

# 50 year outcome data in Venous Stenting

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# What are our expectations

Arterial Patients

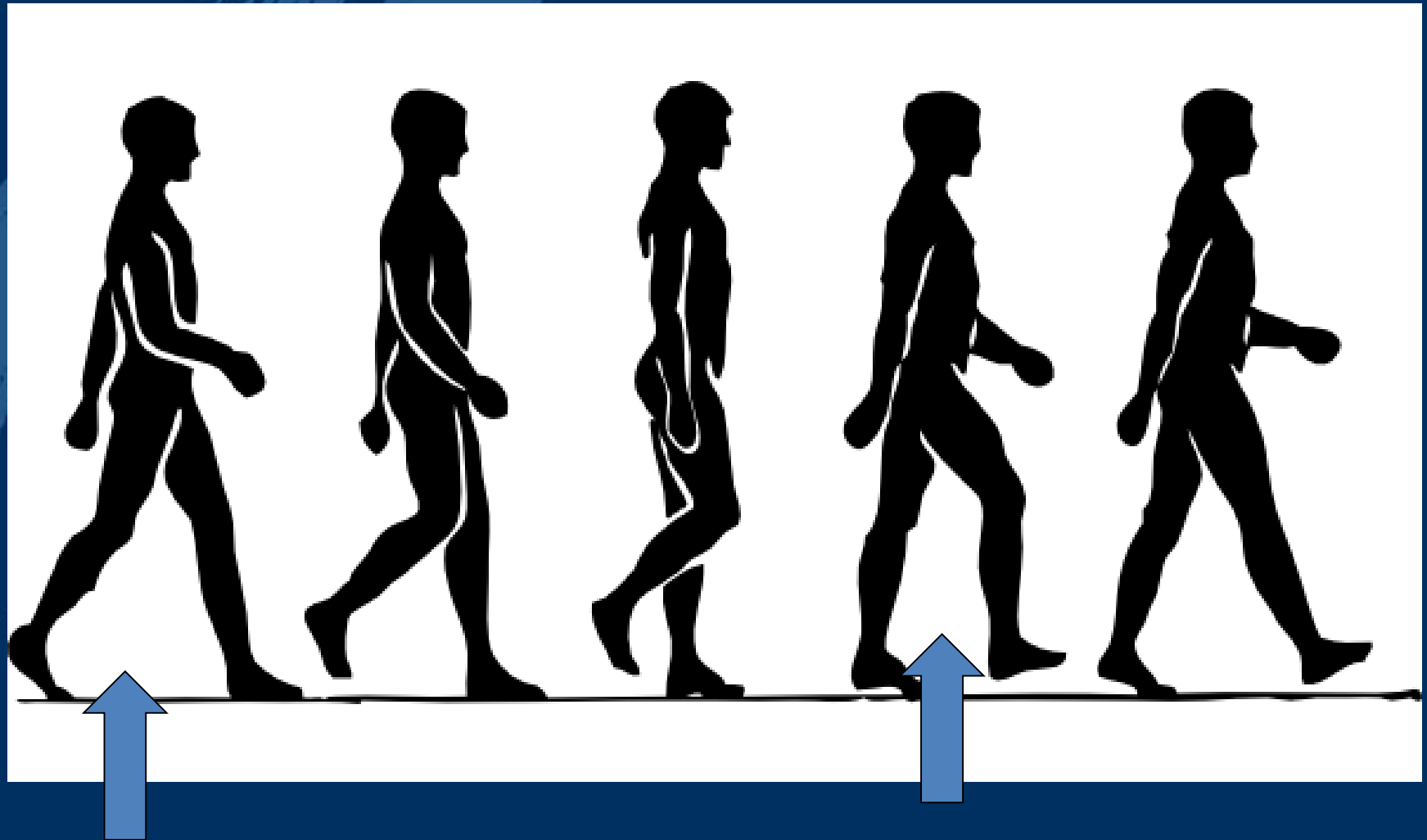


Venous Patients



Testing bench marks started the same as they were for arterial

# What happens when we walk?



Ligament crush

Flexion

# BENCH TESTING APPROACH FOR VENOUS STENTS

Why does the standard fall short?

The deformation modes have precedent in other anatomical locations.

