ABSTRACT

A balloon type intravascular occluding catheter comprising a first and second flexible tube and a tapered nose at one terminal end of the tubes. An elastic annulus circumscribes the tubes rearwardly of, but adjacent to the nose and is connected in such a manner as to be inflatable to form a balloon by fluid applied through apertures in the first of the tubes which underlies the annulus of flexible material. A trocar is removably disposed in the second tube, the trocar having a vessel piercing tip thereon, and an aperture in the nose which is aligned with the trocar to permit entrance and egress of the tip beyond the nose so as to engage the vessel wall for penetration thereof and entry of the catheter thereinto. Thereafter the balloon may be inflated so as to occlude the vessel and, if desired, the trocar may be removed to inject medication or the like through the second tube.

18 Claims, 12 Drawing Figures
INTRAVASCULAR OCCLUDING CATHETER

SUMMARY OF THE INVENTION AND STATE OF THE PRIOR ART

The present invention relates to an intravascular occluding catheter and a method of utilizing the same to penetrate and enter a vessel and occlude such vessel, and more particularly relates to a balloon type intravascular occluding catheter having a removable trocar with a vessel piercing tip thereon for permitting the formation of an incision in the vessel walls and entry of the catheter connected thereto past the balloon so that the balloon may be expanded to thereby internally clamp or otherwise occlude fluid flow in the vessel.

There are numerous catheters depicted in the prior art for use in surgery. One of the most famous of the catheters is the Fogarty catheter as illustrated in U.S. Pat. No. 3,435,826 which is utilized for embolectomies or removal of an embolus that has broken away from a thrombus. Another type of catheter depicted in the prior art is illustrated in U.S. Pat. No. 3,087,493 wherein the catheter is utilized as an endotracheal tube to maintain a free air way or breathing passage for the patient during surgical operations. Modifications and variations of catheter types are exhibited in such patents as U.S. Pat. No. 2,936,761 wherein the catheter is designed specifically for use in the urinary bladder, or in U.S. Pat. No. 3,547,119 wherein the catheter is in essence a cannula (a small tube for insertion into a duct or vessel) with a stylet which is slidably disposed therein and has a point thereon for making an incision in a vessel.

There are many instances in the human body where, in repairing vascular ruptures or removing blockages therein, it is necessary to stop blood flow in order to repair the rupture or remove the blockage in the vessel. Conventional practice is to clamp the vessel being repaired, at least at the higher pressure end, to keep the area to be repaired free of blood so that the repair may be made or blockage removed, while simultaneously preventing a loss of blood which would otherwise have to be replaced. When the vessel being clamped, for example, is in a relatively young person, the vessel is usually soft and pliable and there is little (in most instances) calcium formation in the vessel. However, in older people that have minor arterial diseases, or calcium formations within the artery, placing a clamp on the artery causes the calcium to break up. After the repair has been made and the clamp removed, the calcium tends to move in the artery in the direction of blood flow and may act as an occluding embolus, whose affect is dependent upon the place where it lodges. Additionally, as the arteries and veins become older they tend to become less pliable and the placement of a clamp thereon tends to create a crease in the vessel wall which causes weakening thereof, many times resulting in an increase in the original atheromatous process at that point.

Accordingly, it is desirable to provide an intravascular occluding device that will expand radially from within the vessel to thereby occlude flow in the vessel whether it be blood or any other body fluid, to thereby inhibit weakening of the vessel lining and thereby preventing the release of calcium and/or atheroma and the possible damage to the vessel wall by an external occluding clamp, as heretofore mentioned, while forming to the internal shape of the vessel.

Additionally, because operations which are performed to repair, for example, ruptured aortic aneurysms are usually conducted on an emergency basis, the implement being used to occlude the vessel should preferably be one which may enter the vessel and occlude as rapidly as possible so as to permit clearing of the ruptured area to facilitate repairs, and to effect rapid but noninjurious clamping of the vessel from at least its high pressure end.

In view of the above, it is a principal object of the invention to provide an intravascular occluding catheter which may rapidly and effectively be applied to stem fluid flow or isolate a region of the vessel which is to be surgically addressed.

Another object of the present invention is to provide a catheter of the balloon type which may rapidly make an incision in the wall of a vessel and enter therein to permit expansion of the balloon so as to occlude further passage of fluids.

