FIRST TIME DATA RELEASE: Impact of stent structure on venous flow

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Disclosure

I have the following potential conflicts of interest to report:

- Receipt of grants/research support
  
  Medtronic, BD BARD, Cook, Ab medica, Bentley, Optimed, Boston Scientific

- Receipt of honoraria and travel support
  
  Medtronic, BD BARD, Cook, Ab medica, Bentley, Optimed, Boston Scientific
Objectives

• Impact of cross sectional area reduction on pressure drop ($\Delta P$ mm H$_2$O)

• Impact of length of stenosis on pressure drop

• Impact of the stent diameter on pressure drop

• Impact of stent on tributaries pressure drop after jailing
Materials

- Tube material: silicon (1mm, soft, transparent)
- Tube diameter: 12 & 14 mm
- Fluid: water & blood (porcine)
- Type of stenosis: spherical & cylindrical
- Pump: rotary pump (more venous like)
- Stents: 4 dedicated venous stents have been evaluated till now
Experiment

- Tube 12mm: reduction of cross section area using ImageJ software
• Tube 12 mm
• Fluid: Blood & Water
• Stenosis: Cylindrical (7 cm)
• Flow: 1.5 L/min

Impact of stenosis rate
Spherical and cylindrical stenosis
Impact of stenosis length

- Tube 12 mm
- Fluid: Blood
- Stenosis: Cylindrical & Spherical (7 cm)
- Stenosis Rate: 80%

![Graph showing pressure drop vs. flowrate for spherical and cylindrical stenoses](image)

- Pressure Drop [mmH2O]
- Flowrate [L/min]

<table>
<thead>
<tr>
<th>Flowrate [L/min]</th>
<th>Spherical</th>
<th>Cylindrical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>64.48</td>
<td>132.34</td>
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</table>

Note: The graph illustrates the comparison between spherical and cylindrical stenoses.
- Ø Stent 12 mm & 14 mm
- Fluid: Blood
- Stenosis: Cylindrical
- Stenosis Rate: 80%

Impact of stent diameter

![Graph showing pressure drop vs flowrate for stent diameters 12mm and 14mm.](image-url)
Impact of stent on tributaries
Experiment

Test with physiological solution

Dedicated venous stent

Test with blood

Red arrows showing points of measurements
Impact of stent on tributary

Venous stent: 1, 2, 3 and 4
Diameter: 14 mm, Length: 100 mm
Fluid: blood, Hematocrit value: 37.9%
Flow: different flows in main vessel (L/min), Flow in tributary: 75% of main vessel flow
Conclusion

• There is a clear and significant impact of area reduction on delta P

• There is a clear and significant impact of the length of stenosis on delta P

• There is a clear and significant impact of the stent diameter on delta P

• There is a difference between the impact of stent design on delta P after overstenting of a tributary, but its clinical translation remain unclear
Thank you very much

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