WHAT IS CLAIMED IS:

1. An intravascular nerve ablation system for delivery of an ablative fluid to a volume of tissue in proximity to the vessel wall of a target vessel comprising:

a catheter body having a proximal end, a distal end, a central axis extending in a longitudinal direction and a fluid injection lumen;

at least a first and second guide tube, located distal to the distal end of the catheter body each guide tube having a distal end,a lumen, and a distal portion that is outwardly expandable between a first position aligned with the axis and a second position inclined away from the axis;

at least a first and second injector tube, each injector tube having an injection lumen providing a pathway for delivering the ablative fluid, the injector tubes located coaxially inside the lumens of the first and second guide tubes respectively, each injector tube having a sharpened injection needle with injection egress at its distal end, each injector tube being adapted to slide distally and proximally within the lumens of the first and second guide tubes; and

a penetration depth limitation mechanism for limiting the depth of penetration of the injection needles into the vessel wall of the target vessel.

2. The system of Claim 1 further including a sheath fixedly attached to a sheath control mechanism located near the proximal end of the catheter body, the sheath located coaxially outside of the catheter body, the sheath having a closed position and an open position, the open position allowing the guide tubes to expand outward against the inside of the wall of the target vessel, the closed position completely enclosing the guide tubes, injector tubes and injection needles.

3. The system of Claim 2 where the distal portion of the guide tubes are self-expanding and expansion of the guide tubes is caused the proximal motion of the sheath being releasing the self-expanding guide tubes to move outwardly from the central axis of the catheter body.

4. The system of Claim 2 further including an injector tube control mechanism adapted to control the distal and proximal motion of the injector tubes as the slide within the lumens of the guide tubes.

5. The system of claim 4 futher including labeling to indicate the order of use of the sheath control mechanism and the injector tube control mechanism, , the labeling elected from at least one of the types from the group of roman alphanumeric letters, numbers, words, arrows or directional indicators.

6. The system of Claim 1 where the delivery of the ablative fluid is in a circular pattern.

7. The system of claim 1 further including a port for injecting the ablative fluid, the port being in fluid communication with the fluid injection lumen of the catheter body,

8. The system of Claim 1, wherein the injection needles are less than 25 gauge.

9. The system of Claim 1, further including at least one radiopaque marker.

10. The system of Claim 9, comprising a radiopaque marker on the sheath.

11. The system of Claim 9, comprising a radiopaque marker on at least one of the guide tubes.

12. The system of Claim 1 where the penetration limiting mechanism limits the penetration of the injection egress to a location in proximity to the vessel wall of the target vessel elected from one of the locations from the group of the media, the adventitia, outside of the aventitia, both the media and adventitia or both the adventitia and outside of the adventitia of the target vessel.

13. An intravascular nerve ablation system for delivery of an ablative fluid to a volume of tissue in proximity to the vessel wall of a target vessel comprising:

a catheter body having a proximal end, a central axis extending in a longitudinal direction and a fluid injection lumen;

an external source of ablative fluid in fluid communication with said fluid injection lumen;

a guide tube having a proximal end, a distal end and a lumen, the guide tube having a distal portion adapted to expand outward;

an injector tube having an injection lumen in fluid communication with the fluid injection lumen of the catheter body, a portion of the injector tube located coaxially inside of the guide tube, the injector tube having a sharpened injection needle with injection egress at its distal end, the injection lumen of the injector tube

being in fluid communication with the fluid injection lumen of the catheter body, the injector tube being adapted to slide in the proximal and distal directions within the lumen of the guide tube;

an injector tube control mechanism adapted to control the proximal and distal movement of the injector tube with respect to the guide tube;

a port for injection of the ablative fluid located near the proximal end of the catheter body, the port being in fluid communication with the fluid injection lumen of the catheter body;

and, a penetration depth limitation mechanism for limiting the depth of penetration of the injection needle injection egress into the vessel wall of a target vessel.

14. The system of Claim 13 further including a sheath having a sheath control mechanism at its proximal end, the sheath located coaxially outside of the catheter body, the sheath having a closed position and an open position, the open position allowing the guide tube and injector tube to expand outward to facilitate delivery of an ablative fluid to the wall of the target vessel, the sheath control mechanism adapted to control the longitudinal motion of the sheath between its closed and open positions.

15. The system of claim 14 where the closed position of the sheath causes complete encapsulation of the guide tube, and injection egress at the distal end of the injection needle, the closed position providing complete protection from inadvertent release of fluid from the lumens of the system during insertion and removal from the target vessel, the closed position further preventing accidental needle stick injuries to the patient or health care workers using the system.

