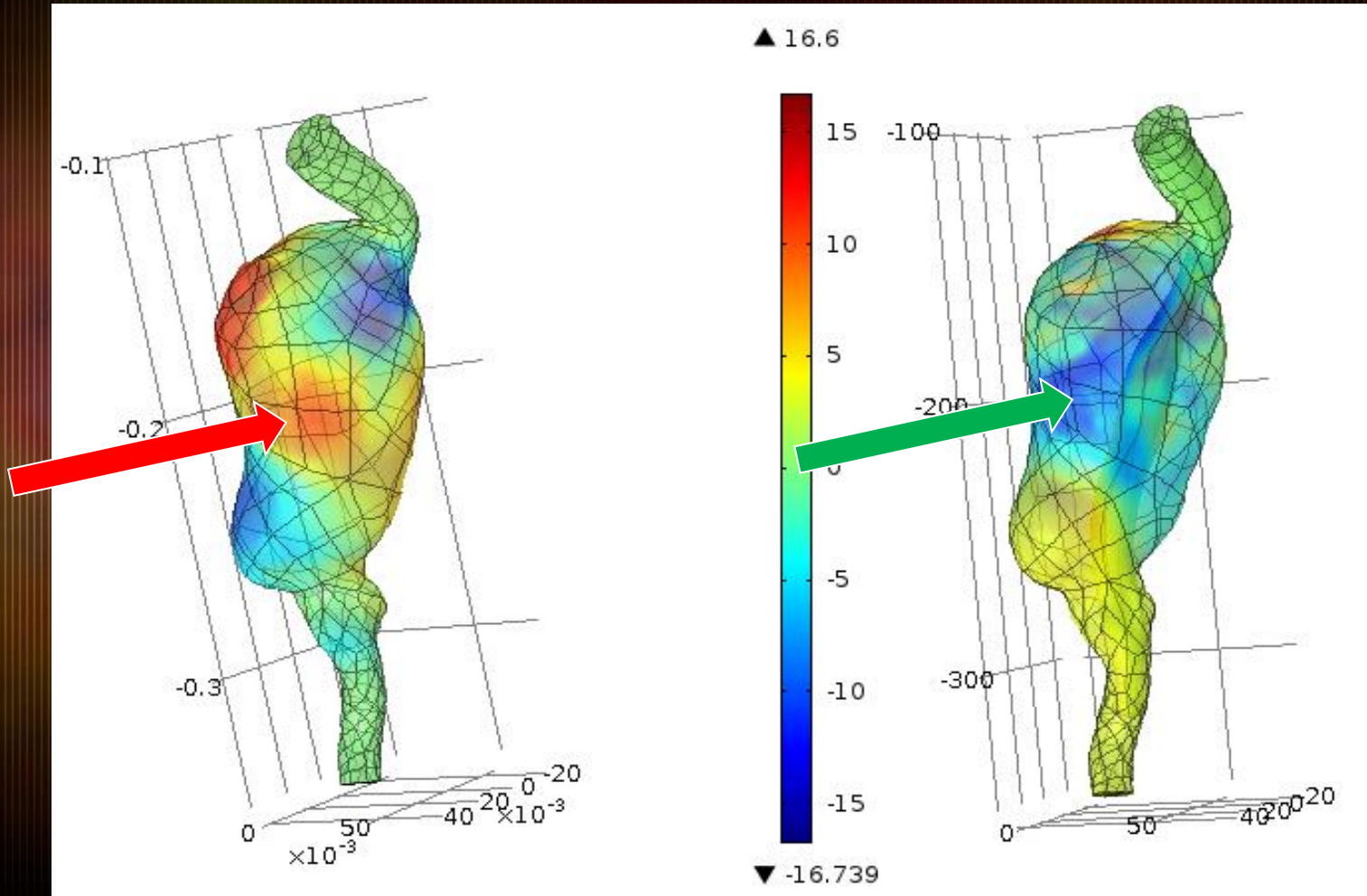
Without MFM

With MFM

Pressure

High Stress Value

Stress Value is Decreasing
After MFM Stenting

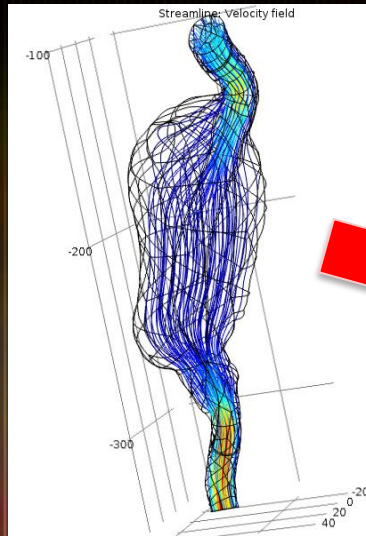


Without MFM

