

bore at the annulus to more closely match the circular profiles of existing aortic valve implants. In this manner, an existing valve implant developed for the aortic position, perhaps with some modification, could then be implanted at the mitral position together with such an anchor. In addition, such anchors could also potentially be used at the heart's other native valves to more securely anchor prosthetic valves at those sites as well.

[0009] The present disclosure relates to prosthetic devices that are primarily intended to be implanted at one of the native mitral, aortic, tricuspid, or pulmonary valve regions of a human heart, as well as apparatuses and methods for implanting the same. The prosthetic devices can be used to repair the native valve annulus, as well as to position and secure a prosthetic heart valve in the native valve region. The disclosed devices can include a helical anchor having a plurality of turns or coils, where the helical anchor can assume an axially collapsed position where portions of at least two of the coils align or overlap in a radial direction.

[0010] In one embodiment, a helical device for implanting at a native heart valve of a heart of a patient includes a first set of one or more coils and a second set of one or more coils, and a central axis extending through the first set of coils and the second set of coils. The device is configured to assume an axially expanded state where the entire first set of coils is positioned on a first side of the second set of coils relative to the central axis, and is also configured to assume an axially compressed state where a first coil of the first set of coils is positioned on a second side of at least a portion of the second set of coils opposite to the first side relative to the central axis. The first set of one or more coils can have a first inner diameter, and the second set of one or more coils can have an inner diameter different from the first inner diameter.

[0011] In certain embodiments, the device can include a first set of coils having at least two coils and a second set of coils having at least two coils. At least one of the coils

of the first set of coils is positioned relative to the central axis between two coils of the second set of coils when the device is in the compressed state. The first set of coils can be configured to be positioned on a ventricular side of a native valve, and the second set of coils can be configured to be positioned on an atrial side of the native valve. Preferably, the upper and lower coils are made from a shape-memory material, such as Nitinol.

[0012] The present disclosure also relates to a method of implanting a helical device, including an upper coil and a lower coil, at a native valve of a heart of a patient, involves positioning the lower coil on a ventricular side of the native valve, positioning the upper coil on an atrial side of the native valve, such that the entire upper coil is positioned on a first side of the lower coil relative to a central axis of the device, and adjusting the device to a position where at least a portion of the upper coil is positioned on a second side of at least a portion of the lower coil opposite to the first side relative to the central axis.

[0013] The method can include implanting a prosthetic heart valve within the device. The prosthetic heart valve is positioned in the device when the prosthetic heart valve is in a radially compressed state, and the prosthetic heart valve is radially expanded such that a radial pressure is applied between the prosthetic heart valve and the device to anchor the prosthetic heart valve within the device.

[0014] In another embodiment, a system for securing a prosthetic heart valve at a native heart valve of a heart of a patient includes a helical docking device including a first set of one or more coils and a second set of one or more coils, where a central axis extends through the first set of coils and the second set of coils, and a prosthetic heart valve configured to be held in the docking device. The docking device is configured to assume an axially expanded state where the entire first set of coils is positioned on a first side of the second set of coils relative to the central axis, and is also configured to assume an axially compressed state wherein a first coil of the first set of coils is positioned on a second side of at least a portion of the second set of coils opposite to the

CLAIMS

1. A device for implanting at a native heart valve of a heart of a patient, the device comprising a first set of one or more coils and a second set of one or more coils, and a central axis extending through the first set of coils and the second set of coils;

wherein the device is configured to assume an axially expanded state wherein the entire first set of coils is positioned on a first side of the second set of coils relative to the central axis; and

wherein the device is configured to assume an axially compressed state wherein a first coil of the first set of coils is positioned on a second side of at least a portion of the second set of coils opposite to the first side relative to the central axis.

2. The device of claim 1, wherein the first set of coils has a first inner diameter, and the second set of coils has a second inner diameter different from the first inner diameter.

3. The device of claim 2, wherein the first set of coils comprises at least two coils and the second set of coils comprises at least two coils.

4. The device of claim 2, wherein at least one of the coils of the first set of coils is positioned relative to the central axis between two coils of the second set of coils when the device is in the compressed state.

5. The device of claim 2, wherein the first set of coils are configured to be positioned on a ventricular side of a native mitral valve, and the second set of coils are configured to be positioned on an atrial side of the native mitral valve.

6. The device of claim 1, wherein the device comprises a shape-memory material.
7. The device of claim 1, wherein the device comprises Nitinol.
8. The device of claim 1, wherein the first set of coils is positioned radially inward relative to the second set of coils when the device is in the compressed state.
9. The device of claim 8, wherein the first set of coils configured to exert a radially outwardly directed force against the second set of coils when the device is in the compressed state.
10. The device of claim 1, wherein an axial tension is applied to the device when the device is in the axially expanded state.

11. A system for securing a prosthetic heart valve at a native heart valve of a heart of a patient, the system comprising:

a helical docking device comprising a first set of one or more coils and a second set of one or more coils, and a central axis extending through the first set of coils and the second set of coils; and

a prosthetic heart valve configured to be held in the docking device;

wherein the docking device is configured to assume an axially expanded state wherein the entire first set of coils is positioned on a first side of the second set of coils relative to the central axis; and

wherein the docking device is configured to assume an axially compressed state wherein a first coil of the first set of coils is positioned on a second side of at least a portion of the second set of coils opposite to the first side relative to the central axis.

12. The system of claim 11, further comprising a delivery catheter, wherein the delivery catheter is configured to deploy the docking device at the native heart valve.

13. The system of claim 11, wherein the first set of one or more coils has a first inner diameter, and the second set of one or more coils has a second inner diameter different from the first inner diameter.

14. The system of claim 11, wherein the first set of coils comprises at least two coils and the second set of coils comprises at least two coils.

15. The system of claim 11, wherein the first coil is positioned relative to the central axis between two coils of the second set of one or more coils when the docking device is in the compressed state.

16. The system of claim 11, wherein the first set of coils is configured to be positioned on a ventricular side of a native mitral valve, and the second set of coils is configured to be positioned on an atrial side of the native mitral valve.