	Distal SFA	Paget-Schroetter	Venous Inguinal Ligament
Lateral Compression	---	✓	✓
Axial Compression	✓	---	✓
Torsion	✓	---	✓
Bending	✓	---	✓

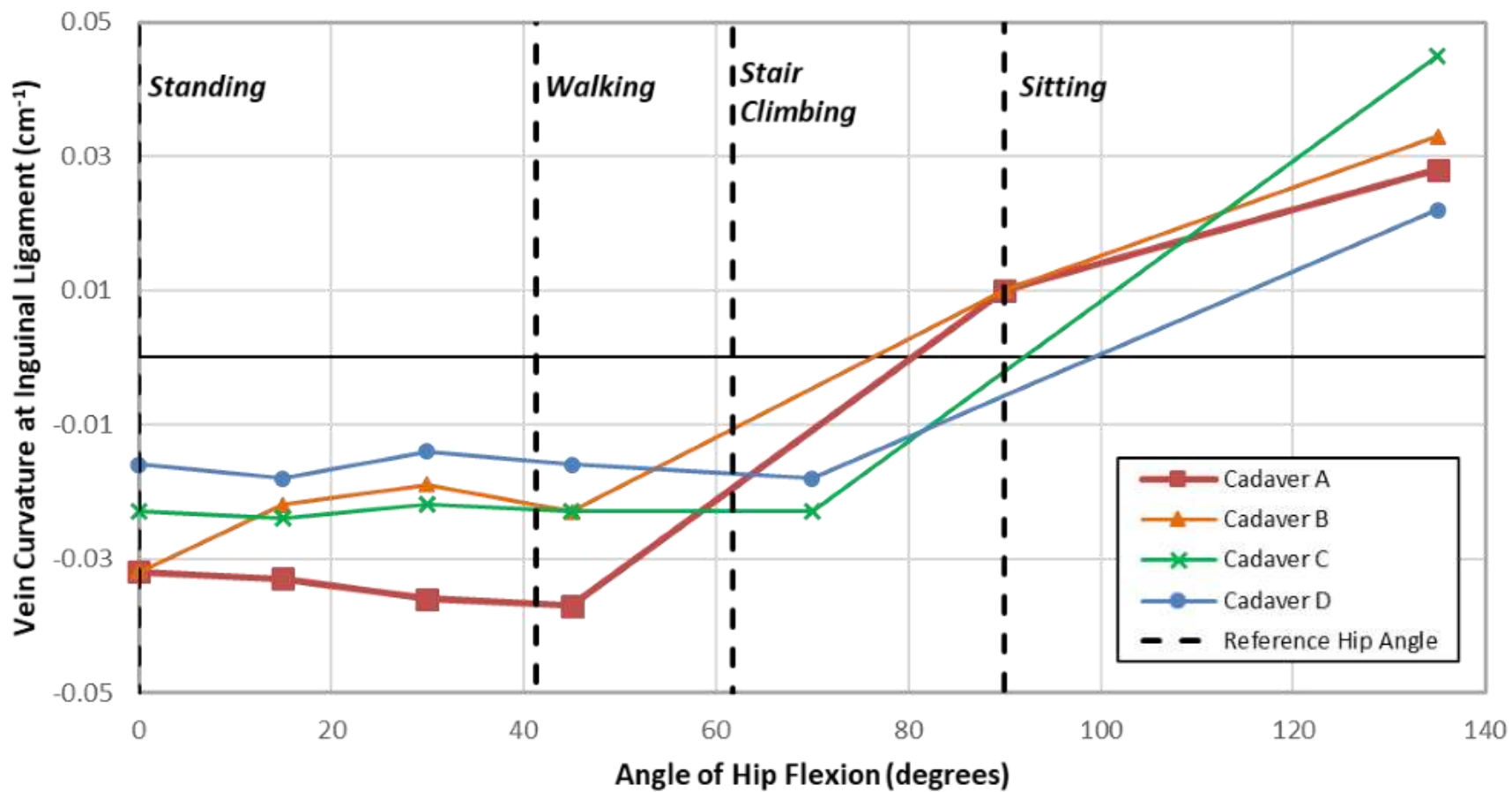
But, the **arterial precedent of a 10-year test is insufficient for venous applications.**