Another object of the present invention is to provide a novel method of occluding a vessel with a catheter having an expansible balloon adjacent one end thereof and a vessel wall piercing tip thereon, including the steps of piercing the vessel wall with the tip, inserting the catheter into the vessel through the incision thus made, and expanding the balloon to thereby occlude flow in the vessel.

Yet another object of the present invention is to provide a method of intravascular occlusion utilizing a balloon-type catheter, as above set forth, which includes a trocar disposed in the catheter and having a vessel piercing tip on one end thereof, whereby after the balloon on the catheter has entered into the vessel and internally clamped the vessel to prevent further flow, removing the trocar will provide a passage for medication into the vessel, or permit fluid samples to be taken through the passage.

Yet another object of the present invention is to provide a novel intravascular occluding catheter having a pair of tubes, one for permitting the entry of fluid for expansion of the balloon and the other for entrance and egress of a trocar having an incising tip thereon.

Yet another object of the present invention is to provide a catheter which may be used in pairs or more to isolate a vessel section so as to permit entry of medication into the section so as to prevent contamination of surrounding areas when it is desired to surgically address the particular area isolated.

Other objects and a more complete understanding of the invention may be had by referring to the following specification and claims taken in conjunction with the accompanying drawings in which:

FIG. 1 is an enlarged fragmentary sectional view of a catheter constructed in accordance with the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view of a portion of the device illustrated in FIG. 1;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3;

FIG. 5 is an enlarged fragmentary sectional view of another embodiment of a catheter constructed in accordance with the present invention;
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FIG. 6 is a sectional view taken along line 6—6 of FIG. 5;

FIG. 7 is an enlarged fragmentary sectional view of still another embodiment of a catheter constructed in accordance with the present invention;

FIG. 8 is an enlarged fragmentary perspective view illustrating the construction of the catheter of FIG. 7;

FIG. 9 is a fragmentary schematic view of a catheter constructed in accordance with the present invention and being used for intravascular occlusion of the aorta so that a ruptured aortic aneurysm may be repaired;

FIG. 10 is another view of a catheter constructed in accordance with the present invention for repairing and rupture below the renal arteries;

FIG. 11 depicts the use of a catheter constructed in accordance with the present invention for occluding the aorta for clearing an occluding clot at the branch of the aorta and the common iliac (commonly called Leriche syndrome); and,

FIG. 12 is a fragmentary schematic view of a typical use of a pair of catheters constructed in accordance with the present invention and being utilized in conjunction with a conventional external occluding clamp for repairing a rupture in a vessel.

Referring now to the drawing, and especially FIG. 1 thereof, the distal end 11 of an intravascular occluding, balloon type catheter 10 constructed in accordance with the present invention is illustrated therein. As shown, the catheter 10 comprises a flexible tubular member or first tube 12 having a bore 12A, and defining a first passageway between the inner wall of the tube and the exterior of a second tube, the second tube also having a bore 13A defining a second passageway. The catheter includes a tapered, in the present instance bullet shaped, nose 14 to facilitate entry thereof into an incision in a vessel (not shown). In the illustrated instance the second tube 13 is mounted coaxially of the first tube 12 and may be epoxied or otherwise connected to the first tube at the interior portion 14A of the nose 14 adjacent the terminal end of the second tube 13, as at 13B.

Disposed adjacent but rearwardly of the nose 14 is an annular recess 15, which houses a balloon forming the first tube 12, to this end and in the illustrated instance, the recess 15 is disposed circumferentially of and in the first tube 12 to provide a relatively smooth continuous exterior in conjunction with the elastic annulus 16. As shown, apertures 19 underly the annulus and extend radially through the wall of the tube 12 to permit fluid communication between the annulus 16 and the bore 12A. The annulus includes laterally displaced marginal edge portions 17 and 18, the annulus being connected along its marginal edge portions, in the illustrated instance as by thread or the like 20 to form an inflatable balloon upon a pressurized fluid entry into the bore 12A. A suitable air drying cement or the like may be soaked onto the bindings or thread 20 to provide a smooth surface thereon. In this connection a similar type structure with regard to binding may be employed as illustrated in the patent to Fogarty No. 3,435,826.

