Claims

1. A medical implant (1), preferably a patch (5) that is adapted to repair or close a defect (D), preferably an opening in a ventricular or atrial or vessel wall (W), wherein

the medical implant (1) comprises an adhesive composition (6),

the medical implant (1) comprises two states, wherein the medical implant (1) in its first state can be deployed to the implant site while the adhesive composition (6) is inactive, and brought into the second state, preferably at the implant site, by an activation mechanism,

the adhesive composition (6), in said second state, is curable by a curing mechanism.

2. A medical implant (1) according to claim 1, wherein in the first state, the medical implant (1) comprises at least one cavity (24) that contains the adhesive composition (6) and that is adapted to, in the second state, release the adhesive composition (6).

3. A medical implant according to claim 2, wherein the cavity has at least two boundary surfaces, wherein at least one property, preferably at least one of permeability and solubility, is different between the two boundary surfaces.

4. A medical implant according to one of the claims 1 or 2, comprising a radiopaque element (106, 107, 108, 109).

5. A medical implant according to claim 4, comprising a support structure (31, 107, 109), wherein the radio-opaque element (106, 107, 108, 109) is preferably arranged within or formed by the support structure (31).

6. A medical implant according to one of the claims 4 or 5, wherein the radio-opaque element (106, 107, 108, 109) is arranged within or formed by the adhesive composition (6,104, 117',117'').

7. A medical implant according to one of the claims 4 to 6, wherein the radio-opaque element (106, 107, 108, 109) comprises at least one of barium sulfate and iodine.

8. A medical implant according to one of the preceding claims, wherein the implant (1) comprises at least one discrete marker (110).

9. A medical implant according to claim 8, wherein the marker (110) is at least one of radio-opaque and echogenic.

10. A medical implant according to one of the claims 8 or 9, wherein the implant comprises at least two discrete markers (110) that are arranged at a pre-defined distance and/or orientation from one another.

11. A medical implant according to one of the preceding claims, wherein the medical implant (1) has a generally flat shape with a first (101', 103') and a second surface (101', 103''), wherein the first (101', 103') and the second surfaces (102, 103'') have substantially opposite orientations, and wherein at least one property of the first surface (101', 103') is different from a corresponding property of the second surface (102, 103'').

12. A medical implant according to claim 11, wherein the first surface (101’, 103’) is adapted to enhance cell ingrowth.

13. A medical implant according to one of the claims 11 or 12, wherein the second surface (102,103’’) is adapted to provide adhesion to biological tissue, preferably human tissue, most preferably one of endocardial, pericardial and septal tissue.

14. A medical implant according to one of the preceding claims, wherein at least one surface of the implant, comprise a velour-like surface (101’’).

15. A medical implant according to one of the preceding claims, wherein the adhesive composition is arranged on the medical implant in a, preferably non-uniform, pattern.

16. A medical implant according to one of the preceding claims, wherein the adhesive composition comprises GelMA, preferably GelMA of animal origin, particularly preferably Fish GelMA or porcine GelMA.

17. A medical implant according to claim 16, wherein the GelMA is formed by a mixture of at least two GelMAs of animal origin, preferably a mixture of Fish GelMA and porcine GelMA.

18. A medical implant according to one of the claims 16 or 17, wherein the adhesive composition further comprises a photoinitiator.

19. A medical implant according to one of the claims 16 to 18, wherein the GelMA is cross-linkable by X-ray radiation.

20. A medical implant according to one of the preceding claims, comprising at least one rivet (130), preferably a blind rivet, for attachment of the implant to a tissue.

21. A medical implant according to one of the preceding claims, comprising at least retaining element (123, 124) for retaining a suture (125) at an outer circumference of the implant, and a suture (123, 124) that is arranged within said loop (124).

22. A medical implant according to claim 21, wherein the at least one retaining element (123, 124) is formed from the same material as the medical implant (1).

23. A medical implant according to one of the claims 21 or 22, wherein the at least one retaining element (123, 124) is formed of polyurethane with a thickness of 35 to 65 µm, preferably 45 to 55 µm.

24. A medical implant according to one of the claims 21 to 23, wherein the at least one retaining element (123, 124) is configured as a separate element arranged on the medical implant (1).

25. A medical implant according to one of the claims 21 to 24, wherein the at least one retaining element (123, 124) comprises a pre-determined breaking point, in particular an indentation (122, 127).

26. A medical implant according to one of the preceding claims, wherein the adhesive composition comprises, preferably consists of, a dried adhesive composition (111’,112’).

27. A medical implant according to claim 26, wherein the dried adhesive composition is activatable by exposure to a liquid.

~~28. A method for deploying a medical implant (1) that comprises an adhesive, preferably a medical implant (1) that comprises an adhesive according to claim 1, comprising the steps~~

~~deploying the medical implant (1) to a first site in a first state,~~

~~bringing the medical implant (1) into a second state by means of an activation mechanism,~~

~~where the adhesive is cured by means of a curing mechanism.~~

~~29. A method according to claim 28, comprising the step of increasing the temperature to bring the medical implant (1) into the second state.~~

~~30. A method according to claim 29, wherein the temperature increase is at least partially, preferably only, provided by an external heat source.~~

~~31. A method according to one of the claims 28 to 30, wherein the temperature increase is at least partially, preferably only, provided by a patient's body heat.~~

~~32. A method according to one of the claims 28 to 31, wherein the temperature increase is at least partially, preferably only, provided by electromagnetic radiation.~~

~~33. A method according to one of the claims 28 to 32, comprising the step of applying a pressure increase to bring the implant into the second state.~~

~~34. A method according to claim 33, wherein the pressure increase is at least partially caused by osmotic pressure.~~

