

Growth-accommodating heart valve system

Tech ID: 33462 / UC Case 2022-977-0

BRIEF DESCRIPTION

This technology describes a prosthetic heart valve system designed to accommodate the growth of children.

SUGGESTED USES

- Pediatric Cardiac Surgery: Primary application in pediatric cardiac surgery for replacing diseased or malfunctioning heart valves in children with congenital heart disease.
- Congenital Heart Defect Treatment: Specifically designed to address congenital heart defects in pediatric patients, providing a tailored solution for their unique needs.
- Long-Term Valve Replacement: Offers a solution for long-term valve replacement in pediatric patients, potentially reducing the need for multiple surgeries as the child grows.
- Growth-Responsive Valve: Designed to accommodate the natural growth of children, ensuring continued functionality and efficacy as the child's heart grows.
- Preventing Valve Dysfunction: Helps prevent valve dysfunction by adapting to the changing dimensions of the child's heart over time.
- Customized Treatment: Provides a customizable treatment option based on the unique needs and growth trajectory of each pediatric patient.
- Advancing Pediatric Cardiology: Represents an advancement in pediatric cardiology by addressing the challenges associated with valve replacement in growing children, potentially leading to improved outcomes and long-term prognosis.
- Minimally Invasive Procedures: Suitable for transcatheter implantation, allowing for minimally invasive procedures compared to traditional open-heart surgery.
- Enhancing Quality of Life: Aims to improve the quality of life for pediatric patients with congenital heart disease by providing a durable and effective valve replacement option.
- Reducing Complications: Designed to mitigate complications such as paravalvular leak, enhancing the safety and effectiveness of the valve replacement procedure.
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FEATURES/BENEFITS

Features:

1. Expandable Stent:
 - » Designed to expand radially to accommodate the child's growth.
 - » Constructed with support beams interconnected by joints, forming a web-like cylindrical cage.
2. Leaflets:
 - » Multiple leaflets forming the valve.

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OTHER INFORMATION

KEYWORDS

Pediatric prosthetic valve, Growth-accommodating valve, Child heart valve replacement, Transcatheter valve implantation, Expandable stent valve, Congenital heart disease treatment, Pediatric cardiac surgery, Leaflet attachment method, Paravalvular leak prevention, Prosthetic valve for children

CATEGORIZED AS

- » Medical
 - » Delivery Systems
 - » Devices
 - » Disease: Cardiovascular and Circulatory System

» Attached to the expandable stent along a path that maintains length during expansion.

3. Transcatheter Implantation:

» Can be implanted transcatheterly, minimizing the invasiveness of the procedure.

4. Size Range:

» Lower limit diameter of 9 mm and upper limit diameter of 25 mm, suitable for pediatric patients.

5. Leaflet Material Options:

» Leaflets can be made from biological tissue or stretchable polymeric material, providing flexibility in material selection.

6. Skirt for Paravalvular Leak Mitigation:

» Includes a skirt around the outer surface to mitigate paravalvular leak, made from a stretchable polymer.

7. Technical Design for Functionality:

» Utilizes excessive leaflet tissue in the contracted configuration to facilitate expansion without requiring increased blood pressure to open the valve.

» Attachment path for leaflets remains relatively unchanged during expansion, preventing tearing.

» Leaflets maintain valve closure at different three-dimensional configurations as the stent expands.

Benefits:

1. Growth Accommodation:

» Addresses the challenge of accommodating the growth of pediatric patients, reducing the need for multiple valve replacements.

2. Minimized Invasiveness:

» Transcatheter implantation reduces the invasiveness of the procedure compared to traditional open-heart surgery.

3. Versatility:

» Provides options for leaflet material, allowing customization based on patient needs and preferences.

4. Reduced Risk of Complications:

» Skirt design helps mitigate paravalvular leak, reducing the risk of complications post-implantation.

5. Long-Term Functionality:

» Designed to maintain valve functionality as the child grows, potentially enhancing long-term outcomes and quality of life.

6. Innovative Design:

» Incorporates unique technical features to ensure functionality and durability during growth and expansion.

TECHNOLOGY DESCRIPTION

This invention addresses a significant need in pediatric cardiology by providing a prosthetic valve system that can grow with the child, potentially reducing the need for multiple valve replacements as the child matures.

1. Summary of the Invention:

» The prosthetic valve system includes an expandable stent and multiple leaflets forming a valve.

» The stent expands radially while maintaining the length of the path to which the leaflets are attached, ensuring the valve's functionality as the child grows.

» The system can be implanted transcatheterly.

» The expandable stent is constructed with support beams interconnected by joints, forming a web-like cylindrical cage.

2. Embodiments:

» The expandable stent may have a lower limit diameter of 9 mm and an upper limit diameter of 25 mm.

» Leaflets can be made from biological tissue or stretchable polymeric material.

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» A skirt around the outer surface of the system may be included to mitigate paravalvular leak, made from a stretchable polymer.

3. Technical Features:

- » The invention utilizes excessive leaflet tissue in the contracted configuration to allow for expansion without requiring more blood pressure to open the valve.
- » The attachment path for leaflets does not change significantly during expansion, preventing tearing.
- » Leaflets maintain valve closure even as the stent expands, adapting to different three-dimensional configurations.

STATE OF DEVELOPMENT

Prototype developed

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230263627	08/24/2023	2022-977