We claim:

1. An apparatus for anastomosing a cut vessel, the apparatus comprising:

a first ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a first vessel end of the cut vessel, the inner surface having at least one spike extending away from the inner surface into the inner lumen, the at least one spike of the first ring being configured to penetrate a vessel wall of the first vessel end and secure the first ring to the first vessel end; and

a second ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a second vessel end of the cut vessel, the inner surface having at least one spike extending away from the inner surface into the inner lumen, the at least one spike of the second ring being configured to penetrate a vessel wall of the second vessel end and secure the second ring to the second vessel end;

wherein the first and second rings, after being secured to the first and second vessel ends, are configured to be joined together into direct engagement to anastomose the cut vessel.

2. The apparatus of claim 1, wherein the at least one spike of the first ring extends at about a forty-five (45) to about a sixty (60) degree angle with respect

to the inner surface of the first ring, and the at least one spike of the second ring extends at about a forty-five (45) to about a sixty (60) degree angle with respect to the inner surface of the second ring.

3. The apparatus of claim 1, wherein the first ring surface of the first ring includes at least one post configured to be received in a corresponding receiver depression on the first ring surface of the second ring when the first and second rings are joined together.

4. The apparatus of claim 3, wherein a portion of the at least one post is configured to engage a portion of the corresponding receiver depression to at least partially prevent the at least one post from egressing the corresponding receiver depression.

5. The apparatus of claim 3, wherein the first and second ring are at least partially prevented from rotating relative to one another when the at least one post is received in the corresponding receiver depression.

6. The apparatus of claim 3, wherein the first ring includes a plurality of posts and the second ring includes a plurality of receiver depressions for receiving the plurality of posts, at least one of the posts being configured to be received in only one correspondingly configured receiver depression.

7. The apparatus of claim 1, wherein

the first ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the first ring having an orientation indicator, and

the second ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the second ring having an orientation indicator, the orientation indicators of the first and second rings being configured to align with one another when the first and second rings are joined together.

8. The apparatus of claim 1, wherein

the first ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending therefrom for penetrating an everted portion of the first vessel end, and

the second ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending therefrom for penetrating an everted portion of the second vessel end.

9. The apparatus of claim 8, wherein

the first ring has a first layer of material that is separately formed from the first ring and joined to the inner surface of the first ring, the at least one spike that extends away from the inner surface of the first ring being provided on the first layer of material, the first ring having a second layer of material that is separately formed from the first ring and joined to the recession floor of the first ring, the at least one spike that extends away from the recession floor of the first ring being provided on the second layer of material, and

the second ring has a first layer of material that is separately formed from the second ring and joined to the inner surface of the second ring, the at least one spike that extends away from the inner surface of the second ring being provided on the first layer of material, the second ring having a second layer of material that is separately formed from the second ring and joined to the recession floor of the second ring, the at least one spike that extends away from the recession floor of the second ring being provided on the second layer of material.

10. The apparatus of claim 1, wherein each of the first and second rings are shaped as a funnel, flute, truncated cone, or semi-octagon.

11. The apparatus of claim 1, wherein

the inner lumen of the first ring inwardly tapers from the first ring surface to the second ring surface of the first ring, and

the inner lumen of the second ring inwardly tapers from the first ring surface to the second ring surface of the second ring.

12. A method anastomosing a cut vessel, the method comprising:

providing the apparatus of claim 1;

positioning the first ring over a first vessel end of the cut vessel so that the first vessel end is in the inner lumen and surrounded by the inner surface of the first ring;

penetrating a vessel wall of the first vessel end with the at least one spike that extends away from the inner surface of the first ring to secure the first ring to the first vessel end;

positioning the second ring over a second vessel end of the cut vessel so that the second vessel end is in the inner lumen and surrounded by the inner surface of the second ring;

penetrating a vessel wall of the second vessel end with the at least one spike that extends away from the inner surface of the second ring to secure the second ring to the second vessel end; and

with the first and second rings secured to the first and second vessel ends, joining the first and second rings together to anastomose the cut vessel.

13. The method of claim 12, wherein

the first ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a

longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, and

the second ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, the method further comprising:

everting an edge of the first vessel end onto the central recession of the first ring;

penetrating the vessel wall of the first vessel end with the at least one spike that extends away from the recession floor of the first ring to secure the first ring to the edge of the first vessel end;

everting an edge of the second vessel end onto the central recession of the second ring; and

penetrating the vessel wall of the second vessel end with the at least one spike that extends away from the recession floor of the second ring to secure the second ring to the edge of the second vessel end.

14. An apparatus for anastomosing a cut vessel, the apparatus comprising:

a first ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring

surfaces, the inner surface defining an inner lumen configured to receive a first vessel end of the cut vessel, the first ring including an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, the at least one spike being configured to penetrate a vessel wall of the first vessel end; and

a second ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a second vessel end of the cut vessel, the second ring including an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, the at least one spike being configured to penetrate a vessel wall of the second vessel end;

wherein the first and second rings, after being secured to the first and second vessel ends, are configured to be joined together to anastomose the cut vessel.