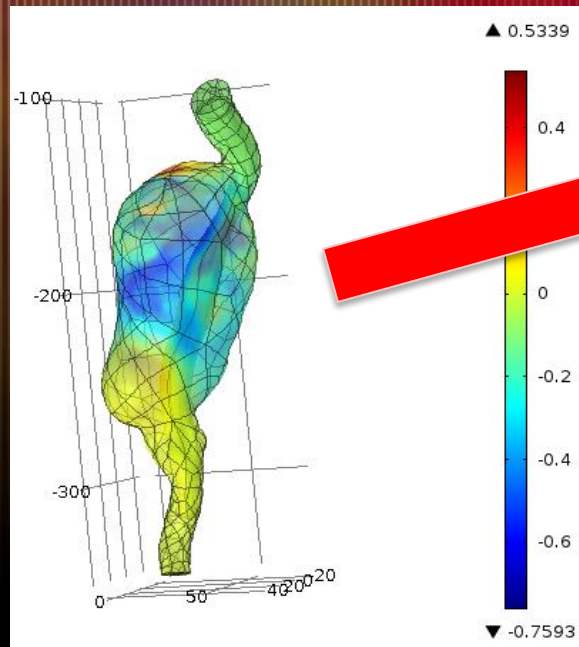
With MFM

Hemodynamic Results

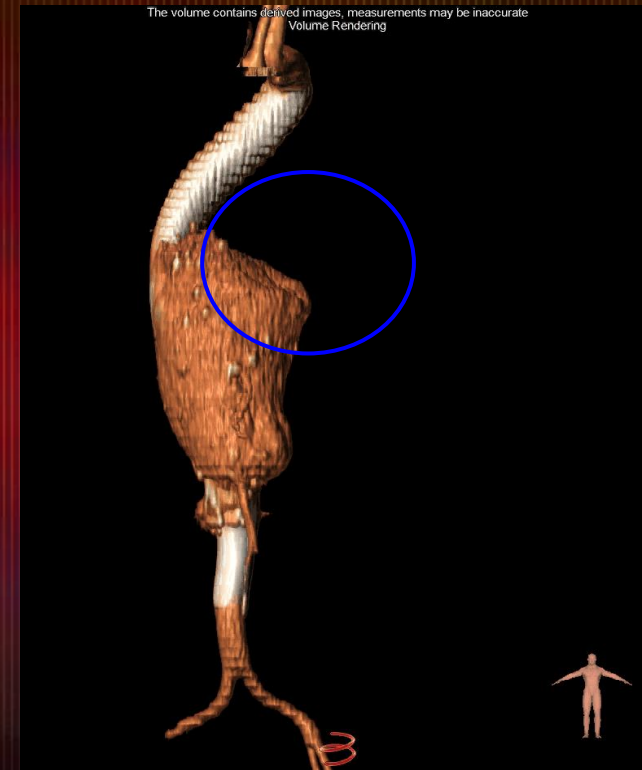
Lower
velocity
value



Lower
pressure/
wall stress
value



Thrombus formation



