vasculature. The nose cone is desirably positioned proximate the frame supporting the valve. If the nose cone is not positioned properly with respect to the frame, gaps or exposed frame edges may cause injury to the patient, or otherwise interfere with valve delivery. The position of the nose cone can typically vary from its initial position, such as during manufacturing, shipping, storage, or preparation of a device that includes the nose cone and frame.

SUMMARY

[005] Certain embodiments of the present disclosure provide a prosthetic valve delivery assembly that includes a storage tube. The storage tube comprises a radial slot in an outer surface of the storage tube. The assembly includes a prosthetic heart valve that includes a frame having a distal portion and a proximal portion. The valve is at least partially disposed within the storage tube, such as being disposed in the storage tube or at least substantially disposed within the storage tube. The assembly further includes a nose cone having a proximal end and a distal end and disposed about an elongated shaft that extends through the storage tube. A removable tab is disposed between the distal frame portion and the nose cone. The tab assists in maintaining the position of the nose cone relative to the distal end of the frame. The tab defines a pair of arms disposed about the nose cone, and the radial slot is configured to receive the arms of the tab.

[006] In a particular implementation, the tab includes a proximal portion configured to be grasped by a user and a distal portion configured to be inserted about the proximal end of the nose cone. The distal portion defines the pair of arms. The arms engage the proximal end of the nose cone. For example, the nose cone may include a distal, conical, portion extending from a distal apex to a base and an intermediate portion extending proximally from the base. The diameter of the intermediate portion proximate the base is smaller than a diameter of the base of the distal portion of the nose cone. The arms are disposed about the intermediate portion of the nose cone.

[007] In another implementation, the storage tube has an outer surface that defines a radial slot configured to receive the arms of the tab. In a particular example, the storage tube includes a pair of slots in opposing sides of the storage tube, such that the arms can be inserted through a first slot and out of a second slot. According to another example,

nose cone cap. In a particular example, the stylet is configured to be insertable proximally through the apex of the nose cone cap until the loop of the stylet abuts the apex of the nose cone cap.

[017] In a further example, the nose cone cap includes a latch releasably coupled to a tether. The tether is coupled to the nose cone cap, such as extending through one or more apertures formed in the nose cone cap. A component of the latch or tether, such as a pin, is configured to be inserted through a loop located at the distal end of the stylet and coupled to the tether. When coupled to the tether, the latch and tether resist axial movement of the stylet.

[018] In further embodiments, the present disclosure provides a method for securing the position of a nose cone relative to a prosthetic valve. A prosthetic valve is placed at least partially within a storage tube comprising a radial slot in an outer surface of the storage tube. A nose cone is positioned relative to the valve. A tab is inserted between at least a portion of the nose cone and the valve such that the nose cone is restrained from proximal movement relative to the tab. The tab, in one implementation, is inserted through a radially extending slot formed in an outer surface of the storage tube. In another implementation, the valve extends distally from the distal end of the storage tube and the tab is inserted such that it abuts the distal end of the valve. The tab defines a pair of arms disposed about the nose cone. The radial slot is configured to receive the arms of the tab. The inserting step comprises inserting the arms through the radial slot.

[019] In a particular implementation, the method includes placing a nose cone cap over a distal end portion of the nose cone and securing the nose cone cap to the storage tube. The nose cone is thus restrained by the nose cone cap from distal and/or proximal axial movement relative to the storage tube. In a particular example, the nose cone cap comprises internal fins and the nose cone is received in a cavity formed by the fins. The fins compress a distal portion of the nose cone proximally against the tab. In a further example, a stylet is inserted through the nose cone and the nose cone cap is inserted over the stylet. In one aspect, the stylet includes a loop at its distal end, and the loop is received by a recess formed in the nose cone cap. In another example, the stylet is inserted proximally through a distal apex of the nose cone cap into an axial bore, wherein the axial bore has a diameter smaller than the diameter of a loop located at the distal end of the stylet. In a further example, a tether is inserted through the loop of the stylet and

We claim:

1. A prosthetic valve delivery assembly, comprising:

a storage tube comprising a radial slot in an outer surface of the storage tube;

a prosthetic heart valve comprising a frame, the frame having a distal end and a proximal end, the prosthetic heart valve at least partially disposed within the storage tube;

a nose cone disposed about an elongated shaft, the elongated shaft extending through the storage tube, the nose cone having a distal end and a proximal end; and

a removable tab disposed between the distal end of the frame and the nose cone;

wherein the tab assists in maintaining the position of the nose cone relative to the distal end of the frame;

wherein the tab defines a pair of arms disposed about the nose cone, and the radial slot is configured to receive the arms of the tab.

2. The assembly of claim 1, wherein the nose cone comprises a distal conical portion extending from a distal apex to a base and an intermediate portion extending proximally from the base, the diameter of the intermediate portion proximate the base being smaller than a diameter of the base of the distal portion, wherein the tab is configured to be disposed about the intermediate nose cone portion proximate the base of the distal nose cone portion.

3. The assembly of claim 2, wherein the arms are disposed about the intermediate nose cone portion.

4. The assembly of claim 3, wherein the arms comprise inner arms and the tab further defines a pair of outer arms, the outer arms extending about the inner arms.

5. The assembly of claim 4, wherein the outer arms engage an outer surface of the storage tube.

6. The assembly of claim 4, further comprising a nose cone cap extending over the distal end of the nose cone, wherein the outer arms of the tab engage an outer surface of the nose cone cap.

7. The assembly of any of claims 1-6, wherein the tab comprises a gripping surface.

8. The assembly of any of claims 1-5 and 7, further comprising a nose cone cap extending over at least a distal portion of the nose cone and releasably coupled to a distal end of the storage tube.

9. The assembly of claim 8, wherein the nose cone cap has an inner surface defining a plurality of axially and radially extending fins, defining a cavity for receiving at least the distal end portion of the nose cone.

10. The assembly of claims 8 or 9, further comprising a stylet having an elongated shaft and a loop at the distal end of the elongated shaft, wherein the loop is disposed within the nose cone cap.

11. The assembly of any of claims 1, 2, and 7, wherein the tab defines a pair of arms, the assembly further comprising a nose cone cap extending over at least a distal end portion of the nose cone, the nose cone cap having a distal end and a proximal end, the proximal end of the cap defining a proximally extending tab arm configured to be received between the arms of the tab.

12. A method for securing the position of a nose cone relative to a prosthetic valve, comprising:

placing the prosthetic valve at least partially within a storage tube comprising a radial slot in an outer surface of the storage tube;

positioning a nose cone relative to the valve; and

inserting a tab about the nose cone and the valve such that the nose cone is restrained from proximal movement relative to the tab;

wherein the tab defines a pair of arms disposed about the nose cone;

wherein the radial slot is configured to receive the arms of the tab; and

wherein the inserting step comprises inserting the arms through the radial slot.

13. The method of claim 12, further comprising placing a nose cone cap over a distal end portion of the nose cone and securing the nose cone cap to the storage tube, wherein the nose cone is restrained from moving distally relative to the storage tube by the nose cone cap.

14. The method of claim 12 or claim 13, further comprising securing a second pair of arms of the tab about an exterior surface of the nose cone cap.

15. The method of any of claims 12-14, further comprising inserting a stylet proximally through a distal end of the nose cone.