15. The apparatus of claim 14, wherein

the inner surface of the first ring has at least one spike extending away from the inner surface into the inner lumen, the at least one spike extending

away from the inner surface of the first ring being configured to penetrate a vessel wall of the first vessel end and secure the first ring to the first vessel end,

the inner surface of the second ring has at least one spike extending away from the inner surface into the inner lumen, the at least one spike extending away from the inner surface of the second ring being configured to penetrate a vessel wall of the second vessel end and secure the first ring to the second vessel end.

16. The apparatus of claim 15, wherein

the first ring has a first layer of material that is separately formed from the first ring and joined to the inner surface of the first ring, the at least one spike that extends away from the inner surface of the first ring being provided on the first layer of material, the first ring having a second layer of material that is separately formed from the first ring and joined to the recession floor of the first ring, the at least one spike that extends away from the recession floor of the first ring being provided on the second layer of material, and

the second ring has a first layer of material that is separately formed from the second ring and joined to the inner surface of the second ring, the at least one spike that extends away from the inner surface of the second ring being provided on the first layer of material, the second ring having a second layer of material that is separately formed from the second ring and joined to the recession floor of the second ring, the at least one spike that extends away from

the recession floor of the second ring being provided on the second layer of material.

17. The apparatus of claim 14, wherein the first ring surface of the first ring includes at least one post configured to be received in a corresponding receiver depression on the first ring surface of the second ring when the first and second rings are joined together.

18. The apparatus of claim 17, wherein a portion of the at least one post is configured to engage a portion of the corresponding receiver depression to at least partially prevent the at least one post from egressing the corresponding receiver depression.

19. The apparatus of claim 17, wherein the first and second ring are at least partially prevented from rotating relative to one another when the at least one post is received in the corresponding receiver depression.

20. The apparatus of claim 17, wherein the first ring includes a plurality of posts and the second ring includes a plurality of receiver depressions for receiving the plurality of posts, at least one of the posts being configured to be received in only one correspondingly configured receiver depression.

21. The apparatus of claim 14, wherein

the first ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the first ring having an orientation indicator, and

the second ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the second ring having an orientation indicator, the orientation indicators of the first and second rings being configured to align with one another when the first and second rings are joined together.

22. A method anastomosing a cut vessel, the method comprising:

providing the apparatus of claim 14;

positioning the first ring over a first vessel end of the cut vessel so that the first vessel end is in the inner lumen and surrounded by the inner surface of the first ring;

everting an edge of the first vessel end onto the central recession of the first ring;

penetrating the vessel wall of the first vessel end with the at least one spike that extends away from the recession floor of the first ring to secure the first ring to the edge of the first vessel end;

positioning the second ring over a second vessel end of the cut vessel so that the second vessel end is in the inner lumen and surrounded by the inner surface of the second ring;

everting an edge of the second vessel end onto the central recession of the second ring;

penetrating the vessel wall of the second vessel end with the at least one spike that extends away from the recession floor of the second ring to secure the second ring to the edge of the second vessel end; and

with the first and second rings secured to the first and second vessel ends, joining the first and second rings together to anastomose the cut vessel.

23. The apparatus of claim 14, wherein

the inner lumen of the first ring inwardly tapers from the first ring surface to the second ring surface of the first ring, and

the inner lumen of the second ring inwardly tapers from the first ring surface to the second ring surface of the second ring.

Claims

1. An apparatus for anastomosing a cut vessel, the apparatus comprising:

a first ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a first vessel end of the cut vessel, the inner surface having at least one spike extending away from the inner surface into the inner lumen, the at least one spike of the first ring being configured to penetrate a vessel wall of the first vessel end and secure the first ring to the first vessel end; and

a second ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a second vessel end of the cut vessel, the inner surface having at least one spike extending away from the inner surface into the inner lumen, the at least one spike of the second ring being configured to penetrate a vessel wall of the second vessel end and secure the second ring to the second vessel end;

wherein the first and second rings, after being secured to the first and second vessel ends, are configured to be joined together into direct engagement to anastomose the cut vessel.

2. The apparatus of claim 1, wherein the at least one spike of the first ring extends at about a forty-five (45) to about a sixty (60) degree angle with respect to the

inner surface of the first ring, and the at least one spike of the second ring extends at about a forty-five (45) to about a sixty (60) degree angle with respect to the inner surface of the second ring.

3. The apparatus of claim 1 or 2, wherein the first ring surface of the first ring includes at least one post configured to be received in a corresponding receiver depression on the first ring surface of the second ring when the first and second rings are joined together.

4. The apparatus of claim 3, wherein a portion of the at least one post is configured to engage a portion of the corresponding receiver depression to at least partially prevent the at least one post from egressing the corresponding receiver depression.

5. The apparatus of claim 3 or 4, wherein the first and second ring are at least partially prevented from rotating relative to one another when the at least one post is received in the corresponding receiver depression.

6. The apparatus of any one of the claims 3 to 5, wherein the first ring includes a plurality of posts and the second ring includes a plurality of receiver depressions for receiving the plurality of posts, at least one of the posts being configured to be received in only one correspondingly configured receiver depression.

