



Ideal for Doppler & Colour Doppler flow research and development applications.

Product Description

Shelley's tissue mimicking anthropomorphic carotid bifurcation vascular phantoms are designed to very accurately mimic complex physiological vessel geometries and are compatible with ultrasound, MRI and radiographic imaging modalities.

The carotid bifurcation vasculatures are manufactured using the latest CAD/CAM and NC machining techniques, thereby offering a known geometry to within 0.005 cm. The resulting thin walled silicone vascular model (1.0 mm thick vessel wall) is embedded in an agar-based tissue-mimicking material.

Features

- Realistic normal and stenosed vessel geometries.
- Scattering particles are added to the vessel mimicking material to enhance echogenicity and speckle texture.
- Geometry is known to within 0.005 cm.
- The tissue mimic and vessel are embedded in an acrylic encasement that is sealed with an o-ring Lexan® lid (0.25 mm thick).
- Phantoms are fitted with plastic quick-disconnect entrance and exit fluid connectors.
- Tissue mimicking material acoustic attenuation & acoustic velocity are known.
- Vessel wall tissue mimicking material acoustic attenuation & acoustic velocity are known.
- Available as a sealed, non-flow model for MR.
- Also compatible with MRI and x-ray imaging studies.

Applications

- Calibration of clinical angiographic imaging systems.
- Research and product development requiring complex and realistic normal and stenosed vascular geometries.
- Comparisons between finite-element modeling and in vitro measurements.
- Ideal for flow experiments when used with a physiological flow pump.

Mimicking Material Specifications

Ultrasound Tissue Mimicking Material Specification

Acoustic Attenuation: 0.56 dB cm⁻¹ MHz⁻¹ at 5 MHz with nearly linear frequency dependence
 Acoustic velocity: 1539 ± 4 ms⁻¹

Ultrasound Vessel Wall Mimicking Material Specification

Acoustic Attenuation: 3.5 dB cm⁻¹ MHz⁻¹ with linear frequency dependence
 Acoustic velocity of: 1020 ± 20 ms⁻¹

Scattering particles are added to the vessel-mimicking material to increase echogenicity and add speckle texture. The vessel-mimicking material is stable over time, with a Young's elasticity modulus of 1.3 to 1.7 Mpa for strains of up to 10%, which mimics human arteries under typical physiological conditions.

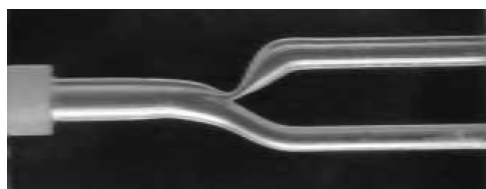
Agar Carotid Bifurcation Phantom Specifications

Phantom Length: 265 mm
 Phantom Width: 120 mm
 Phantom Depth: 65 mm

Agar depth: 50 mm
 Scanning window: 240 mm x 95 mm
 Phantom Weight: 2500gr
 Depth to the center of the vessel: 16mm
 Thickness and material for the acoustic window: 10um lexan sheet.



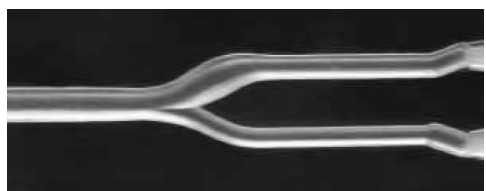
Carotid Bifurcation Vascular Geometries



Asymmetric 70% diameter stenosis



Symmetric 70% diameter stenosis



Normal Bifurcation

Normal Carotid Bifurcation Model

30% symmetric Carotid Bifurcation Model: 3.95 mm
 30% asymmetric Carotid Bifurcation Model: 4.00 mm

50% symmetric Carotid Bifurcation Model: 2.82 mm
 50% asymmetric Carotid Bifurcation Model: 2.84 mm

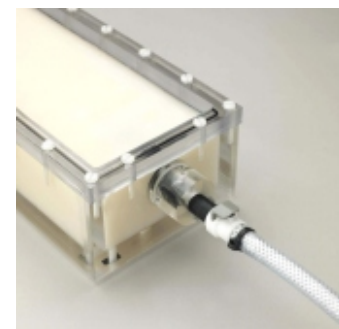
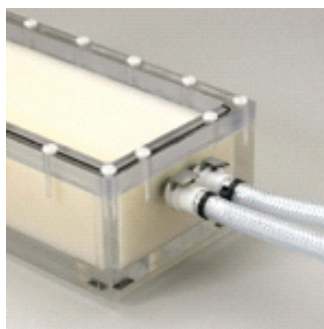
60% symmetric Carotid Bifurcation Model: 2.24 mm
 60% asymmetric Carotid Bifurcation Model: 2.27 mm

70% symmetric Carotid Bifurcation Model: 1.67 mm
 70% asymmetric Carotid Bifurcation Model: 1.68 mm

Common carotid input: 8.00 mm diameter
 Internal carotid output: 5.52 mm diameter
 External carotid output: 4.62 mm

Vessel material: Silicone
 Vessel wall thickness: 1 mm

Tubing Connections Supplied



Combine carotid bifurcation phantoms with Shelley's physiological flow pumps (CompuFlow 1000 or CompuFlow 1000 MR) and our blood mimicking fluid to simulate blood flow in carotid bifurcation arteries.

Journal References:

Carotid Bifurcation Doppler Flow Phantom Reference

Poepping TL, Nikolov N, Rankin N, Lee M, Holdsworth DW., "An in vitro system for Doppler ultrasound flow studies in the stenosed carotid artery bifurcation" *Ultrasound Med Biol* 2002 Apr;28(4):495-506

CompuFlow 1000 physiological flow pump pre-programmed carotid artery blood flow waveform Reference:

Holdsworth, D.W., Norley, C.J.D., Frayne, R., Steinman, D.A., and Rutt, B.K., "Characterization of common carotid artery blood-flow waveforms in normal human subjects," accepted for publication in *Phys. Meas.*, (Dec 1998)

Shelley's Blood Mimicking Fluid Reference

Kumar V. Ramnarine, Dariush K. Nassiri, Peter R. Hoskins and Jaap Lubbers "Validation Of A New Blood-Mimicking Fluid For Use In Doppler Flow Test Objects" *Ultrasound in Med. & Biol.* Vol. 24, No. 3, pp. 451-459, 1998

These carotid bifurcation phantoms are ideal when connected to Shelley's computer-controlled physiological flow pumps; CompuFlow 1000 and CompuFlow 1000 MR.



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