

CLAIMS

What is claimed is:

1. A valve repair device for repairing a native valve of a patient, the valve repair device comprising:

a coaption element having an opening;

an expandable coaption portion disposed within the coaption element and configured to expand outward through the opening in the coaption element, the expandable coaption portion extending between a proximal end and a distal end;

an actuation member that engages the expandable coaption portion to expand and retract the expandable coaption portion; and

an anchor portion having at least one anchor configured to attach to the native valve of the patient.

2. The valve repair device of claim 1, wherein the expandable coaption portion expands symmetrically through two openings in the coaption element.

3. The valve repair device of claim 1, wherein the expandable coaption portion expands asymmetrically through two openings in the coaption element such that the distal end of the expandable coaption portion extends to a greater width than the proximal end of the expandable coaption portion.

4. The valve repair device of claim 1, wherein the expandable coaption portion expands asymmetrically through two openings in the coaption element such that the proximal end of the expandable coaption portion extends to a greater width than the distal end of the expandable coaption portion.

5. The valve repair device of any one of claims 1, 3, or 4, wherein:

the expandable coaption portion comprises first and second expandable coaption portions;

the first expandable coaption portion extends through a first opening in the coaption element to a first distance; and

the second expandable coaption portion extends through a second opening in the coaption element to a second distance.

6. The valve repair device of any one of claims 1-5, wherein the actuation member pushes on one of the proximal end and the distal end of the expandable coaption portion to cause the expandable coaption portion to expand.

7. The valve repair device of any one of claims 1-5, wherein the actuation member pushes on one of the proximal end and the distal end of the expandable coaption portion and pulls on the other of the proximal end and the distal end of the expandable coaption portion to cause the expandable coaption portion to expand.

8. The valve repair device of any one of claims 1-7, wherein the actuation member is a flexible actuation member that is routed through the distal end to the proximal end of the expandable coaption portion.

9. The valve repair device of any one of claims 1-8, wherein the expandable coaption portion is attached to a proximal portion of the coaption element.

10. The valve repair device of any one of claims 1-9, further comprising a biasing member extending between the proximal end and the distal end of the expandable coaption portion that biases the expandable coaption portion toward the extended condition.

11. The valve repair device of any one of claims 1-9, further comprising a biasing member extending between the proximal end and the distal end of the expandable coaption portion that biases the expandable coaption portion toward the retracted condition.

12. The valve repair device of any one of claims 1-11, further comprising:

a locking member extending between the proximal end and the distal end of the expandable coaption portion; and

a lock that has a locked condition and an unlocked condition;

wherein in the unlocked condition, the lock allows the locking member to change length as the proximal and distal ends move together or apart; and

wherein in the locked condition, the lock prohibits the locking member to change length as the proximal and distal ends move together or apart.

13. The valve repair device of any one of claims 1-12, wherein the actuation member comprises a rotatable cam member that is rotatable between a first position and a second position to cause the expandable coaption portion to expand from a retracted condition to an extended condition.

14. The valve repair device of any one of claims 1-13, wherein the valve repair device comprises:

a shaft;

a collar that the shaft extends through, the collar being attached to the coaption element;

a cap attached to the shaft such that the cap can be moved by the shaft away from the collar; and

a plurality of paddle portions, wherein the paddle portions are moveable between an open position and a closed position and are configured to attach to the native valve of the patient;

wherein movement of the cap toward the collar causes the paddle portions to move to the closed position, and movement of the cap away from the collar causes the paddle portions to move to the open position.

15. The valve repair device of claim 14, wherein the shaft extends through expandable coaption portion.

16. The valve repair device of claim 14 or 15, wherein the expandable coaption portion expands towards the paddle portions of the valve repair device.

17. The valve repair device of any one of claims 1-16, wherein a width of the expandable coaption portion is inversely proportional to a length of the expandable coaption portion.

18. The valve repair device of any one of claims 1-17, wherein the expandable coaption portion is formed from a tube of braided material.

