

[54] VENOUS VALVE SNIPPER

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[58] Field of Search..... 128/2 B, 305, 311, 328

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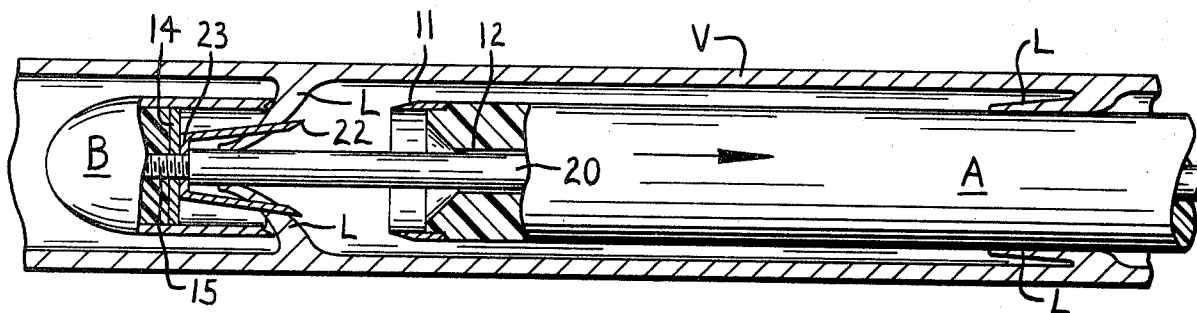
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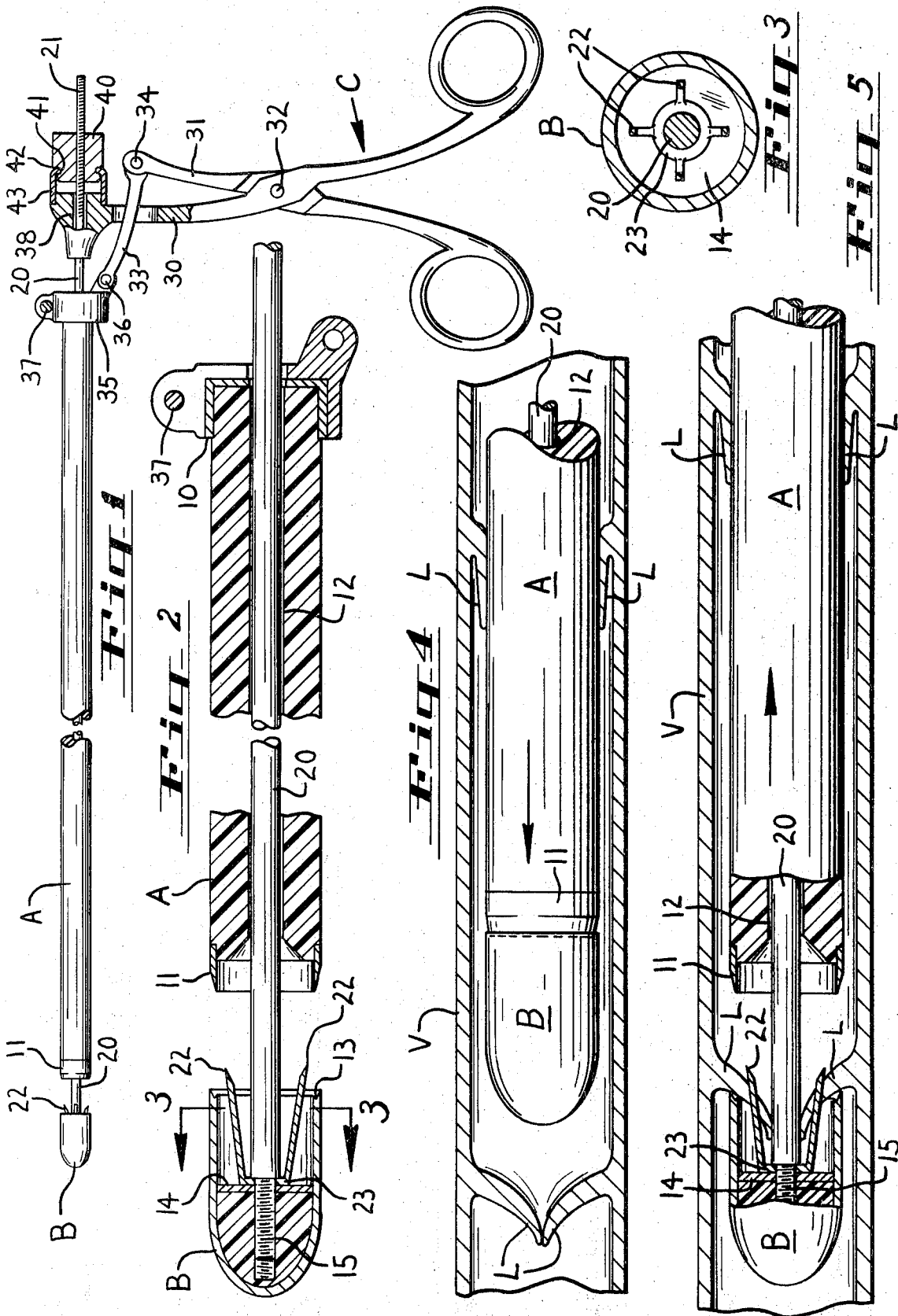
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[57] ABSTRACT

