of venous insufficiency along the esophageal varices. Endovascular access for the catheter is preferably provided through the superior mesenteric vein or portal vein to shrink the portal vein branches leading to the lower esophagus. Proper positioning of the electrode within the vein can be confirmed using fluoroscopic or ultrasound techniques. The electrodes apply RF energy or other radiant energy at a suitable frequency to shrink the vein and reduce the swelling and transmission of high portal venous pressure to the veins surrounding the esophagus.

While several particular forms of the invention have been illustrated and described, it will be apparent that various modifications can be made without departing from the spirit and scope of the invention. Accordingly, it is not intended that the invention be limited, except as by the appended claims.

What is claimed is:

1. An apparatus for applying energy to cause shrinkage of a vein, the apparatus comprising:

a catheter having a shaft with an outer diameter and a working end, wherein the outer diameter of the catheter is less than the inner diameter of the vein; and

at least two electrodes located at the working end of the catheter, wherein the electrodes are spaced apart from one another by less than 180 degrees so as to produce a directional RF field to heat a venous treatment area adjacent the electrodes along a circumferential portion of the vein and not the entire circumference of the vein to cause preferential shrinkage of the vein when RF energy is applied to the vein by the electrodes;

an outer tube having a first end and a second end, the outer tube surrounding the catheter shaft;

a tip member located at the working end of the catheter shaft;

at least two bowable members, each bowable member having a first mounting end attached to the second end of the outer tube, a second mounting end attached to the tip, and one of the at least two electrodes between the first and second mounting ends;

a generally elastic cover connecting the second end of the outer tube to the tip;

wherein the outer tube moves over the catheter shaft, and the electrodes move away from the catheter shaft when the second end of the outer tube moves toward the tip, and the cover prevents fluid from seeping between the outer tube and the catheter shaft.

2. The apparatus of claim **1** further comprising a piezoelectric element located adjacent the electrodes, the piezoelectric element producing pulse-echo soundings of the vein to determine the vein diameter and the extent of vein shrinkage.

3. The apparatus of claim **1** further comprising a temperature sensor located on one of the at least two electrodes.

4. The apparatus of claim **1** further comprising a temperature sensor located between the two electrodes.

5. The apparatus of claim **1** wherein the catheter includes a plurality of extendable members having a plurality of bowable sections, each bowable section including one of the at least two electrodes.

6. The apparatus of claim **1** wherein the working end of the catheter has a diameter larger than the diameter of the remainder of the catheter.

7. The apparatus of claim **1** wherein the working end of the catheter further includes ports for providing a fluid to the vein during treatment.

8. The apparatus of claim **1** wherein the electrodes are formed from non-insulated portion of a metallic plate disposed in the working end of the catheter.

9. The apparatus of claim **8** wherein the electrodes are formed into pairs, wherein each pair of electrodes comprises a discrete pair of opposite polarity electrodes and the electrodes within each discrete pair are arranged such that an electrode in one discrete pair is adjacent a like polarity electrode of an adjacent pair.

10. The apparatus of claim **9** comprising an even number of electrodes, wherein said even number comprises at least four, and wherein said even number of electrodes are disposed in a plurality of discrete pairs of opposite polarity electrodes at the working end, said electrodes in each discrete pair being arranged such that an electrode in one discrete pair is adjacent a like polarity electrode of an adjacent pair.

11. The apparatus of claim **1** wherein the electrodes are formed of a material that produces heat upon the application of selected energy to the electrodes.

12. The apparatus of claim **1** wherein the electrodes are configured so as to not penetrate the vein.

13. An apparatus for applying energy to biological tissue, comprising:

a catheter having an elongated body with a distal end and a proximal end;

at least four exposed, electrically conductive surfaces located at the distal end of the catheter; and

an outer tube having a first end and a second end, the outer tube surrounding the catheter;

a tip located at the working end of the catheter; and

a cover connecting the second end of the outer tube to the tip;

wherein the exposed surfaces are disposed so that each exposed surface is located adjacent another exposed surface of like polarity and adjacent another exposed surface of unlike polarity;

whereby energy imparted by a pair of exposed surfaces of unlike polarity is directional.

14. The apparatus of claim **13** wherein the positioning device comprises a control wire attached to the distal end of the catheter and disposed within the catheter such that changing its tension controls the deflection of the catheter distal end.

15. The apparatus of claim **13** further comprising an energy source having two potentials, one of which is connected to two exposed surfaces through a conductive device and the other of which is connected to the other two exposed surfaces through another conductive device.

16. The apparatus of claim **13** wherein the exposed surfaces are disposed at the distal end of the catheter as discrete pairs with each pair comprising one surface of one polarity and another surface of a different polarity;

wherein the pairs are disposed in relation to each other so that the exposed surface of an adjacent pair is of like polarity.

17. The apparatus of claim **13** further comprising a temperature sensor located on one of the electrodes.

18. The apparatus of claim **13** further comprising a temperature sensor located between two electrodes.

19. The apparatus of claim **13** wherein the catheter includes a plurality of extendable members having a plurality of bowable sections, each bowable section including one of the electrically conductive surfaces.

20. The apparatus of claim **13** further comprising:

at least two bowable members, each bowable member having a first mounting end attached to the second end