CLAIMS

What Is Claimed Is:

1. A system for providing endoluminal delivery of a deliverable device through vasculature of a patient to a delivery site within the patient, comprising:

an outer delivery sheath including a distal section, wherein at least a portion of the outer delivery sheath is sized for insertion into the vasculature of the patient;

a carrier segment located at a distal portion of a catheter shaft, the carrier segment having an outer surface sized to temporarily hold the deliverable device in the distal section of the outer delivery sheath, wherein at least a portion of the catheter shaft is located within and coaxial to the outer delivery sheath; and

a delivery segment located coaxial to the outer delivery sheath, the delivery segment having an outer surface sized to radially fit within the deliverable device after detaching the deliverable device from the carrier segment when the deliverable device resides within the distal section of the outer delivery sheath, wherein the delivery segment is configured to deploy the deliverable device at the delivery site.

2. The system of Claim 1, wherein at least a portion of the distal section of the outer delivery sheath is expandable.

3. The system of Claim 2, wherein the at least a portion of the distal section of the outer delivery sheath comprises one or more electrically activated elements.

4. The system of Claim 2, wherein the at least a portion of the distal section of the outer delivery sheath comprises one or more piezo-ceramic elements.

5. The system of Claim 2, wherein the at least a portion of the distal section of the outer delivery sheath comprises a passively expandable material that is expandable upon application of an outward radial force applied by at least one of the carrier segment and the delivery segment.

6. The system of Claim 2, wherein the at least a portion of the distal section of the outer delivery sheath expands upon application of a tensile force to the at least a portion of the distal section.

7. The system of Claim 1, wherein the distal section includes at least one of an internal projection and a narrowed area extending radially inward from an interior surface of the distal section.

8. The system of Claim 1, wherein a portion of an internal surface of the outer delivery sheath further comprises a guide for retaining at least a portion of a longitudinally extending element configured to selectively manipulate at least a part of the outer delivery sheath or a structure coaxial to the outer delivery sheath.

9. The system of Claim 1, wherein a portion of an internal surface of the outer delivery sheath further comprises a guide, the guide comprising at least one of:

(a) a lumen; and

(b) a grommet;

wherein the guide retains at least one control line for selective retention of the deliverable device.

10. The system of Claim 1, wherein the carrier segment and the delivery segment are both situated upon the catheter shaft.

11. The system of Claim 1, wherein the carrier segment is situated upon the catheter shaft, and wherein the delivery segment is associated with a delivery segment shaft that is coaxial to the catheter shaft and axially moveable relative to the catheter shaft.

12. The system of Claim 1, wherein the carrier segment is an expandable balloon having an expanded diameter smaller than an expanded diameter for the delivery segment.

13. The system of Claim 1, wherein the delivery segment is an expandable balloon having an expanded diameter larger than an expanded diameter for the carrier segment.

14. The system of Claim 1, wherein at least one of the carrier segment and the delivery segment is a mandrel.

15. The system of Claim 14, wherein the mandrel is expandable by mechanical or electromechanical means.

16. The system of Claim 14, wherein the mandrel is not expandable.

17. The system of Claim 1, wherein the delivery segment is located axially proximal to the carrier segment.

18. The system of Claim 1, wherein the delivery segment is located axially distal to the carrier segment.

19. The system of Claim 1, wherein the delivery segment includes a magnet to aid in capture and retention of the deliverable device on the delivery segment.

20. An assembly for intravascular delivery of a deliverable device to a delivery site within a patient, comprising:

a first catheter including a first catheter shaft;

a carrier segment situated along the first catheter shaft, the carrier segment configured to receive the deliverable device prior to inserting the first catheter within the patient; and

a delivery segment sequentially positioned in an axial orientation relative to the carrier segment, wherein the delivery segment is configured to engage the deliverable device within the patient while the deliverable device is coaxial to at least a portion of

the first catheter, and wherein the delivery segment is configured to thereafter deploy the deliverable device at the delivery site.

21. The assembly of Claim 20, wherein the delivery segment is also situated along the first catheter.

22. The assembly of Claim 20, wherein the delivery segment is situated along a second catheter, the second catheter comprising a coaxial lumen through which passes the first catheter.

23. The assembly of Claim 22, wherein at least one of the first catheter and the second catheter comprise a curved distal portion.