16. The vascular nerve ablation system of Claim 15 further including a tapered distal portion that in combination with the sheath completely enclose the injection needles when the sheath is in its closed position.

17. The system of Claim 14 further including a radiopaque marker in proximity to the distal end of the sheath.

18. The system of claim 14 further including a locking mechanism that when engaged prevents the longitudinal motion of the sheath.

19. The vascular nerve ablation system of Claim 13 where the delivery of the ablative substance is in a helical pattern.

20. The vascular nerve ablation system of claim 13 further including a component to prevent movement of the injector tube with respect to the guide tube.

21. The system of claim 20 further including a handle located near the proximal end of the catheter body, the component to prevent movement of the injector tube being integral to the handle.

22. The system of Claim 13 where the delivery of the ablative fluid is into a specific volume of tissue selected from at least one of the group consisting of the media of the wall of the target vessel, the adventitia of the wall of the target vessel, the volume outside of the adventitia of the wall of the target vessel, the media and adventitia of the wall of the target vessel, and the adventitia and the volume outside of the adventitia of the target vessel.

23. The system of Claim 13 where the delivery of ablative fluid includes at least three points of injection egress.

24. The system of Claim 13 where said catheter body includes a fixed guide wire attached to its distal end.

25. The system of Claim 13 configured to be advanced coaxially over a separate guide wire.

26. The system of claim 13where the distal portion of the injector tube is self-expanding.

27. The system of Claim 26 where the self-expanding portion is formed from NITINOL.

28. The system as of Claim 13 where said ablative fluid includes at least one of the ablative fluids selected from the group including ethanol, phenol, glycerol, lidocaine, bupivacaine, tetracaine, benzocaine, guenethadine, botulinum toxin, distilled water, hypotonic saline solution or hypertonic saline solution.

29. The system of Claim 13 where said ablative fluid is a heated fluid composition.

30. The vascular nerve ablation system of Claim 13 where said ablative fluid is a cooled fluid composition.

31. The vascular nerve ablation system of Claim 13 where said ablative fluid is a form of steam injected through the injection lumen of the catheter body.

32. The system of Claim 13, the injector tube control mechanism and the penetration depth limitation mechanism are located on a proximal handle.

33. A percutaneously delivered system for peri-vascular fluid delivery comprising:

a fluid delivery catheter having a proximal control portion, a central catheter body, a distal fluid delivery portion;

the distal fluid deliver portion including 2 or more injection needles having lumens, the injection needles having injection egress near their distal ends, the needles further adapted to move radially outward to penetrate the wall of a target vessel to position the injection egress at a pre-set depth with respect to the inner wall of the target vessel;

the proximal control portion including a proximal port for injection of fluids and a control mechanism adapted to cause the outward radial motion of the injection needles;

the central catheter body including an injection lumen that provides fluid communication between the proximal port for injection of fluids and the lumens of the injection needles, the central portion further including a member that allows the proximal control mechanism to cause the outward radial motion of the injection needles,

the fluid delivery catheter further including an internal fluid volume comprising the internal fluid volume of the catheter from the proximal end of the proximal port of the proximal control portion to the injection egress at the distal end of the injection needles, the internal fluid volume being less than 0.5ml.

34. The system of Claim 33, wherein the internal fluid volume of the fluid delivery catheter is less than 0.2 ml.

35. The system of Claim 33, wherein the internal fluid volume of the fluid delivery catheter is less than 0.1 ml.

36. The system of Claim 33, wherein at least one of the lumens of the injection needles comprises a volume occupying structure.

37. The system of Claim 36, wherein the volume occupying structure comprises a wire configured to reduce the internal fluid volume.

38. The system of Claim 37, wherein the wire is formed from a radiopaque material to enhance visualization of the injection needles under fluoroscopy.

39. A percutaneously delivered system for peri-vascular fluid delivery comprising:

a fluid delivery catheter, having a proximal control portion, a central catheter body, a distal fluid delivery portion;

the distal fluid deliver portion including 2 or more injection needles having lumens, the injection needles having injection egress near their distal ends, the needles further adapted to move radially outward to penetrate the wall of a target vessel to position the injection egress at a pre-set depth with respect to the inner wall of the target vessel;

the proximal control portion including a proximal port for injection of fluids and a control mechanism adapted to cause the outward radial motion of the injection needles;

the central catheter body including an injection lumen that provides fluid communication between the proximal port for injection of fluids and the lumens of the injection needles, the central portion further including a member that allows the proximal control mechanism to cause the outward radial motion of the injection needles,

the injection needles further including structures designed to provide enhanced visibility of the injection needles under fluoroscopy.