In accordance with the invention, means are provided for cooperation with the catheter 10 to make an incision in a vessel for immediate insertion of the catheter into the vessel to a point at least rearwardly of the balloon forming annulus 16. To this end, and referring first to FIGS. 1 and 3, an aperture 21 is formed in the nose 14, in the illustrated instance centrally of the nose so as to be aligned with the bore 13A of the second tube 13. Disposed in the bore 13A of the second tube 13 is a trocar 22 having a vessel piercing tip or end 23 thereon. The vessel piercing end 23 has preferably a piercing point 24 with a cutting edge 25 on the upper surface thereof, the cutting edge being slightly concave as illustrated in FIG. 2 and including side scalloped or tapered portions 26 and 27 respectively. The underside 28 of the tip is preferably smoothly convex so as to provide a camming surface which gently merges into the bullet shaped nose 14. The cutting edge 25, on the other hand, is concave so as to merge into the exterior of the nose 14. In this manner, by disposing the distal end 11 of the catheter 10 at an obtuse angle along the axis of the vessel to be pierced, the tip 23 will easily enter through a wall of the vessel, and even if accidentally striking a unintended interior portion of the vessel, will be cammed by the smooth underside 28, the edge 25 serving to make an incision in the wall of the vessel to permit easy entrance of the nose 14 into the vessel.

The trocar 22 may be made of a flexible wire to give stability to the catheter 10 for ease of entry into the vessel. After entry of the distal end 11 of the catheter 10 into the vessel through the incision thus made, beyond the balloon forming annulus, a fluid such as a saline solution or air may be pressurized in the bore 13A to cause expansion of the elastic annulus thereby forming an internally occluding clamp. Thereafter the trocar may be removed to permit a supply of medication, anticoagulant or the like to enter the vessel through the bore 13A of second tube 13. Additionally, after removing the trocar, specimens of blood or other fluid in the occluded vessel may be taken through the bore 13A.

Although the embodiment illustrated in FIGS. 1—4 is the preferred embodiment, other embodiments lend themselves to the practice of the method of the present invention and incorporate apparatus constructed in accordance therewith. For example, in FIG. 5, the distal end 41 of an intravascular occluding, balloon type catheter 40, constructed in accordance with the present invention, is illustrated therein. As shown, the catheter 40 comprises a first tube 42 and a second tube 43, the tube 42 having a bore 42A and a second tube having a bore 43A including a tapered nose 44 to facilitate entry of the catheter into an incision in a vessel (not shown). As shown the second tube 43 is mounted interiorly of the first tube 42 and projects forwardly into the interior of the nose 44. In the present instance, and unlike the preferred embodiment heretofore described, the nose is sepsatable from the catheter proper, and contains an aperture 51 which is radially offset from the central axis of the first tube 42 but aligned with the bore 43A thereof. The nose 44, therefore, has an offset tapered wall which merges towards the offset aperture 41 and terminates therewith.

In order to provide a smooth exterior on the catheter which merges into the nose 44, a flexible sheath 45 is provided circumscribing the tubes, and in contact with the wall of the first tube 42. The sheath terminates in an end wall 46, short of the axial end 42B of the first tube 42, thereby forming a circumferentially extending recess 47 intermediate the end wall 44A of the nose 44 and the end wall 46 of the sheath 45. As best illustrated in FIG. 6, underlying the recess 47 and extending...
through the wall of the first tube 42 is a plurality of apertures 48 which provide fluid communication between the bore 42A of the first tube 42 and the recess 47. Disposed in the recess 47 is a balloon forming thin elastic annulus 52 which extends circumferentially of the catheter in the recess to provide a relatively smooth continuous exterior intermediate the sheath 45 and the nose 44. The elastic annulus 52 includes laterally displaced, marginal edge portions 53 and 54 which are reinforced or thick relative to the thin section 54 intermediate the marginal edge portions. The marginal edge portions 53 and 54 may be epoxied or otherwise connected to both the end walls 44A and 46 as well as the first tube 42.

The thinner wall of the elastic annulus will permit the balloon, when thus formed, to conform more easily to the internal configuration of the vessel into which the catheter has been inserted. It should be recognized that the structure of the annulus 52 may be also utilized in conjunction with the structure of the catheter illustrated in the preferred embodiment in FIGS. 1-4.

As with the embodiment described in FIGS. 1-4, means are provided for cooperation with the catheter 60 to make an incision in a vessel for immediate insertion of the catheter into the vessel to a point at least rearwardly of the balloon forming annulus 52. To this end, the catheter 60 comprises a first tube 43 and a second tube 63, the tube 62 having a bore 62A and the second tube having a bore 63A and including a tapered nose portion 64 similar to the nose 44 shown in the embodiment of FIGS. 5 and 6, to facilitate entry of the catheter 10 into an incision in a vessel (not shown). In the illustrated instance the second tube 63 is disposed adjacent to the first tube 62, both tubes being housed in a sheath 65 which circumscribes the tubes. In this embodiment, as shown, the end of the tube 62 is closed as at 62B so as to prevent fluid from entering the interior of the nose 64.