A cylindrical catheter-type instrument has a tubular member slidable lengthwise relative to a distal head member. The instrument may be inserted in the distal end of a vein in closed position causing it to pass through the venous valves in the direction of normal blood flow. When the instrument is partially withdrawn in open position the venous valve leaflets protrude into a gap between the tubular and head members and become impaled on spikes in the head member. Then the tubular member is closed on the head member causing an annular cutting blade on the tubular member to snip-off the valve leaflets. Opening and closing of the head and tubular members is accomplished by a scissors-type handle connected to the two parts.

7 Claims, 5 Drawing Figures





VENOUS VALVE SNIPPER

BACKGROUND OF THE INVENTION

This invention relates to an instrument for removing the venous valves from veins.

In utilizing vein grafts to bypass blocked arteries, the standard procedure is to reverse the vein in order to avoid obstruction to the blood flow by the valves in the vein. However, in reversing the vein the arterial flow through the graft then proceeds from the narrow end to the wider end. This produces undesirable flow characteristics including turbulence which is believed to be one of the causes of development of intimal hyperplasia reported after such operations.

By excising the valves it is possible to place the vein with the wider end toward the inflow anastomosis and the narrower end toward the outflow anastomosis. This achieves better flow characteristics and reduces the possibility of stasis in the vein graft which sometimes predisposes to thrombosis. It is also often desirable to remove the venous valves while the vein remains in situ, obviating the necessity to dissect the vein out. This reduces the operative time significantly in appropriate situations.

Objects of the invention are, therefore, to provide an instrument for excising venous valves safely and without damage to the vein wall, to provide an instrument for this purpose which can be used after the vein is dissected out or while the vein still remains in situ, and to provide an instrument of the type described having a disposable part which does not have to be cleaned and sterilized after use.

SUMMARY OF THE INVENTION

The present instrument consists of a disposable part and a permanent or re-usable part. The utilization of a disposable part insures good functioning of the instrument every time it is used. The disposable part comprises a flexible tubular portion having an annular cutting blade which may be closed and opened toward and away from a rounded metal head. The permanent part comprises a scissors-type handle which may be detachably connected with the disposable part to accomplish the cutting action.

The instrument is introduced in closed position into the distal end of a vein in the direction of blood flow and is therefore easily maneuvered past all of the venous valves. The instrument is then placed in the open position, leaving a gap between the head and the cutting blade on the tubular portion. By partially withdrawing the instrument in open position, sharp spikes in the head portion spear and impale the venous valve leaflets which protrude into the gap. Closing of the tubular portion and blade against the head cleanly excises the valve leaflets without damaging the vein wall.

Then the instrument is withdrawn to the next valve and the above manipulations repeated. When the instrument is finally withdrawn from the vein, it contains all the excised valve leaflets impaled on the spikes in the head portion. The vein is then capable of conveying a flow of blood in the reverse direction, i.e., from the wider end to the narrower end.

The invention will be better understood and additional objects and advantages will become apparent from the following description of the preferred embodiment illustrated on the accompanying drawing. Various

changes may be made, however, in the details of construction and arrangement of parts and certain features may be used without others. All such modifications within the scope of the appended claims are included in the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an elevation view with parts broken away and parts in section, showing an instrument embodying the invention in open position;

FIG. 2 is an enlarged longitudinal sectional view of a portion of FIG. 1;

FIG. 3 is a view on the line 3—3 in FIG. 2;

FIG. 4 is a longitudinal sectional view of a vein, showing how the instrument is introduced into the vein; and

FIG. 5 is a view similar to FIG. 3, showing the operation of the instrument.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The instrument comprises a flexible catheter tube A of suitable plastic material such as Teflon, a highly polished and rounded metal head B and a manipulating handle C. A metal collar or cap 10 is fixedly mounted on the proximal end of tube A and a sharpened annular metal cutting blade 11 is fixedly mounted on the distal end of the tube. The tube contains a lumen or bore 12.

The proximal end of head B is cylindrical and its wall section is notched or recessed at 13 forming an anvil to guide and receive the sharpened cutting edge of blade 11. A transverse wall 14 in the head B has a central threaded opening to receive the threaded distal end 15 of a flexible metal core rod or wire 20 which is slidable longitudinally in the lumen 12. The proximal end 21 of the core rod is also threaded.