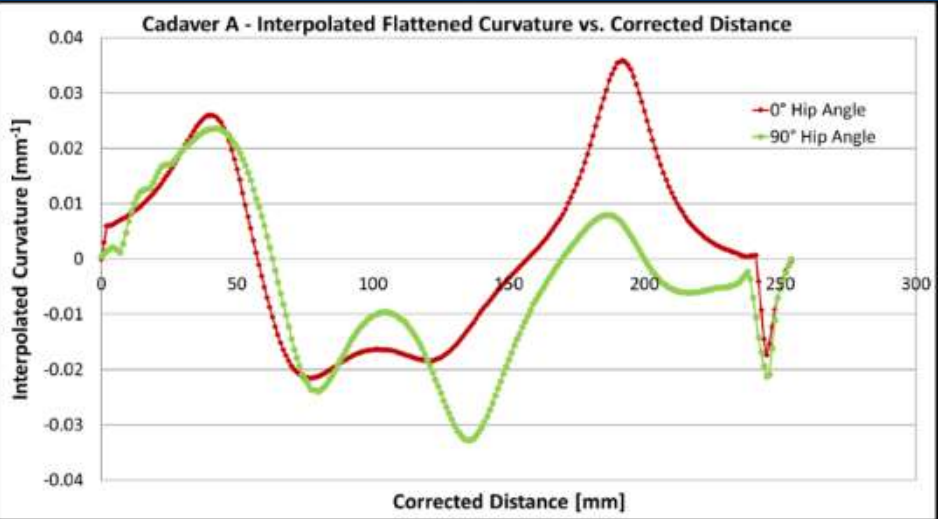
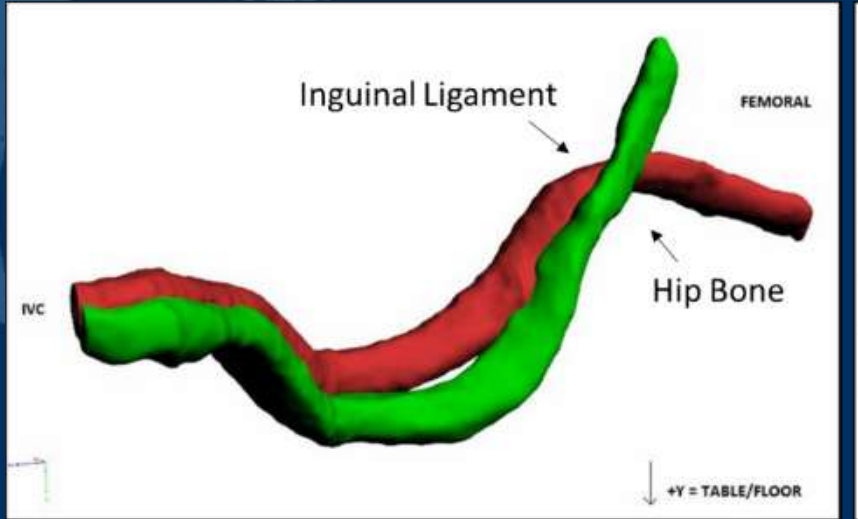
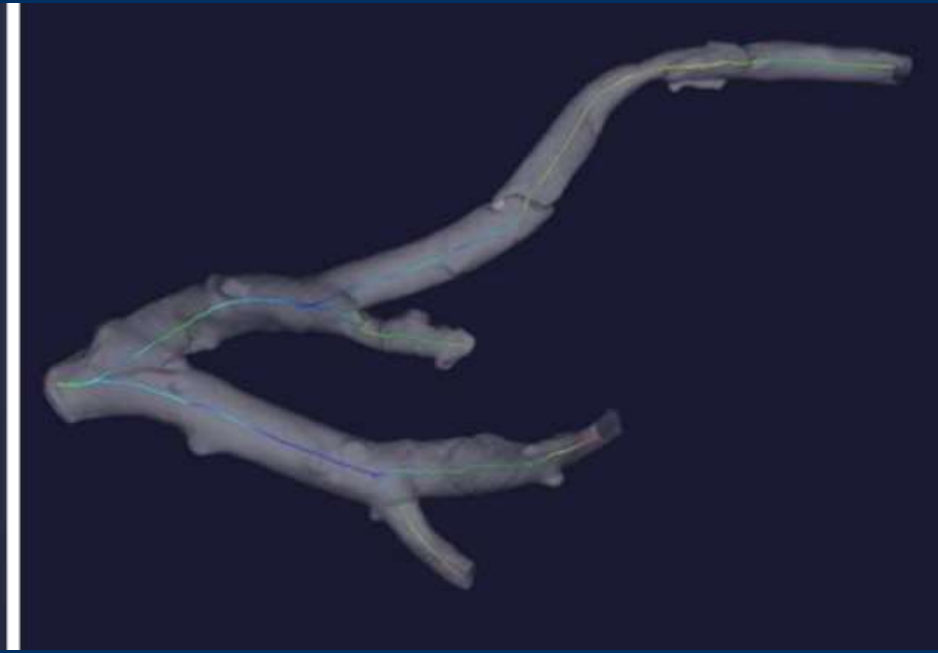
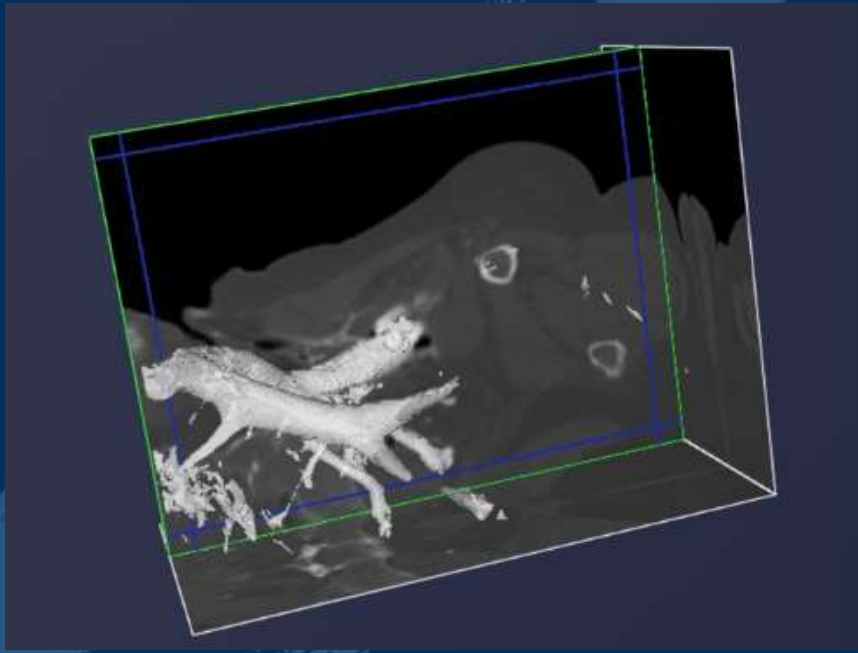
Young age of venous occlusion patients (typically 30+ years of age) may present additional considerations on duration of stent performance.<sup>1</sup>