ARIZONA HEART FOUNDATION



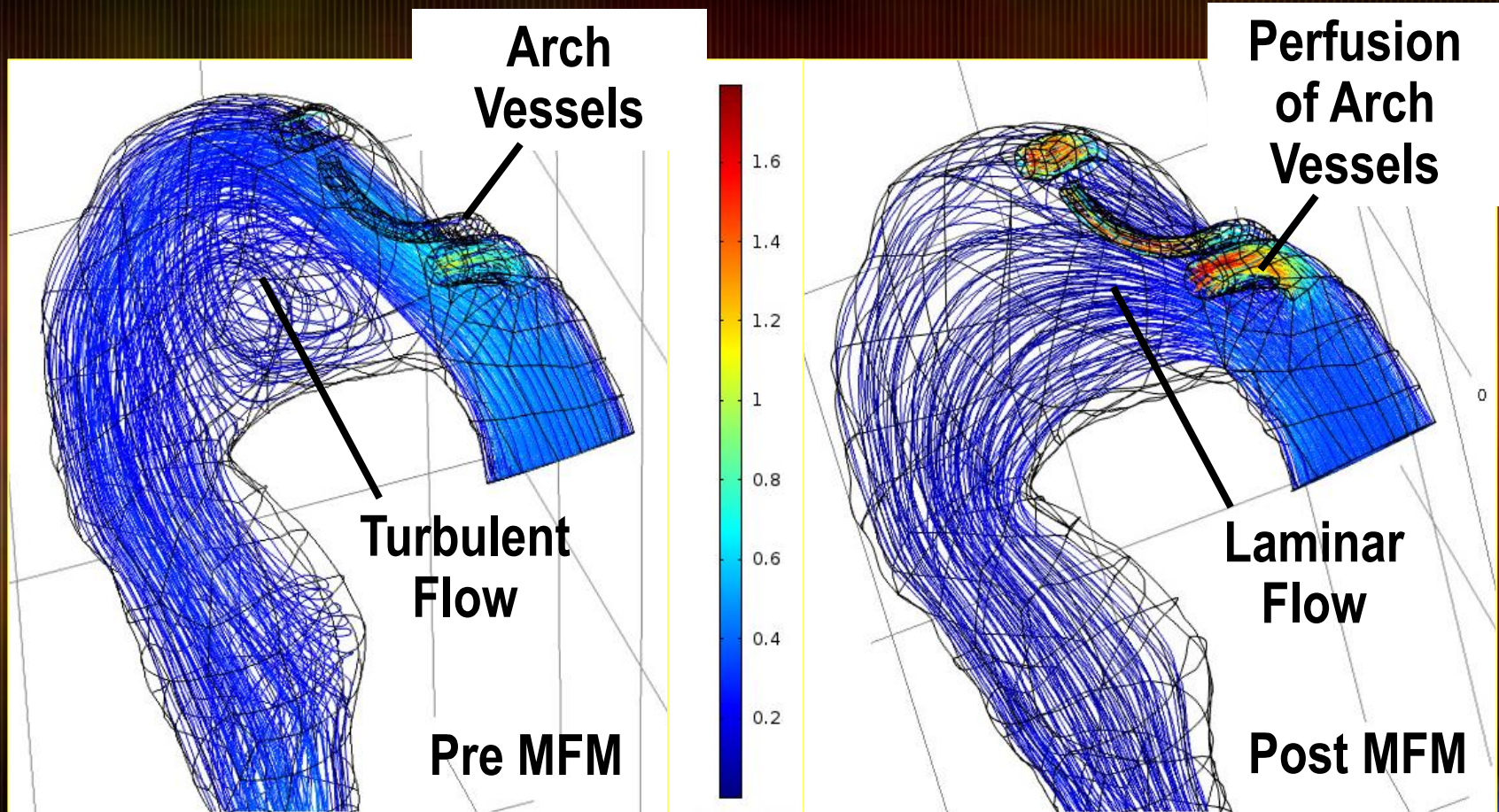


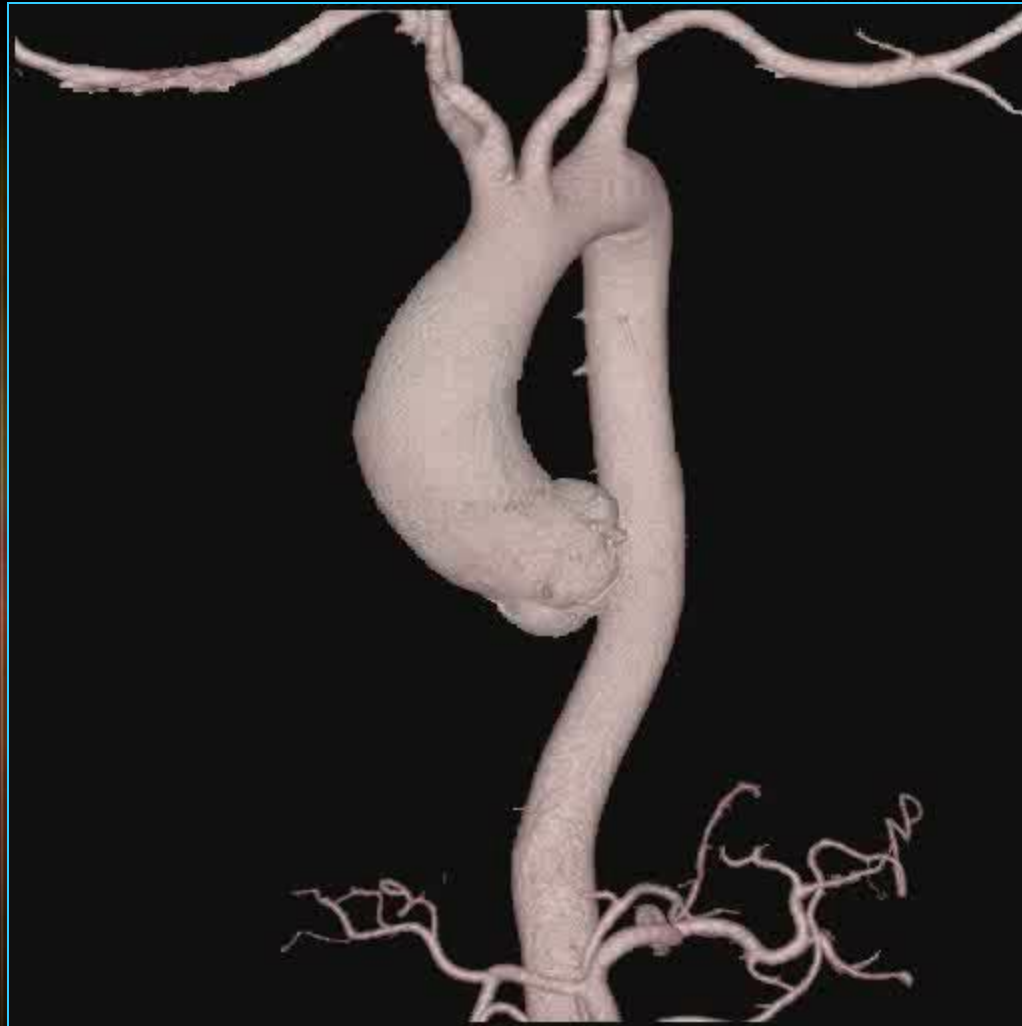
FOUNDATION



Finite Element Analysis- Velocity Measurement

