

Claims

1. A system comprising:

an expandable docking station that includes:

a valve seat that expands to 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 expandable docking station and expandable valve are configured such that, when 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 expandable docking station is configured such that, when implanted in the portion of the circulatory system, the diameter of the valve

seat is not increased more than 3mm by the radial outward force applied by the expandable frame to the valve seat.

3. The system of claim 1 or 2 wherein the range of sizes comprises 27mm to 38mm.
4. The system of any of claims 1-3 wherein the 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.
5. The system of any of claims 1-4 wherein the expandable docking station is configured such that, when implanted in the portion of the circulatory system, pressure of blood on the expandable docking station enhances retention by the retaining portions.
6. The system of any of claims 1-5 wherein the expandable docking station is configured such that force applied by the retaining portions, when implanted in the portion of the circulatory system, is in proportion to the pressure of blood acting on the system.
7. The system of any of claims 1-6 wherein the expandable docking station is configured such that force applied by the retaining portions, when implanted in the portion of the circulatory system, is greater when the heart is in a diastolic phase than when the heart is in the systolic phase.
8. The system of any of claims 1-7 wherein the valve seat is formed by a suture.
9. The system of any of claims 1-8 wherein the sealing portion comprises a portion of a metal frame covered with a fabric.
10. The system of any of claims 1-9 wherein the sealing portion comprises 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 portion.
13. The system of any of claims 1-12 wherein the docking station has an overall length that is adjustable.
14. The system of claim 13 wherein the docking station includes a first half that a second half of the docking station can adjustably extend into to adjust the overall length.
15. The system of any of claims 1-14 wherein the one or more retaining portions extend radially outward of the one or more sealing portion when the docking station is in an unconstrained state.