40. The system of Claim 39, wherein at least a portion of at least one of the structures comprises a radiopaque material.

41. The system of Claim 40, wherein the radiopaque material includes at least one of tantalum, platinum, and gold.

42. The system of Claim 40, wherein at least one of the lumens of the injection needles comprises a radiopaque wire.

43. The system of Claim 40, wherein at least a portion of the injection needles comprises at least one of a radiopaque band, ring, filler, insert, plug, and plating.

44. A percutaneously delivered system for peri-vascular fluid delivery comprising:

a fluid delivery catheter, having a proximal control portion, a central catheter body, a distal fluid delivery portion;

the distal fluid delivery portion including 2 or more expandable guide tubes, each guide tube having a distal end and a lumen, the distal fluid delivery portion also including 2 or more injection needles having injection lumens, each injection needle adapted to move distally and proximally within the lumen of a guide tube, each needle having injection egress near its distal end, the needles further adapted to move distally outward a preset distance beyond the distal ends of the guide tubes to penetrate the wall of a target vessel to position the injection egress at a pre-set depth with respect to the inner wall of the target vessel;

the proximal control portion including a proximal port for injection of fluids and a mechanism adapted to cause the distal and proximal motion of the injection needles, the mechanism further adapted to limit the penetration of the injection egress to the preset depth with respect to the inner wall of the target vessel, the proximal control portion also including an internal mechanism to set the pre-set distance for penetration of the injection egress beyond the inside wall of the target vessel;

the central catheter body including an injection lumen that provides fluid communication between the proximal port for injection of fluids and lumens of the injection needles, the central portion further including a member that allows the proximal control mechanism to cause the distal and proximal motion of the injection needles.

45. The system of Claim 44, wherein the internal mechanism to set the pre-set distance is accessible to the user of the system.

46. The system of Claim 44, wherein the internal mechanism to set the pre-set distance is used to calibrate the pre-set distance during manufacturing the internal mechanism being hidden from the user of the system.

47. A percutaneously delivered system for peri-vascular fluid delivery comprising:

a fluid delivery catheter, having a proximal control portion, a central catheter body, a distal fluid delivery portion;

the distal fluid delivery portion having movable components, the movable components including an outer sheath, 2 or more expandable guide tubes, each having a distal end and a lumen, the fluid delivery portion also including 2 or more injector tubes with distal injection needles the injector tubes and injection needles having injection lumens, each injector tube adapted to move distally and proximally within the lumen of a guide tube, each injection needle having injection egress near its distal end, each needle further adapted to move distally outward a preset distance beyond the distal end of the guide tube to penetrate the wall of a target vessel and position the injection egress at a pre-set depth with respect to the inner wall of the target vessel, the distal fluid delivery portion also including an outer sheath having a closed position and an open position, the open position locates the distal end of the sheath a preset distance proximal to the position of the distal end of the sheath in the closed position;

the proximal control portion including a proximal port for injection of fluids, an injection needle control mechanism and a sheath control mechanism, the injection needle control mechanism adapted to cause the distal and proximal motion of the injector tubes with distal injection needles with respect to the guide tubes, the sheath control mechanism adapted to cause the distal and proximal motion of the outer sheath between its closed position and its open position, the proximal control portion further adapted to limit the penetration of the injection egress to the preset depth with respect to the inner wall of the target vessel, the proximal portion also including a mechanism to adjust the preset distance, the proximal control portion having at least one locking mechanism to prevent motion of at least one of the movable components of the distal fluid delivery portion;

the central catheter body including an inner tube and a sheath, the inner tube being coaxially within the sheath, the inner tube having an injection lumen that provides fluid communication between the proximal port for injection of fluids and the lumens of the injector tubes which are in fluid communication with the lumens of the injection needles, the inner tube also providing the means for the injection needle

control mechanism to cause the distal and proximal motion of the injector tubes with distal injection needles with respect to the guide tubes.

48. The system of Claim 47, wherein the proximal control portion includes a locking mechanism configured to prevent distal and proximal movement of the sheath with respect to the guide tubes.

49. The system of Claim 47, wherein the proximal control portion includes a locking mechanism configured to prevent distal and proximal movement of the injection tubes with respect to the guide tubes.

50. The system of Claim 47, wherein the proximal control portion comprises an interlocking mechanism configured to prevent motion of at least one of the movable components of the distal fluid delivery portion if another of the movable components of the distal fluid delivery portion is in an undesired state.

51. The system of Claim 50, wherein the proximal control portion comprises an interlocking mechanism configured to prevent the outer sheath from moving into its closed position unless the injection needles are completely within the lumens of the guide tubes.