Four spikes or prongs 22 having sharpened ends are mounted on a nut or collar 23 which is fixedly secured to the rod 20. Spikes 22 extend divergently in a proximal direction slightly beyond the end 13 of head B, the sharpened ends of the spikes being within the diameter of blade 11 so that the blade will reciprocate freely past the ends of the spikes without interference.

Handle C has a forceps or scissors action comprising a pair of levers 30 and 31 pivotally connected together at 32. Lever 31 has a link 33 pivotally connected therewith at 34. A circular clamp 35 is pivotally connected at 36 with link 33. Clamp 35 may be tightened on collar 10 by means of clamp screw 37.

Lever 30 contains a smooth bore at 38 to slidably receive the rod 20. Proximal end 21 of rod 20 is threaded through a cylindrical nut 40. Nut 40 has a peripheral groove 41 which receives projections 42 on a retainer 43 mounted on handle lever 30.

Thus, the handle C is adapted to reciprocate tube A and blade 11 relative to head B. Nut 40 provides means for adjustment of head B relative to tube A and handle C. Tube A and core rod 20 may be made to different lengths as desired and tube A and head B may be made in different diameters, the outside diameter of collar 10 being uniform in all cases to fit the clamp 35 which is a part of the handle C. Tube A and head B with its core rod 20 and spikes 22 are preferably made as disposable parts while handle C is a re-usable or permanent part.

FIGS. 4 and 5 illustrate the operation of the instrument. With tube A and head B closed together, these parts are introduced from the distal end of the vein V in the direction of venous blood flow and passed through the valve leaflets L as shown in FIG. 4. Depending on the length of the vein, the instrument may have to pass through a number of such valves. When head B has passed through all the valves in the vein segment which is being treated, the instrument is then placed in opened position as shown in FIG. 2, leaving a gap between cutter blade 11 and head B.

When the instrument is slightly withdrawn in the open position, the valve leaflets L enter the gap between cutter blade 11 and head B and become impaled on spikes 22 as shown in FIG. 5. This will impose a resistance to further withdrawal of the instrument which will be felt by the operator. The instrument is then closed, causing cutter blade 11 to move against the anvil 13 and excise the valve leaflets. The cutting action leaves the valve leaflets impaled on the spikes in the head with the spikes protruding through the upstream sides of the leaflets.

When the first pair of valve leaflets has been excised as described, it will then be possible to withdraw the instrument further. Then the instrument is re-opened and the procedure is repeated at the next valve. After all the valves have been excised, the instrument is withdrawn from the distal end of the vein with all the excised valve leaflets speared on the spikes 22 and contained in the hollow head B. Free flow of blood is then possible in the vein in the reverse direction, i.e., from the wider to the narrower end. The vein may then be used as an artery in situ or as a transplant.

Flexible tube A follows the path of a vein in situ in the manner of a catheter. When the vein is dissected out of the body for use as a transplant graft, the tube A may be a rigid tube.

The present type of instrument may also be used to excise any valves, webs or strictures in any tubular structure in the body, such as the urethra, esophagus or the bile ducts.

Having now described my invention and in what manner the same may be used, what I claim as new and

desire to protect by Letters Patent is:

1. A venous valve snipper catheter instrument comprising a tubular member having a distal end and a proximal end, an annular cutting blade on said distal end, a rounded head mounted on a core rod extending through said tubular member, means for sliding said tubular member on said core rod to reciprocate said cutting blade toward and away from said head, said blade having an open position leaving a gap between the blade and head to receive the valve leaflets in a vein when the instrument is inserted and manipulated in the vein, and spikes in said head extending in a proximal direction beyond the head and partially across said gap when the blade is in said open position to impale said valve leaflets by manipulation of the instrument in the vein, said valve leaflets being excised by closing said cutting blade against said head.

2. An instrument as defined in claim 1, said head being hollow to contain said excised valve leaflets on said spikes.

3. An instrument as defined in claim 1, said tubular member and core rod being flexible.

4. An instrument as defined in claim 1, said spikes being mounted on said core rod.

5. An instrument as defined in claim 1 including a rigid collar on said proximal end of said tubular member.

6. An instrument as defined in claim 5, said means for sliding said tubular member on said core rod comprising a handle having a pair of pivotal levers, means for detachably connecting one of said levers with said rigid collar, and means for detachably connecting the other lever with said core rod.

7. An instrument as defined in claim 1, said tubular member and core rod being flexible, a rigid collar on said proximal end of said tubular member, said means for sliding said tubular member on said core rod comprising a handle having a pair of pivotal levers, a clamp on one of said levers for clamping said rigid collar, and a nut on the other lever having threaded engagement with said core rod.

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