

CLAIMS

1. A mitral valve prosthesis, comprising:
 - an asymmetrical, flexible ring, the ring dimensioned to mimic a native mitral annulus of a patient;
 - two leaflets suspended from the flexible ring and configured to coapt with each other;
 - at least two sets of cords, each set of cords attached to a leaflet on a first end and merging into a bundle on a second end; and
 - two caps configured to attach to papillary muscles of the patient, each bundle of cords merging into one of the two caps, such that each bundle of cords is connected to the papillary muscles of the patient via one of the two caps,
 - the flexible ring, leaflets, cords and caps creating an orifice through which blood flows in one direction,
 - wherein dimensions of the flexible ring, leaflets, cords and caps match ~~are dimensioned based on~~ imaged dimensions of 3D imaging of a native mitral valve ~~area~~ of a heart of the patient; and further wherein at least one of said flexible ring, leaflets, cords and caps are fabricated from autologous pericardium of the patient.
2. The mitral valve prosthesis of claim 1, wherein one of the two leaflets is dimensioned to mimic a native anterior leaflet of the patient and the other of the two leaflets is dimensioned to mimic a native posterior leaflet of the patient.
3. The mitral valve prosthesis of claim 1, wherein the cords are dimensioned to mimic native chordae tendineae of the patient.
4. The mitral valve prosthesis of claim 1, wherein dimensions of the flexible ring are obtained from a three-dimensional imaging study of the patient.
5. The mitral valve prosthesis of claim 1, wherein dimensions of the leaflets are obtained from a three-dimensional imaging study of the patient.

6. The mitral valve prosthesis of claim 1, wherein dimensions of the cords are obtained from a three-dimensional imaging study of the patient.

7. The mitral valve prosthesis of claim 1, wherein the flexible ring is fabricated with biological three-dimensional printing.

8. The mitral valve prosthesis of claim 1, wherein the flexible ring and leaflets are fabricated with homograft material.

9. The mitral valve prosthesis of claim 1, wherein the flexible ring and leaflets are fabricated with biocompatible composite material.

10. The mitral valve prosthesis of claim 1, wherein a rigidity of the flexible ring is customized for the patient.

11. The mitral valve prosthesis of claim 1, wherein each of said two caps are attached to the papillary muscles via sutures.

12. The mitral valve prosthesis of claim 1, wherein the cords and caps are fabricated with homograft material.

13. The mitral valve prosthesis of claim 1, wherein each of the at least two sets of cords is sutured to each of the two leaflets.

14. A method comprising:
performing 3D imaging of native mitral valve ~~area~~ of a heart of a patient;
obtaining dimensions of a ring, two leaflets, cords and caps for of the native mitral valve ~~prosthesis elements~~ based on the 3D imaging; and

fabricating a mitral valve prosthesis according to said dimensions, the mitral valve prosthesis including:

a flexible ring with dimensions mimicking measured dimensions of a native mitral annulus of the patient,

two leaflets suspended from the flexible ring and having dimensions mimicking measured dimensions of native leaflets of the patient, the two leaflets configured to coapt with each other,

at least two sets of chords, each set of cords attached to a leaflet on a first end and merging into a bundle on the second end, the cords having dimensions mimicking measured dimensions of native chordae tendineae of the patient, and

two caps configured to attach to papillary muscles of the patient, each bundle of cords merging into one of the two caps, such that each bundle of cords is connected to the papillary muscles of the patient via one of the two caps;

wherein at least one of said flexible ring, leaflets, cords and caps are fabricated from autologous pericardium of the patient.

15. The method of claim 14, wherein the measured dimensions of the native mitral annulus, native leaflets, and native chordae tendineae are obtained from an imaging study conducted on the patient.

16. The method of claim 15, wherein the imaging study is a three-dimensional imaging study.

17. The method of claim 14, wherein the flexible ring and leaflets are fabricated with homograft material.

18. The method of claim 14, wherein the flexible ring and leaflets are fabricated with biocompatible composite material.

19. The method of claim 14, wherein the fabricating includes printing at least one of the flexible ring, leaflets, and cords with three-dimensional biological printing.

20. The method of claim 14, wherein the cords and caps are fabricated with homograft material.