52. The system of Claim 50, wherein the proximal control portion comprises an interlocking mechanism configured to prevent distal and proximal motion of the injection tubes unless the outer sheath is in its open position.

53. A percutaneously delivered system for peri-vascular delivery of fluid comprising:

a fluid delivery catheter, having a longitudinal axis, a proximal control portion, a central catheter body, a distal fluid delivery portion and a container of fluid for injection;

the distal fluid deliver portion having movable components, the movable components including 2 or more expandable guide tubes each having a lumen and a distal end with a center, the movable components also including 2 or more injector tubes with distal injection needles. The injector tubes and injection needles having injection lumens, each injector tube adapted to move distally and proximally within the lumen of a guide tube, each injection needle having injection egress near its distal end, the needles further adapted to move radially outward to a fully deployed position

to penetrate the wall of a target vessel to position the injection egress at a pre-set depth with respect to the inner wall of the target vessel, the injector tubes with distal injection needles having a curved shape, the curved shape causing at least one injection egress of the injection needles to curve back in the proximal longitudinal direction with respect to the center of the distal end of the guide tube, when the needles are in the fully deployed position;

the proximal control portion including a proximal port for injection of fluids and a control mechanism adapted to cause the outward radial motion of the injection needles;

the central catheter body including an injection lumen that provides fluid communication between the proximal port for injection of fluids and lumen of the injection needles, the central portion further including a member that allows the proximal control mechanism to cause the outward radial motion of the injection needles.

54. The system of claim 53 where the distal portion of the guide tubes have a guide tube radius of curvature and the distal portion of the injector tubes including the injection needles have a needle radius of curvature, the guide tube radius of curvature and the needle radius of curvature being approximately the same when the guide tubes are fully expanded.

55. A fluid delivery system for delivery of a prescribed fluid in or outside the vessel wall of a target vessel of a human body comprising:

a catheter body having a central axis extending in a longitudinal direction having a fluid injection lumen, the fluid injection lumen being in fluid communication with three or more sharpened injection needles, the catheter body further including a distal tip and an outer sheath, the outer sheath having a first closed position where the sheath and the distal tip together enclose the sharpened injection needles, the sheath having a second open position, the open position allowing the injection needles to expand outward into the inside vessel wall of a target vessel;

an external source of fluid in fluid communication with said fluid injection lumen, and injection egress located near the distal end of the needles adapted to

provide circumferential delivery of the ablative fluid from the fluid injection lumen at a prescribed depth of injection.

56. The system of Claim 55, wherein the delivery of the fluid is into a specific volume of tissue selected from:

the media of the wall of the target vessel,

the adventitia of the wall of the target vessel,

a volume outside of the adventitia of the wall of the target vessel,

the media and adventitia of the wall of the target vessel, and

the adventitia and the volume outside of the adventitia of the target vessel.

57. The system of Claim 55, wherein the delivery includes at least three points of injection egress.

58. The system of Claim 55, further including a distal balloon to prevent the ablative fluid from flowing downstream in the target vessel.

59. The system of Claim 55, wherein said catheter body includes a fixed guide wire attached to its distal end.

60. The system of Claim 55 configured to be advanced coaxially over a separate guide wire.

61. The system of Claim 55, wherein the injection egress is provided by at least one injector tube having an injection needle at its distal end, the injection egress being near the distal end of the injection needle.

62. The system of Claim 55, further including a distal self-expanding portion.

63. The system of Claim 62, wherein the distal self-expanding portion includes the injection egress.

64. The system of Claim 63, wherein the distal self-expanding portion includes at least one guide tube, and the injection egress is provided by at least one injector tube having a needle at its distal end, the at least one injector tube adapted to be advanced and retracted through the at least one guide tube.

65. The system of Claim 63, further including a sheath that when retracted to its most proximal open position allows the distal self-expanding portion to expand outward.

66. The system of Claim 62, wherein the self-expanding portion is formed from NITINOL.

67. The system of Claim 55, wherein the sheath includes a radiopaque marker near its distal end.

68. The system of Claim 55, wherein the distal tip includes a radiopaque marker.

69. The system as of Claim 55, wherein the fluid includes at least one of the fluids selected from the group including chemotherapy agents, alcohol, ethanol, phenol, glycerol, lidocaine, bupivacaine, tetracaine, benzocaine, distilled water, hypertonic saline, hypotonic saline, guenethadine, and botulinum toxin.