19. A system for repairing a native valve of a patient, the system comprising:

a delivery catheter;

a valve repair device coupled to the delivery catheter, wherein the valve repair device comprises:

a coaption element having an opening;

an expandable coaption portion disposed within the coaption element and configured to expand outward through the opening in the coaption element, the expandable coaption portion extending between a proximal end and a distal end;

an actuation member that engages the expandable coaption portion to expand and retract the expandable coaption portion; and

an anchor portion having at least one anchor configured to attach to the native valve of the patient.

20. The system of claim 19, wherein the expandable coaption portion expands symmetrically through two openings in the coaption element.

21. The system of claim 19, wherein the expandable coaption portion expands asymmetrically through two openings in the coaption element such that the distal end of the expandable coaption portion extends to a greater width than the proximal end of the expandable coaption portion.

22. The system of claim 19, wherein the expandable coaption portion expands asymmetrically through two openings in the coaption element such that the proximal end of

the expandable coaption portion extends to a greater width than the distal end of the expandable coaption portion.

23. The system of any one of claims 19, 21, or 22, wherein:

the expandable coaption portion comprises first and second expandable coaption portions;

the first expandable coaption portion extends through a first opening in the coaption element to a first distance; and

the second expandable coaption portion extends through a second opening in the coaption element to a second distance.

24. The system of any one of claims 19-23, wherein the actuation member pushes on one of the proximal end and the distal end of the expandable coaption portion to cause the expandable coaption portion to expand.

25. The system of any one of claims 19-24, wherein the actuation member pulls on one of the proximal end and the distal end of the expandable coaption portion to cause the expandable coaption portion to expand.

26. The system of any one of claims 19-24, wherein the actuation member pushes on one of the proximal end and the distal end of the expandable coaption portion and pulls on the other of the proximal end and the distal end of the expandable coaption portion to cause the expandable coaption portion to expand.

27. The system of any one of claims 19-26, wherein the actuation member is a flexible actuation member that is routed through the distal end to the proximal end of the expandable coaption portion.

28. The system of any one of claims 19-27, wherein the expandable coaption portion is attached to a proximal portion of the coaption element.

29. The system of any one of claims 19-28, further comprising a biasing member extending between the proximal end and the distal end of the expandable coaption portion that biases the expandable coaption portion toward the extended condition.

30. The system of any one of claims 19-28, further comprising a biasing member extending between the proximal end and the distal end of the expandable coaption portion that biases the expandable coaption portion toward the retracted condition.

31. The system of any one of claims 19-30, further comprising:

a locking member extending between the proximal end and the distal end of the expandable coaption portion; and

a lock that has a locked condition and an unlocked condition;

wherein in the unlocked condition, the lock allows the locking member to change length as the proximal and distal ends move together or apart; and

wherein in the locked condition, the lock prohibits the locking member to change length as the proximal and distal ends move together or apart.

32. The system of any one of claims 19-31, wherein the actuation member comprises a rotatable cam member that is rotatable between a first position and a second position to cause the expandable coaption portion to expand from a retracted condition to an extended condition.

33. The system of any one of claims 19-32, wherein the valve repair device comprises:

a shaft;

a collar that the shaft extends through, the collar being attached to the coaption element;

a cap attached to the shaft such that the cap can be moved by the shaft away from the collar; and

a plurality of paddle portions, wherein the paddle portions are moveable between an open position and a closed position and are configured to attach to the native valve of the patient;

wherein movement of the cap toward the collar causes the paddle portions to move to the closed position, and movement of the cap away from the collar causes the paddle portions to move to the open position.

34. The system of any one of claims 19-33, wherein the shaft extends through expandable coaption portion.
35. The system of any one of claims 33 and 34, wherein the expandable coaption portion expands towards the paddle portions of the valve repair device.
36. The system of any one of claims 19-35, wherein a width of the expandable coaption portion is inversely proportional to a length of the expandable coaption portion.
37. The system of any one of claims 19-36, wherein the expandable coaption portion is formed from a tube of braided material.