Disposed adjacent to but rearwardly of the nose 64 is an annular recess 66 which houses a balloon forming, thin elastic annulus 67. To this end, and in the illustrated instance, the recess 66 is disposed circumferentially of and in the sheath 65 to provide a relatively smooth continuous exterior in conjunction with the elastic annulus 67. As shown, apertures 69 underly the annulus and extend radially through the wall of the tube 62 to permit fluid communication between the annulus 67 and the bore 62A of the first tube 62. The annulus 67 is similar to the annulus shown in FIG. 5 and includes laterally spaced marginal edge portions 67A and 67B, and a relatively thin portion 67C. The annulus 67 is connected, along its marginal edge portions, as by being epoxied to the first tube and the nose as well as the sheath 65. Alternatively, the annulus may be secured in the manner similar to that illustrated and described above relative to FIG. 1.

As before, means are provided for cooperation with the catheter 60 to make an incision in a vessel for immediate insertion of the catheter into the vessel to a point at least rearwardly of the balloon forming annulus 67. To this end, an aperture 71 is formed in the nose 64, in the illustrated instance radially offset from the central axis of catheter 60 so as to be aligned with the bore 63A of the second tube 63. Disposed in the bore 63A of the second tube 63 is a trocar 72 having a vessel piercing tip or end 73 thereon. The vessel piercing end 73 is similar in structure to that illustrated in FIG. 3 and therefore need not be described further. In the embodiment illustrated in FIGS. 7 and 8, the catheter may be formed as by molding, the bores 62A and 63A formed in the mold by disposing a wire or the like therein so that upon cooling of the material, such as a polyurethane or polyethylene, the wires may be removed thereby forming the tubular structures heretofore described.

In this connection it should be recognized that the embodiment illustrated in FIG. 7, and the cross hatching shown therein was for purposes of defining the structure and not to show particularly that the structure contained separate adjacent tubes because the walls of the tubes may be integral not only with each other but with the sheath 65.

In certain instances it may be desirable to extend the cutting surface of the trocar cutting end 73 by extending the cutting surface from the tip onto the exterior wall of the nose 64. In this instance, it is preferable to employ a nose similar to that illustrated in FIGS. 5 and 7 wherein the aperture 71 is offset axially from the central axis of the catheter 60. Thus, for example in FIG. 7, the surface of the nose as at 74 may be extended to provide an additional knife edge to make a somewhat longer incision than would be available by the cutting surface 25 on the trocar 73.

While the distal end of the catheters have been described in some detail, it should be recognized that the proximal end may be terminated in any convenient, well known manner. In the illustrated instance, and referring first to FIG. 9, the proximal end 80 of the catheter may be bifurcated and include a pair of legs 81 and 82 respectively which may be connected to the first and second tubes illustrated in FIGS. 1, 2, 5, 6, 7 and 8. For example, the leg 81 which is connected to the first tube of the catheter, may terminate in a conventional Luer lock 83 which provides a connection for a hypodermic syringe or the like which may be filled with a fluid for pressurizing the elastic annulus, such as the elastic annulus 16, to form a balloon. Alternatively, the leg 82 which is connected to the second tube, may terminate in a like manner in a conventional Luer lock 85 having a cap 86 thereon to which is connected the trocar such as the trocar 22 illustrated in FIG. 1. Preferably the trocar, with the cap 86 attached securely to the Luer lock 85, should have its terminal or piercing end extending beyond the nose of the catheter, the cap preferably having an alignment mark thereon, when tightly secured to the Luer lock, such as at 87, to indicate the position of the cutting tip of the trocar in alignment with the mark.