Reduction of Stress by Modifying the Damaging Vortex

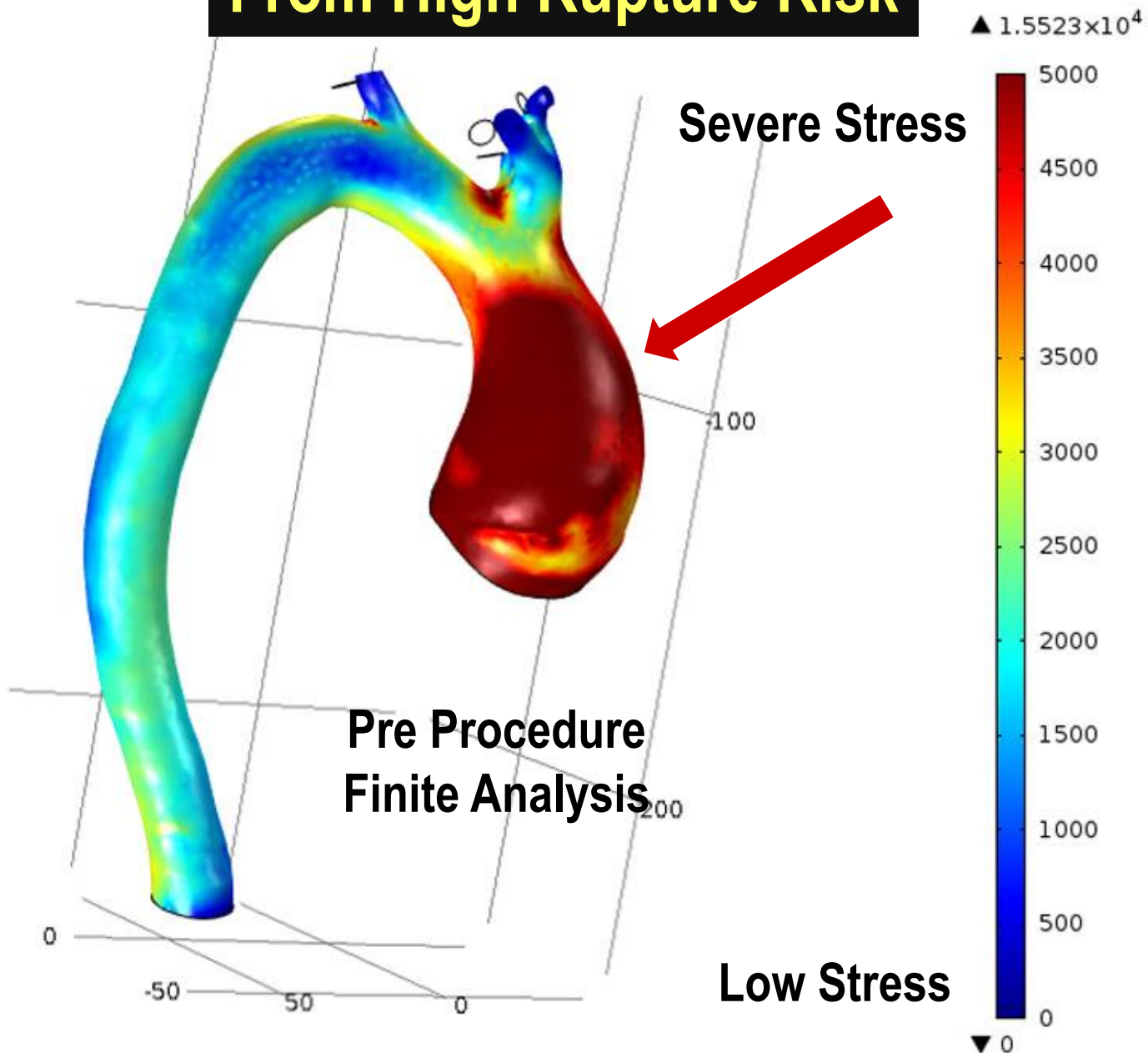




ARIZONA HEART FOUNDATION



From High Rupture Risk

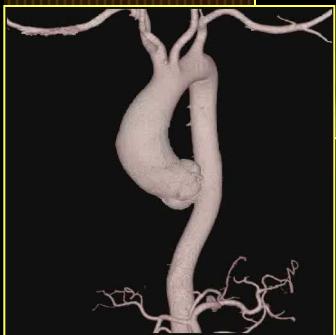