7. The apparatus of any one of the claims 1 to 6, wherein

the first ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the first ring having an orientation indicator, and

the second ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the second ring having an orientation indicator, the orientation indicators of the first and second rings being configured to align with one another when the first and second rings are joined together.

8. The apparatus of any one of the claims 1 to 7, wherein

the first ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending therefrom for penetrating an everted portion of the first vessel end, and

the second ring includes an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending therefrom for penetrating an everted portion of the second vessel end.

9. The apparatus of claim 8, wherein

the first ring has a first layer of material that is separately formed from the first ring and joined to the inner surface of the first ring, the at least one spike that extends away from the inner surface of the first ring being provided on the first layer of material, the first ring having a second layer of material that is separately formed from the first ring and joined to the recession floor of the first ring, the at least one spike that extends away from the recession floor of the first ring being provided on the second layer of material, and

the second ring has a first layer of material that is separately formed from the second ring and joined to the inner surface of the second ring, the at least one spike that extends away from the inner surface of the second ring being provided on the first layer of material, the second ring having a second layer of material that is separately formed from the second ring and joined to the recession floor of the second ring, the at least one spike that extends away from the recession floor of the second ring being provided on the second layer of material.

10. The apparatus of any one of the claims 1 to 9, wherein each of the first and second rings are shaped as a funnel, flute, truncated cone, or semi-octagon.

11. The apparatus of any one of the claims 1 to 10, wherein

the inner lumen of the first ring inwardly tapers from the first ring surface to the second ring surface of the first ring, and

the inner lumen of the second ring inwardly tapers from the first ring surface to the second ring surface of the second ring.

12. An apparatus for anastomosing a cut vessel, the apparatus comprising:

a first ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a first vessel end of the cut vessel, the first ring including an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, the at least one spike being configured to penetrate a vessel wall of the first vessel end; and

a second ring having longitudinally spaced first and second ring surfaces and an inner surface longitudinally extending between the first and second ring surfaces, the inner surface defining an inner lumen configured to receive a second vessel end of the cut vessel, the second ring including an annular central recession between the inner surface and the first ring surface, the annular recession being defined by a longitudinally extending recession sidewall and a laterally extending recession floor, the recession floor including at least one spike longitudinally extending away from the recession floor, the at least one spike being configured to penetrate a vessel wall of the second vessel end;

wherein the first and second rings, after being secured to the first and second vessel ends, are configured to be joined together to anastomose the cut vessel.

13. The apparatus of claim 12, wherein

the inner surface of the first ring has at least one spike extending away from the inner surface into the inner lumen, the at least one spike extending away from the inner surface of the first ring being configured to penetrate a vessel wall of the first vessel end and secure the first ring to the first vessel end,

the inner surface of the second ring has at least one spike extending away from the inner surface into the inner lumen, the at least one spike extending away from the inner surface of the second ring being configured to penetrate a vessel wall of the second vessel end and secure the first ring to the second vessel end.

14. The apparatus of claim 13, wherein

the first ring has a first layer of material that is separately formed from the first ring and joined to the inner surface of the first ring, the at least one spike that extends away from the inner surface of the first ring being provided on the first layer of material, the first ring having a second layer of material that is separately formed from the first ring and joined to the recession floor of the first ring, the at least one spike that extends away from the recession floor of the first ring being provided on the second layer of material, and

the second ring has a first layer of material that is separately formed from the second ring and joined to the inner surface of the second ring, the at least one spike that extends away from the inner surface of the second ring being provided on the first layer of material, the second ring having a second layer of material that is separately formed from the second ring and joined to the recession floor of the second ring, the at

least one spike that extends away from the recession floor of the second ring being provided on the second layer of material.

15. The apparatus of any one of the claims 12 to 14, wherein the first ring surface of the first ring includes at least one post configured to be received in a corresponding receiver depression on the first ring surface of the second ring when the first and second rings are joined together.

16. The apparatus of claim 15, wherein a portion of the at least one post is configured to engage a portion of the corresponding receiver depression to at least partially prevent the at least one post from egressing the corresponding receiver depression.

17. The apparatus of claim 15 or 16, wherein the first and second ring are at least partially prevented from rotating relative to one another when the at least one post is received in the corresponding receiver depression.

18. The apparatus of any one of the claims 15 to 17, wherein the first ring includes a plurality of posts and the second ring includes a plurality of receiver depressions for receiving the plurality of posts, at least one of the posts being configured to be received in only one correspondingly configured receiver depression.

19. The apparatus of any one of the claims 12 to 18, wherein

the first ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the first ring having an orientation indicator, and

the second ring includes and an outer surface longitudinally extending between the first and second ring surfaces, the outer surface of the second ring having an orientation indicator, the orientation indicators of the first and second rings being configured to align with one another when the first and second rings are joined together.

20. The apparatus of any one of the claims 12 to 19, wherein

the inner lumen of the first ring inwardly tapers from the first ring surface to the second ring surface of the first ring, and

the inner lumen of the second ring inwardly tapers from the first ring surface to the second ring surface of the second ring.