<sup>1</sup> Mousa AY, AbuRahma AF. May-Thurner Syndrome: An update and review. *Ann Vasc Surg* 2013; 27: 992.

Activity	Change in Hip Angle	95% Confidence Interval Upper Limit	Count Estimate per year
Walking	34.3° ± 3.5°	41.3°	1,000,000
Stair Climbing	41.9° ± 9.9°	61.7°	25,000
Sit-to-Stand*	90°	N/A	48,000

\*Assumed to be consistent among adult population.





# BENCH TESTING APPROACH FOR VENOUS STENTS

## Body Movements

2

Sit-to-Stand  
Stair Climbing

## Deformation Modes

4

Torsion  
Bending  
Lateral  
Compression  
Axial Compression

## Duration

50\*

Years

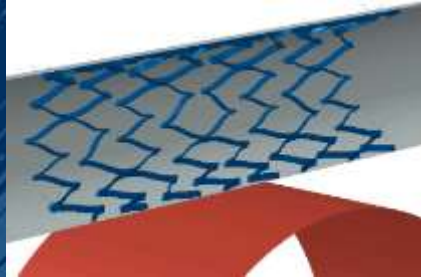
Unique challenges of iliofemoral venous obstruction: Need for Venous  
Stents with 50 Year Durability  
January 2020

\*Worst case (bending) deformation mode was tested to 10 and to 50 years, all other deformation modes were tested to 10 years

