BRIEF SUMMARY

[004] The present disclosure describes devices, systems, and methods for intravascularly delivering an intravascular device to a targeted cardiac valve.

[004a] In one aspect, there is provided a delivery system for delivering an implantable intravascular device to a targeted cardiac valve, the delivery system comprising:

a handle assembly;

an elongated delivery member coupled to the handle assembly and extending distally from the handle assembly, the delivery member having a distal end and being configured to detachably couple to an intravascular device at the distal end, the delivery member further including:

an outer sheath having a distal piece configured to house the intravascular device in a pre-deployed configuration;

a steering component configured to curve the delivery member in a compound curve that enables intravascular delivery of the delivery member to the targeted cardiac valve;

a delivery catheter configured to longitudinally translate the intravascular device relative to the outer sheath; and

a suture catheter having one or more tethers configured to detachably couple to the intravascular device, the suture catheter being longitudinally translatable relative to the delivery catheter to enable adjustment of tension in the one or more tethers.

[004b] In another aspect, there is provided a delivery system for intravascularly delivering an implantable intravascular device to the mitral annulus, the delivery system comprising:

an elongated delivery member coupled to the handle assembly and extending distally from the handle assembly, the delivery member having a distal end and being configured to detachably couple to an intravascular device at the distal end, the delivery member further including:

an outer sheath having a distal piece configured to constrain the intravascular device in a pre-deployed configuration;

a steering catheter configured to curve the delivery member in a compound curve that enables intravascular delivery of the delivery member to the targeted cardiac valve;

a steering catheter configured to curve the delivery member in a compound curve that enables intravascular delivery of the delivery member to the targeted cardiac valve;

a delivery catheter configured to longitudinally translate the intravascular device relative to the outer sheath;

a suture catheter having one or more tethers configured to detachably couple to the intravascular device, the suture catheter being longitudinally translatable relative to the delivery catheter to enable adjustment of tension in the one or more tethers; and

a guidewire tube extending through the delivery member and through the distal piece to an attached distal tip, the distal tip being configured to connect to or seat against a distal side of the distal piece; and

a handle assembly, the handle assembly including an outer sheath holder, a steering catheter handle, a delivery catheter holder, and a suture catheter holder; and

a fixture configured to support the handle assembly, the fixture including:

a delivery device adjustor for longitudinally translating the entire delivery device relative to a base;

an outer sheath adjustor for translating the outer sheath relative to other components of the delivery member; and

a deployment adjustor for translating the delivery catheter, outer sheath, and suture catheter relative to the steering catheter.

[004d] In one embodiment, a delivery system for intravascularly delivering an intravascular device to a targeted cardiac valve includes a handle assembly and an elongated delivery member. The delivery member has a proximal end and a distal end. The proximal end of the delivery member is coupled to the handle assembly and the delivery member extends distally from the handle assembly to its distal end. The delivery member is configured to detachably couple to an implantable intravascular device at its distal end. The delivery member also includes an outer sheath having a cover configured to constrain and/or hold the intravascular device in a pre-deployed configuration, a steering component configured to curve the delivery member in a compound curve that enables intravascular delivery of the delivery member to the targeted cardiac valve, a delivery catheter configured to longitudinally translate the intravascular device relative to

a delivery catheter configured to longitudinally translate the intravascular device relative to the outer sheath;

a suture catheter having one or more tethers configured to detachably couple to a proximal section of the intravascular device, the suture catheter being longitudinally translatable relative to the delivery catheter to enable adjustment of tension in the one or more tethers; and

a guidewire tube extending through the delivery member and through the distal piece to an attached distal tip, the distal tip being configured to connect to or seat against a distal side of the distal piece; and

a handle assembly, the handle assembly including:

an outer sheath holder coupled to the outer sheath at the proximal end of the outer sheath;

a steering catheter handle disposed proximal of the outer sheath holder, a proximal end of the steering catheter being coupled to the steering catheter handle and the steering catheter extending distally therefrom into the outer sheath;

a delivery catheter handle disposed proximal of the steering catheter handle, a proximal end of the delivery catheter being coupled to the delivery catheter handle and the delivery catheter extending distally therefrom into the steering catheter; and

a suture catheter handle disposed proximal of the delivery catheter handle, a proximal end of the suture catheter being coupled to the delivery suture catheter handle and extending distally therefrom into the delivery catheter.

[004c] In another aspect, there is provided a delivery system for intravascularly delivering an implantable intravascular device to the mitral annulus, the delivery system comprising:

an elongated delivery member coupled to the handle assembly and extending distally from the handle assembly, the delivery member having a distal end and being configured to detachably couple to an intravascular device at the distal end, the delivery member further including:

an outer sheath having a distal piece configured to hold the intravascular device in a pre-deployed configuration;

the outer sheath, and a suture catheter having one or more tethers configured to detachably couple to a proximal section of the intravascular device. The suture catheter is longitudinally translatable relative to the delivery catheter to enable adjustment of tension in the one or more tethers.

[005] In some embodiments, the steering component is a steering catheter nested within the outer sheath. The steering catheter may include a plurality of tension cables and corresponding tension cable lumen, the tension cables providing for steering of the steering catheter by adjusting tension in the tension cables. The steering catheter may be formed as a hypotube, the hypotube having a cut pattern that increases the flexibility of the hypotube relative to an uncut section of hypotube. The steering catheter may include a plurality of microfabricated cuts along at least a proximal section of the distal piece, the microfabricated cuts being configured to provide bending in a single plane.

[006] In some embodiments, the outer sheath includes a coil and a braided sleeve. The coil of the outer sheath may be formed from a coil wire having a "D" shaped cross section to provide a rounded inner surface. The outer sheath may include a fluid impermeable flexible polymer cover disposed over the coil and braided sleeve. In some embodiments, the distal piece of the outer sheath is rotationally decoupled from the remainder of the outer sheath. In some embodiments, the delivery catheter includes a compression coil at least at a distal section.