The uses to which the apparatus of the present invention may be put, and the novel method employing the
novel apparatus are best illustrated with real examples. For example, in FIGS. 9 and 10 is illustrated a section of the main aorta 90 exhibiting in each Figure a typical ruptured aortic aneurysm. The rupture 91 illustrated in FIG. 9 is just below and extends between the right and left renal arteries, 92 and 93 respectively, the aneurysm showing up in these instances as a ballooning in the wall of the aorta as at 94. In this instance, the piercing point or tip (using the preferred embodiment of the catheter as the example) makes an incision as at 95 in the wall of the aorta to permit entry thereinto of the catheter 10. Upon entry of the catheter into the aorta 90, the syringe 84 is pressurized and the elastic annulus 16 expands effecting a form fitting balloon which occludes the interior of the aorta 90. The balloon stops blood flow downwardly in the aorta 90 by internal occlusion and permits the surgeon to suture the ruptured area 91 or make other necessary repairs. Thereafter, removal of the catheter permits, because of the very small size of the incision, of easy repair to the incision 95 without harmful effect and with minimal loss of blood.

In the ruptured aneurysm depicted in FIG. 10, and utilizing like numerals to present like things, the rupture 91 is located well below the left and right renal arteries 93 and 92 respectively and slightly above and to the right of the left common iliac 96. The incision 95 is made in precisely the same way as the incision made by the catheter 10 in FIG. 9.

In FIG. 11 is shown a typical example of what is known as the Leriche Syndrome wherein an occluding clot occurs at the bifurcation in the aorta 90 at the juncture of the left and right common iliac arteries 96 and 97. As before, an incision 95 may be made by the end 24 of the trocar associated with the catheter 10 and the clot removed in the normal conventional manner by the surgeon, the balloon 16 serving to occlude blood flow in the aorta without utilizing external clamps.

The catheters of the present invention may also be utilized in pairs or more to isolate a particular section which is to be surgically addressed. To this end, and referring now to FIG. 12, a defect 101 is shown being closed with a patch graft 102 between the common femoral artery 103 and the superficial femoral artery 104, adjacent or at the junction of the profunda femoris 105. For illustrative purposes, and to illustrate the use of apparatus constructed in accordance with the present invention to occlude in pairs, as well as in conjunction with more conventional external occluding clamps, such as the clamp 106, which is shown clamping the profunda femoris, a pair of intravascular occluding catheters constructed in accordance with the present invention are shown isolating a section of the femoral artery on opposite sides of the defect 101. As shown a first catheter 100A is inserted through a self-made incision 110, the balloon expanded to thereby internally occlude the common femoral artery 103. Thereafter, a second catheter 100B with its piercing point makes an incision 111 in the superficial femoral artery and the balloon is then expanded to internally occlude the superficial femoral artery. Thereafter a patch 102 may be easily applied either from a vein graft or even composed of a Dacron plastic. (Of course this type of repair is common in instances where the internal lining of the artery must be removed along with any buildup of atheromata and calcium, i.e., endarterectomy).

In all instances of the examples heretofore described, it should be understood that after the incision has been made by the trocar and the balloon expanded so as to internally occlude the vessel, the trocar may be removed and medication may be applied through the second tube into the area. For example, it may be necessary to insert heparin (an anti-coagulant) into the blood to prevent clotting. Additionally, blood samples may be taken, in all the examples illustrated, by placing a syringe on the Luer lock such as the Luer lock 85 and aspirating the required sample.

After the repair has been completed, the fluid pressure in the first tube is released and the elastic annulus retracts to its previous housing, the catheter is removed and the incision thus made by the piercing point of the trocar may be repaired.

It should be recognized that the catheter of the present invention has many uses. For example, the radiologist may find the catheter extremely useful for dye injection (through the second tube after removal of the trocar) to selected vessels without diffusion of the dye into nonselected vessels. Thus the catheter may be useful in selective arteriography with minimum dye usage.

Another example of the use to which the catheter of the present invention may be put is when a section of bowel must be removed it is oftentimes difficult and almost impossible to remove the bowel section without contamination of the surrounding area due to leakage as the section of bowel is removed. Conventionally, the bowel is clamped at spaced intervals with six clamps, two clamps being positioned adjacent one another on opposite sides of the intended incision on one side of the bowel section to be removed, and two more adjacently positioned clamps between which a second incision is made on the opposite side of the bowel section to be removed. An additional clamp is positioned spaced from each clamp pair on each of the sections to be joined. Thereafter the fluid in the remaining two isolated bowel sections may be neutralized by inserting a catheter through the wall of each of the bowel sections thus isolated, and expanding the balloon so as to occlude the incision made by the catheters. After removal of the trocar, it is a simple matter to pump a medication such as an antibiotic into each of the bowel sections thereby neutralizing the possible harmful effects of any leakage of the section when removing the inwardly disposed clamps to sew the previously incised ends, together. It should be understood for purposes of this disclosure, that the bowel is to be considered a vessel.