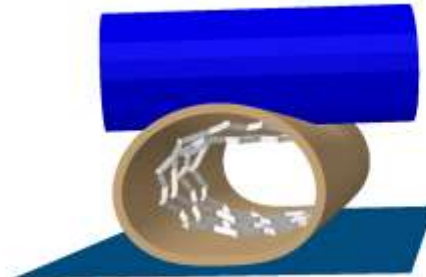


# PRIMARY STENT LOADING MODES: NUMERICAL ANALYSIS

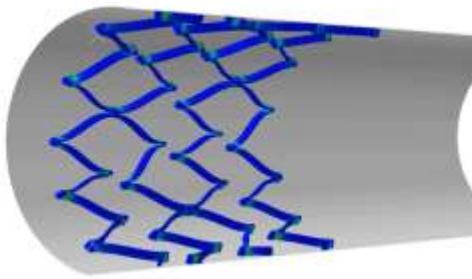
Bending



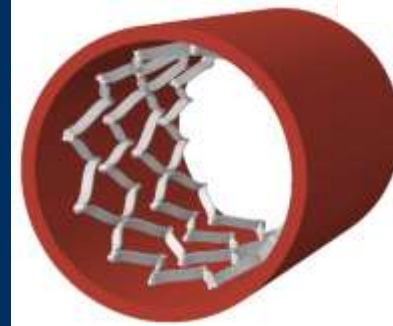
Compression



Axial



Torsion

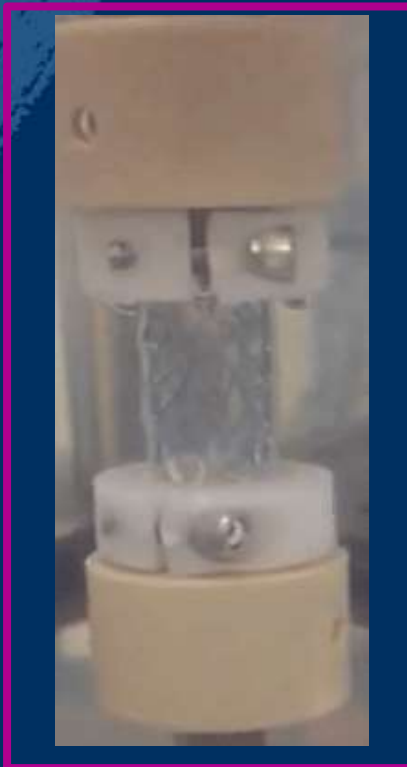


# PRIMARY STENT LOADING MODES: BENCH TESTING

Bending



Axial



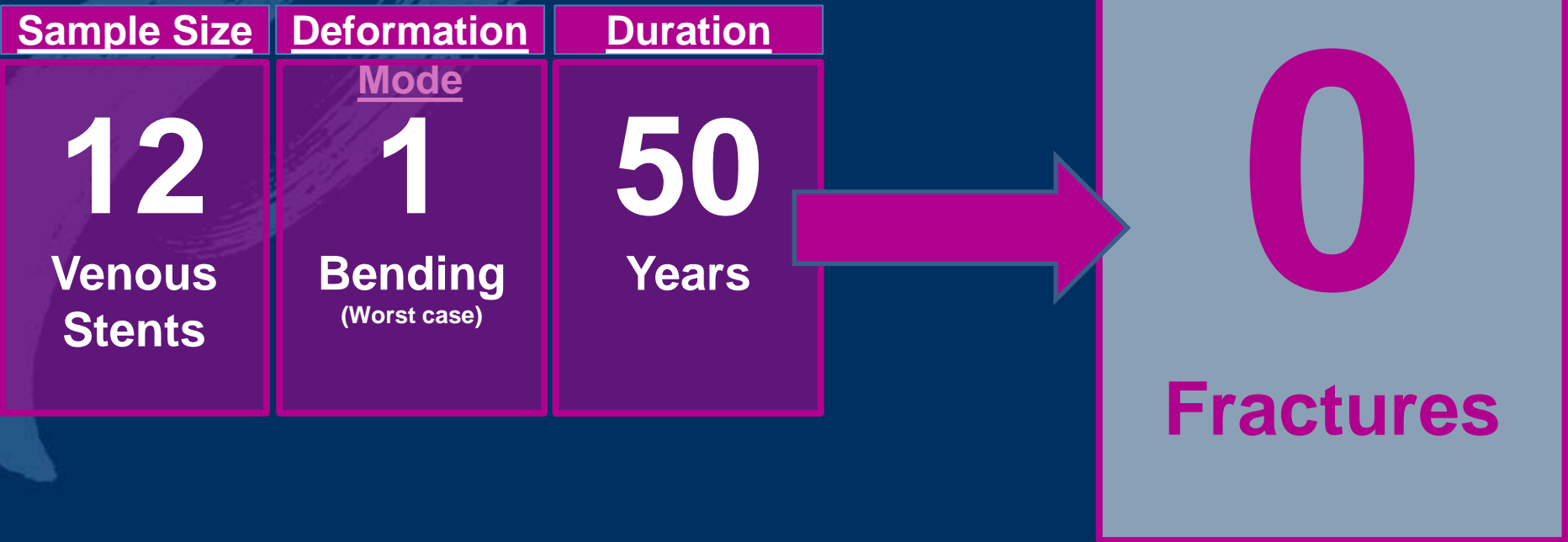
Compression



Torsion

Testing not justified

# A NEW BENCH FOR VENOUS APPLICATION



# Conclusions

- This is a step toward setting a bench mark for testing of venous stents
- New failure modes need to be added as they are identified
- We need to provide assurance to both patients and ourselves that the stents will last for their lifetime

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