ASCENDING ARCH ANEURYSM



9 Month Follow-up

8mm Reduction



ARIZONA HEART FOUNDATION



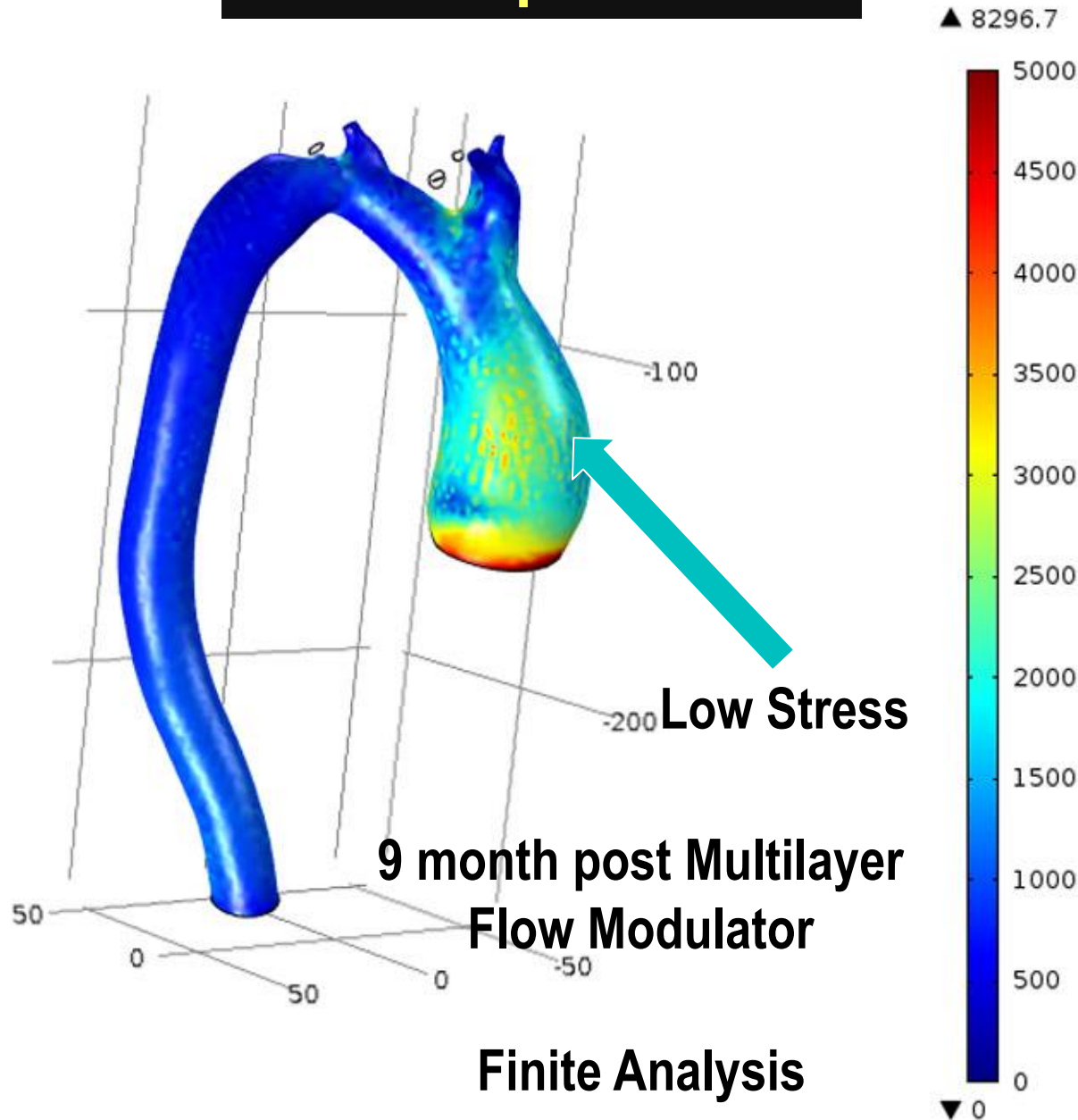
20 month Follow-up



ARIZONA HEART FOUNDATION



To No Rupture Risk!



Latest Iteration



Conclusion

**The Physiology of
the Multilayer Flow
Modulator
Supports its
Positive Clinical
Results**

*Thank you,
E. B. Diethrich*

ARIZONA HEART FOUNDATION