70. The system of Claim 55, wherein said ablative fluid is a heated fluid composition.

71. The system of Claim 55, wherein said ablative fluid is a cooled fluid composition.

72. The system of Claim 55, wherein said ablative fluid is a form of steam injected through the injection lumen of the catheter body.

CLAIMS

1. A vascular nerve ablation system for ablating tissue in or near the vessel wall of a target vessel comprising:

a catheter body having a central axis extending in a longitudinal direction and a fluid injection lumen;

at least two self-expanding injector tubes, each of said injector tubes having an injector tube lumen in fluid communication with the catheter body fluid injection lumen, the distal end of each of said injector tubes being an injector needle with injector needle lumen, and the injector needle lumen being in fluid communication with the injector tube lumen;

a single penetration limiting member directly attached to all of said injector tubes, the single penetration limiting member located at a predetermined distance from the distal end of each injector needle, wherein the single penetration limiting member is configured to simultaneously limit the penetration of each injector needle; and,

an external source of ablative fluid in fluid communication with each of said injector tube lumens.

2. The vascular nerve ablation system as recited in claim 1 where said catheter body includes a fixed guide wire attached to its distal end.

3. The vascular nerve ablation system as recited in claim 1 configured to be advanced coaxially over a separate guide wire.

4. The vascular nerve ablation system of claim 3 having an over-the-wire configuration where the guide wire lumen runs the entire length of the catheter body.

5. The vascular nerve ablation system of claim 3 having a rapid exchange configuration where the proximal end of the guide wire lumen exits from the catheter body at a location at least 10 cm distal to the proximal end of the catheter body.

6. The vascular nerve ablation system as recited in claim 1 further including a sheath that when retracted to its most proximal open position allows the expandable injector tubes to expand outward.

7. The vascular nerve ablation system as recited in claim 1 further including a sheath that includes a radiopaque marker at its distal end.

8. The vascular nerve ablation system as recited in claim 1 further including a sheath that includes a Tuohy-Borst adapter at its proximal end, the Tuohy-Borst adapter when tightened preventing the sheath from moving in the longitudinal direction with respect to the remainder of the vascular nerve ablation system.

9. The vascular nerve ablation system of claim 8 where said sheath has a distal closed position and a proximal open position, where the sheath in the closed position extends in the distal direction so as to completely cover the injector needles.

10. The vascular nerve ablation system as recited in claim 1 where said single penetration limiting member is a cord fixedly attached to each of said injector tubes.

11. The vascular nerve ablation system as recited in claim 1 where said injector tubes are formed from NITINOL.

12. The vascular nerve ablation system as recited in claim 1 where said ablative fluid is an ethanol composition.

13. The vascular nerve ablation system as recited in claim 1 where said single penetration limiting member is located at least 0.5 mm proximal to the distal end of said injector needles.

14. A vascular nerve ablation system for ablating tissue in or near the vessel wall of a target vessel comprising:

a catheter body having a central axis extending in a longitudinal direction and a fluid injection lumen;

at least two self-expanding injector tubes, each of said injector tubes having an injector tube lumen in fluid communication with the catheter body fluid injection lumen, the distal end of each of said injector tubes being an injector needle with injector needle lumen, and the injector needle lumen being in fluid communication with the injector tube lumen;

a single penetration limiting member directly attached to all of said injector tubes, the single penetration limiting member configured to provide uniform penetration and angular spread of the injector needles; and,

an external source of ablative fluid in fluid communication with each of said injector tube lumens.

15. The vascular nerve ablation system as recited in claim 14 further including a sheath that when retracted allows the expandable injector tubes to expand outward.

16. The vascular nerve ablation system as recited in claim 14 where said injector tubes are formed from NITINOL.

17. A vascular nerve ablation system for ablating tissue in or near the vessel wall of a target vessel comprising:

a catheter body having a central axis extending in a longitudinal direction and a fluid injection lumen;

at least two self-expanding injector tubes, each of said injector tubes having an injector tube lumen in fluid communication with the catheter body fluid injection lumen, the distal end of each of said injector tubes being an injector needle with injector needle lumen, and the injector needle lumen being in fluid communication with the injector tube lumen;

a single penetration limiting member directly attached to all of said injector tubes, wherein said at least two injector tubes are configured to move longitudinally and expand simultaneously, wherein the single penetration limiting member is configured to limit the penetration of each of said injector needles into the tissue; and,

an external source of ablative fluid in fluid communication with each of said injector tube lumens.

18. The vascular nerve ablation system as recited in claim 17 further including a sheath that when retracted allows the expandable injector tubes to expand outward.

19. The vascular nerve ablation system as recited in claim 17 where said injector tubes are formed from NITINOL.