Thus the catheter of the present invention makes its own incision and permits the occlusion internally of a vessel to which the catheter is applied. Additionally, the trocar may be removed and medication may be applied into the tube from whence it was removed.

Although the invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction, the combination and arrangement of parts, and the method of operation may be made without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. An intravascular occluding catheter comprising a flexible tubular member having a tapered nose at one terminal end of said members, said flexible tubular
member comprising a first tube; a second tube in said first tube, extending into said nose and defining a first passageway between said first and second tubes; a second passageway in said second tube; an elastic annulus having marginal edge portions, said annulus circumscribing said first tube adjacent said nose, said annulus connected along its marginal terminal portions to form an inflatable balloon; apertures in said first tube connecting said first passageway underlying said annulus and providing fluid communication between said first passageway and said annulus; a trocar disposed in said second passageway, said trocar including a terminal end having a vessel piercing tip thereon; and an aperture in said nose dimensioned to embrace said trocar and permit entrance and egress of said tip of said trocar.

2. An intravascular occluding catheter in accordance with claim 1 wherein said nose is integral and forms part of said first tube.

3. An intravascular occluding catheter in accordance with claim 2 including a circumferential recess in the exterior of said first tube for receiving said annulus.

4. An intravascular occluding catheter in accordance with claim 3 wherein said nose is substantially bullet shaped.

5. An intravascular occluding catheter in accordance with claim 3 wherein said nose includes an axially offset wall.

6. An intravascular occluding catheter in accordance with claim 3 wherein said aperture in said nose is axially offset, and said nose includes an offset tapered wall, said wall of said nose merging towards said offset aperture and terminating therewith.

7. An intravascular occluding catheter in accordance with claim 1 including a flexible sheath circumscribing said tubes and forming a housing therefore.

8. An intravascular occluding catheter in accordance with claim 7 wherein said sheath terminates in a radially and circumferentially extending end wall, a circumferentially extending second wall on said nose axially spaced from said first wall to define a recess therebetween for receipt of said annulus therein.

9. An intravascular occluding catheter in accordance with claim 7 wherein the axis of said second tube is displaced radially from the axis of said first tube.

10. An intravascular occluding catheter in accordance with claim 9 wherein said aperture in said nose is aligned with the passageway of said second tube, and said nose includes a tapered wall which terminates at said aperture.

11. An intravascular occluding catheter in accordance with claim 1 wherein the axis of said first tube is offset from the axis of said second tube, and including a flexible sheath circumscribing said tubes.

12. An intravascular occluding catheter in accordance with claim 11 wherein said nose extends over said first and second tubes and is coextensive with said sheath.

13. An intravascular occluding catheter in accordance with claim 12 including a circumferentially extending recess in said sheath for housing said annulus.

14. An intravascular occluding catheter in accordance with claim 1 wherein said tip includes a point, and a concave cutting edge extending rearwardly of said point and merging into the sidewall of said nose.

15. An intravascular occluding catheter in accordance with claim 14 wherein said cutting edge extends onto the surface of said nose.

16. A method of intravascular occlusion utilizing a catheter, said catheter comprising a flexible tubular member having a tapered nose at one terminal end of said member, said tubular member comprising a first tube; a second tube in said first tube, extending into said nose and defining between said first and second tubes a first passageway; a second passageway in said second tube, an elastic annulus having marginal edge portions, said annulus circumscribing said first tube adjacent said nose, said annulus connected along its marginal terminal portions to form an inflatable balloon; apertures in said first tube connecting said first passageway underlying said annulus and providing fluid communication between said first passageway and said annulus; a trocar disposed in said second passageway, said trocar including a terminal end having a vessel piercing tip thereon; and an aperture in said nose dimensioned to embrace said trocar and permit entrance and egress of said tip of said trocar; comprising the steps of: piercing the vessel wall with the tip of said trocar extending beyond said aperture in said nose, inserting said catheter into said vessel through the hole thus pierced and beyond the elastic annulus circumscribing the first tube, and inflating said balloon; and thereafter withdrawing said trocar from said second tube.

17. A method of intravascular occlusion in accordance with claim 16, including the step of applying medication internally of said vessel through said second tube.

18. A method of intravascular occlusion in accordance with claim 16, including the step of withdrawing fluid from said vessel through said second passageway.