

Claims

1. A cannula structure configured for cannulating a tubular anatomical vessel of a body of a patient, the tubular anatomical vessel having a superficial wall, the cannula structure comprising:

5 a first tube insertable into the tubular anatomical vessel through a cannulation point, the first tube having an elongate length and a lumen therethrough for infusing and channeling into the anatomical vessel a fluid, the first tube comprising:

a distal fluid input configured for receiving the fluid;

10 a first segment having a first lumen therethrough aligned with the lumen of the first tube and which is fluidically coupled to the distal fluid input, wherein the first segment has a lengthwise axis that extends through the first lumen, wherein the first segment is configured for residing entirely internal to the cannulated tubular anatomical vessel, and wherein a distal portion of the first segment includes a flexible or semi-flexible angulatable section;

15 a second segment having a second lumen aligned with and integrally fluidically coupled to the first lumen, wherein the second segment is distal to the first segment and the flexible or semi-flexible angulatable section, and wherein the first and second lumens forms the lumen of the first tube;

a plurality of fluid outputs coupled to the distal fluid input and configured for discharging the fluid into the tubular anatomical vessel, wherein the plurality of fluid outputs comprises:

20 an exit opening disposed near or at a proximal end of the first segment, the exit opening configured for outputting or discharging a first portion of the fluid into the tubular anatomical vessel along a proximal flow direction that is (a) toward the patient's heart, and (b) parallel to the lengthwise axis of the first segment; and

25 a set of fenestrations carried by distal portions of the first segment along portions of a length of the first segment and about portions of a circumference of the first segment on the flexible or semi-flexible angulatable section of the first segment, the set of fenestrations configured for outputting or discharging a second portion of the fluid into the tubular anatomical vessel such that the second portion of the fluid flows along a distal

flow direction that is (a) away from the patient's heart, (b) parallel to the lengthwise axis of the first segment, and (c) opposite to the proximal flow direction; and

an anchoring assembly proximal to the second segment of the first tube and carried by the first segment of the first tube near or adjacent and distal to the set of fenestrations,

5 wherein the anchoring assembly is configured for engagement with the superficial wall of the cannulated tubular vessel adjacent or just internal to the cannulation point, wherein

the anchoring assembly comprises at least one outwardly or radially displaceable structure that is coupled to one of an inflation tube and a slidably displaceable switch,

and which is outwardly or radially displaceable away from the first lumen beyond an

10 exterior surface of the first segment in response to clinician application of a positive pressure that introduces air or liquid into the anchoring assembly through the inflation tube or clinician displacement of the slidably displaceable switch, and wherein the

anchoring assembly has a distal portion disposed closest to the cannula structure's distal end at a first circumferential position about the first segment and a proximal portion

15 disposed closest to the cannula structure's proximal end at a distinct second circumferential position about the first segment such that the distal portion of the

anchoring structure is closer to the second segment of the first tube than the proximal portion of the anchoring structure and the anchoring assembly

is arranged obliquely with respect to the lengthwise axis of the first segment prior to angulation of

20 the flexible or semi-flexible angulatable section of the first segment.

2. The cannula structure of claim 1, wherein the anchoring assembly comprises an inflatable cuff that is disposed about the first segment, and wherein the inflation tube is fluidically coupled to a one-way valve assembly and the inflatable cuff.

25 3. The cannula structure of claim 1, wherein the inflatable cuff that partially resides within portions of a wall thickness of the first segment.

4. The cannula structure of claim 1, further comprising a flow indicator assembly comprising: a fluid indicator port carried by the second segment distal to the anchoring assembly; and a fluidic channel coupled to the fluid indicator port, the fluidic channel comprising a transparent or translucent material capable of providing a visual indication of a flow of fluid from the tubular anatomical vessel into the fluid indicator port.

5. The cannula structure of claim 4, wherein the flow indicator assembly further comprises a luminous portion disposed along the fluidic channel, the luminous portion carrying a substance capable of reacting with the fluid within the fluidic channel to thereby enhance the visual indication of the flow of fluid in the fluidic channel.

6. The cannula structure of claim 1, wherein the anchoring assembly comprises a plurality of outwardly or radially displaceable structures disposed about portions of the circumference of the first segment, and wherein the plurality of outwardly or radially displaceable structures includes a first outwardly or radially displaceable structure disposed closest to the cannula structure's distal end, and a second outwardly or radially displaceable structure distinct from the first outwardly or radially displaceable structure and disposed proximal to the first outwardly or radially displaceable structure.

7. The cannula structure of claim 6, wherein the set of fenestrations includes a first fenestration and a second fenestration disposed at different distal locations relative to each other along the first segment and different circumferential locations relative to each other along the first segment, and wherein the first outwardly or radially displaceable structure is disposed distal to the first fenestration, and the second outwardly or radially displaceable structure is disposed distal to the second fenestration.

8. The cannula structure of claim 6, wherein the anchoring assembly comprises (a) an inflatable cuff, or (b) a rigid or generally rigid annular fluid transport channel fluidically coupled to the plurality of outwardly or radially displaceable structures.

9. The cannula structure of claim 8, wherein the anchoring assembly comprises the inflatable cuff, wherein the plurality of outwardly or radially displaceable structures comprises a plurality of flange members fluidically coupled to the inflatable cuff, and wherein each of the plurality of flange members is outwardly or radially displaceable away from the first lumen in response to inflation of the inflatable cuff.

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10. The cannula structure of claim 9, wherein each of the plurality of flange members protrude away from and beyond the exterior surface of the first segment responsive to inflation of the inflatable cuff while the inflatable cuff (i) resides at least partially within the thickness of a wall of the first segment, or (ii) remains internal to the exterior surface of the first segment.

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11. The cannula structure of claim 1, wherein the anchoring assembly comprises the slidably displaceable switch, wherein the slidably displaceable switch is coupled to a plurality of thin flexible strips of material that extend along and within a wall of the second segment of the first tube and which terminate distal to the set of fenestrations, wherein the at least one outwardly or radially displaceable structure comprises a plurality of petals, wherein each of the plurality of petals is coupled to or formed from an end portion of a corresponding strip of material, wherein responsive to activation of the slidably displaceable switch, each end portion is configured to extend outwardly beyond the exterior surface of the first segment at a different distal location along the first segment and a different circumferential location about the first segment, and wherein each different distal location is distal to the set of fenestrations.

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12. The cannula structure of claim 11, wherein the set of fenestrations comprises a first fenestration and a distinct second fenestration, and wherein the plurality of petals includes a first petal corresponding to the first fenestration, and a second petal corresponding to the second distinct fenestration.

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13. The cannula structure of claim 1, further comprising a second tube configured for mating engagement with the first tube and which serves as a dilator relative to the first tube.