

portion of the docking station that is impermeable to blood can extend from at least the valve seat to at least the sealing portion. The docking station can be adjustable in length. The docking station can include a first half that a second half of the docking station can adjustably extend into to adjust the length. The one or more retaining portions can extend radially outward of the one or more sealing portions when the docking station is in an unconstrained state. Other features described elsewhere in this disclosure may also be included.

[0008] In one exemplary embodiment, a system for implantation in a native heart valve of a patient's heart can include a self-expandable docking station and an expandable valve. The expandable docking station can include a valve seat, one or more sealing portions, and one or more retaining portions. The valve seat can expand to a deployed size and is substantially unexpandable beyond a deployed size. The one or more sealing portions can be connected to the valve seat and can be constructed to expand and extend radially outward of the valve seat and provide a seal over a range of sizes of expansion. The one or more retaining portions can be connected to the one or more sealing portions. The one or more retaining portions can be configured to retain the docking station at a deployed position. The expandable valve can include an expandable frame and a valve element. The expandable frame can be expanded to engage the valve seat of the docking station. The valve element can be connected to the expandable frame. The valve seat and the sealing portions can act as an isolator that reduces or prevents radial outward forces of the expandable valve in the valve seat from being transferred to the sealing portions or the retaining portions such that when the expandable docking station and expandable valve are implanted in a portion of a circulatory system, a radial outward force applied by the sealing portions to the portion of the circulatory than $1/3$, less than $1/4$, less than $1/8$, or less than $1/10$) of a radial outward force applied by the expandable frame to the valve seat. The expandable docking station can be configured

Claims

1. A system for implantation in a native heart valve of a patient's heart, the system comprising:

a self-expandable docking station that includes:

a valve seat that expands to a deployed size and is substantially unexpandable beyond a deployed size;

one or more sealing portions connected to the valve seat that are constructed to expand radially outward of the valve seat and provide a seal over a range of sizes of expansion; and

one or more retaining portions connected to the one or more sealing portions that are configured to retain the docking station at a deployed position;

an expandable valve that comprises:

an expandable frame that is expandable to engage the valve seat of the docking station;

a valve element connected to the expandable frame;

wherein the valve seat and the sealing portions act as an isolator that reduces or prevents radial outward forces of the expandable valve in the valve seat from being transferred to the sealing portions or the retaining portions such that when the self-expandable docking station and expandable valve are implanted in a portion of a circulatory system, a radial outward force applied by the sealing portions to the portion of the circulatory system when within the range of sizes is less than $\frac{1}{2}$ of a radial outward force applied by the expandable frame to the valve seat.

2. The system of claim 1, wherein the range of sizes comprises 27 mm to 38 mm.
3. The system of claim 1 or 2, wherein the self-expandable docking station is configured to expand radially outwardly to varying degrees along its length L when implanted in the portion of the circulatory system.
4. The system of any of claims 1-3, wherein the self-expandable docking station comprises a self-expandable frame made from a lattice of metal struts forming cells, wherein the cells are preferably diamond shaped.

5. The system of any of claims 1-4 wherein the valve seat comprises a substantially unexpandable band configured to maintain the shape of the valve seat and hold the expandable valve in place.
6. The system of claims 4 and 5, wherein the frame comprises a relatively wider inflow end and outflow end, and a relatively narrower waist portion between the inflow end and outflow end, wherein the waist portion comprises the substantially unexpandable band extending around the waist portion.
7. The system of claim 5 or 6, wherein the substantially unexpandable band is configured such that the diameter of the valve seat is not increased more than 3 mm by the radial outward force applied by the expandable frame to the valve seat.
8. The system of any of claims 1-7 wherein the sealing portions comprise a portion of a metal frame covered with a fabric.
9. The system of claims 6 and 8, wherein the sealing portions are between the retaining portions and the waist portion.
10. The system of any of claims 1-9, wherein the sealing portions comprise an open cell foam.

11. The system of any of claims 1-10, wherein a portion of the docking station is permeable to blood and a portion of the docking station is impermeable to blood.
12. The system of claim 11, wherein the portion of the docking station that is impermeable to blood extends from at least the valve seat to at least the sealing portions.
13. The system of claim 11 or 12, wherein the portion of the docking station that is impermeable to blood is covered with an impermeable material.
14. The system of any of claims 1-13, wherein the one or more retaining portions extend radially outward of the one or more sealing portions when the docking station is in an unconstrained state.
15. The system of any of claims 1 to 14, wherein the docking station is configured such that the retaining portions engage an inner surface of the portion of the circulatory system at an angle between 30 and 60 degrees when the docking station is implanted in the portion of the circulatory system.