24. The assembly of Claim 20, wherein the carrier segment is an expandable balloon.

25. The assembly of Claim 20, wherein the carrier segment is a mandrel.

26. The assembly of Claim 25, wherein the mandrel is expandable by mechanical or electromechanical means.

27. The assembly of Claim 25, wherein the mandrel is non-expandable.

28. The assembly of Claim 20, wherein the delivery segment is an expandable balloon.

29. The assembly of Claim 20, wherein the delivery segment is a mandrel.

30. The assembly of Claim 29, wherein the mandrel is expandable by mechanical or electromechanical means.

31. The assembly of Claim 29, wherein the mandrel is non-expandable.

32. The assembly of Claim 20, wherein the delivery segment includes a magnet to aid in capture and retention of the deliverable device on the delivery segment.

33. The assembly of Claim 20, wherein the delivery segment includes an electromagnet to aid in capture and retention of the deliverable device on the delivery segment.

34. A method of delivering a deliverable device through vasculature of a patient to a target site within the patient, comprising:

mounting the deliverable device on a selectively expandable carrier segment located along a catheter shaft, wherein at least a portion of the catheter shaft is located within and coaxial to an outer delivery sheath;

inserting the outer delivery sheath and catheter shaft into the patient;

moving the outer delivery sheath within the patient to position the selectively expandable carrier segment and the deliverable device near the target site;

partially expanding the deliverable device using the selectively expandable carrier segment while the deliverable device remains at least partially within the outer delivery sheath;

positioning a delivery segment radially within the deliverable device and partially expanding the delivery segment to facilitate engagement of the delivery segment with the deliverable device;

moving the delivery segment and deliverable device to the target site; and

deploying the deliverable device at the target site by further expanding the delivery segment.

CLAIMS

1. A system for treating a native heart valve in a patient using endoluminal delivery through vasculature of a patient to a native heart valve seat, the system comprising:

a stent-valve;

an outer delivery sheath including a distal section, wherein at least a portion of the outer delivery sheath is sized for insertion into the vasculature of the patient, wherein at least a portion of the distal section of the outer delivery sheath is expandable and comprises a plurality of piezo-ceramic elements configured to expand the distal section of the outer delivery sheath upon electrically activating the plurality of piezo-ceramic elements;

a carrier segment located at a distal portion of a catheter shaft, the carrier segment having an outer surface sized to temporarily hold the stent-valve in the distal section of the outer delivery sheath, wherein at least a portion of the catheter shaft is located within and coaxial to the outer delivery sheath; and

a delivery segment located coaxially to the outer delivery sheath, the delivery segment having an outer surface sized to radially fit within the stent-valve after detaching the stent-valve from the carrier segment when the stent-valve resides within the distal section of the outer delivery sheath, wherein the delivery segment is configured to deploy the stent-valve at the location of the native heart valve seat.

2. The system of Claim 1, wherein the distal section includes at least one of an internal projection and a narrowed area extending radially inward from an interior surface of the distal section.

3. The system of Claim 1, wherein a portion of an internal surface of the outer delivery sheath further comprises a guide for retaining at least a portion of a longitudinally

extending element configured to selectively manipulate at least a part of the outer delivery sheath or a structure coaxial to the outer delivery sheath.

4. The system of Claim 1, wherein a portion of an internal surface of the outer delivery sheath further comprises a guide, the guide comprising at least one of:

(a) a lumen; and

(b) a grommet;

wherein the guide retains at least one control line for selective retention of the stent-valve.

5. The system of Claim 1, wherein the carrier segment is situated upon the catheter shaft, and wherein the delivery segment is associated with a delivery segment shaft that is coaxial to the catheter shaft and axially moveable relative to the catheter shaft.

6. The system of Claim 1, wherein the carrier segment is an expandable balloon having an expanded diameter smaller than an expanded diameter for the delivery segment.

7. The system of Claim 1, wherein the delivery segment is an expandable balloon having an expanded diameter larger than an expanded diameter for the carrier segment.

8. The system of Claim 1, wherein at least one of the carrier segment and the delivery segment is a mandrel.

9. The system of Claim 8, wherein the mandrel is expandable by mechanical or electromechanical means.

10. The system of Claim 1, wherein the delivery segment is located axially proximal to the carrier segment.

11. The system of Claim 1, wherein the delivery segment includes a magnet to aid in capture and retention of the stent-valve on the delivery segment.