NextGen Neonatal Shunt Deployment for Congenital Heart Disease

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Need

Hypoplastic Left Heart Syndrome (HLHS) is responsible for up to 40% of neonate cardiac mortality due to the severely underdeveloped left ventricle [1]

The Norwood Procedure [1]:
Establishes the right ventricle as the main blood pump of the body. Requires the excision of cardiac muscle to insert the shunt.

Objective:
Design a single insertion shunt deployment device that stretches the cardiac tissue to maintain intended blood flow in HLHS neonates.

Solution

Constraints
C1-C4: Syringe and Balloon Retraction
C5: ≤ 15 cm Length

See how it works!

Verification Testing Results

<table>
<thead>
<tr>
<th>V3: Leak Test</th>
<th>V4: Compression Test</th>
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</thead>
<tbody>
<tr>
<td>R3: Non-leak Features</td>
<td>Results: No Leakage PASS</td>
</tr>
<tr>
<td>R4: Deformation Resistant</td>
<td>Elastic Moduli Results: ≥ 15 kPa 644.6 kPa PASS</td>
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</tbody>
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The device successfully deploys into a pig heart, while also meeting the outlined dimensional constraints, and maintains a flow rate of 0.5 L/min.

Conclusion & Impacts

Impact:
Retention of cardiac tissue leading to increased mechanical stability of the heart

Future Revisions:
1. Utilize biocompatible materials
2. Additional functionality of tip