~~35. A method according to one of the claims 33 to 34, wherein the pressure increase is at least partially caused by applying a mechanical deformation, preferably a mechanical pressure, to the medical implant (1).~~

~~36. A method according to one of the claims 28 to 35, comprising the step of exposing the implant to humidity to bring it into the second state.~~

~~37. A method according to one of the claims 28 to 36, comprising the step of exposing the implant to electromagnetic radiation to bring it into the second state.~~

~~38. A method according to one of the claims 28 to 37, comprising the step of spontaneous mixing of two components in the second state, which causes curing of the adhesive.~~

~~39. A method according to one of the claims 28 to 38, comprising the step of exposing the implant to electromagnetic radiation in the second state, which causes curing of the adhesive.~~

~~40. A method according to one of the claims 28 to 39, comprising the step of inflating a separate inflation reservoir (27) to bring the medical implant (1) into the second state.~~

~~41. A method according to one of the claims 28 to 40, comprising the step of disposing a liquid, preferably an organic solvent, even more preferably an organic solvent that is miscible with human blood, to bring the medical implant (1) into the second state.~~

~~42.~~28. A medical implant (1), preferably a medical implant (1) according to one of the claims 1 to 25, that is adapted to repair or close a defect (D), preferably an opening in a ventricular or atrial or vessel wall (W), wherein

the medical implant (1) comprises at least one tear line (3) that is arranged in proximity to a circumference of the medical implant (1), and

is adapted such that upon deployment to an implant site, preferably a septal defect site (D), the medical implant (1) can be attached to a tissue wall and torn along the tear line (3).

~~43.~~29. A medical implant (1) according to one of the claims 1 to 25 or 28~~42~~, comprising a biodegradable material that is adapted to lose its mechanical strength in a human body within six to 36 months, , preferably twelve months, even more preferably six months.

~~44. A medical implant (1) according to one of the claims 42 or 43, wherein the medical implant (1) is coated with a non-adhering coating (2), preferably at least one of silicone and poly(tetrafluoro ethylene), between the outer edge (OC) and the tear line (3).~~

~~45.~~30. A medical implant (1) according to one of the claims 28~~42~~ to 29~~44~~, wherein the medical implant (1) comprises a, preferably cross-shaped, cut (4) that is adapted such that a delivery device can partially extend through said cut (4).

~~46.~~31. A medical implant (1) according to one of the claims 28~~42~~ to 30~~45~~, wherein the medical implant (1) comprises fibers (26), preferably woven, spun or knitted fibers (26).

~~47.~~32. A medical implant (1) according to claim 31~~46~~, wherein the fibers (26) are made of a bio-degradable material.

~~48.~~33. A medical implant (1) according to claim 32~~47~~, wherein the bio-degradable material is selected from a group of poly(lactic-co-glycolic acid), poly(L-lactic acid), poly(D-lactic acid), poly(glycolic acid), poly(caprolactone), any copolymer and/or blend of these materials.

~~49.~~34. A medical implant (1) according to any one of the preceding claims, comprising a spine structure (31), preferably a spine structure (31) with different mechanical properties from the rest of the medical implant (1).

~~50.~~35. A medical implant according to claim 34~~49~~, wherein the spine structure (31) comprises, preferably consists of, a polyurethane.

~~51.~~36. A medical implant (1) according to claim 34~~49~~, wherein the spine structure extends beyond the medical implant (1) to provide non-elastic tear arms.

~~52.~~37. A medical implant according to one of the claims 20 to 25 and claim 36~~51~~, wherein the retaining element (123, 124) is formed by or on the non-elastic tear arm (120, 126).

~~53.~~38. A medical implant (1) according to one of the claims 28~~42~~ to 33~~48~~, wherein the medical implant (1) comprises an adhesive composition (6), in particular an adhesive composition (6) that is adapted to attach the medical implant (1) to human tissue.

~~54. A medical implant (1) according to one of the claims 42 to 53, wherein the tear line (3) comprises a laser-cut tear line (3).~~

~~55.~~39. A medical implant (1) according to one of the claims 28~~42~~ to 38~~54~~, comprising at least one extension (13) radially extending beyond the periphery of the medical implant (1).

~~56.~~40. A medical implant (1) according to claim 39~~55~~, wherein the at least one extension (13) comprises one of a string and a suture.

~~57.~~41. A medical implant (1) according to claim 39~~55~~ or 40~~56~~, wherein the at least one extension (13) comprises a strip consisting of the same material as the medical implant (1).

~~58.~~42. A medical implant according to one of the claims 20 to 25 and one of the claims 39~~55~~ to 41~~57~~, wherein the retaining element (123, 124) is formed by the at least one extension (120, 126).

~~59. A medical implant (1) according to one of the claims 55 to 57, wherein the at least one tear line (3) is adapted, in particular located and dimensioned, such as to separate the at least one extension (13) from the medical implant (1) upon tearing.~~

~~60.~~43. A medical implant (1) according to one of the claims 39~~55~~ or 1~~59~~, wherein the extensions (13) are adapted to hold the medical implant (1), preferably a patch (5), to a delivery device, preferably a balloon (B).

~~61.~~44. A medical implant (1) according to one of the claims 28~~42~~ to 43~~60~~, wherein the medical implant (1) is formed by a part of a surface of an inflatable balloon (B) of a delivery device.

~~62. A delivery device to deliver a medical implant (1) according to one of the claims 42 to 61, preferably a medical implant (1) comprising an adhesive (6), comprising~~

~~a shaft (S) with an implant holder (21) for holding the implant (1), said implant holder (H) being adapted to hold the implant (1) preferably at least partially along its periphery~~

~~the delivery device further comprising a actuation mechanism for increasing a distance between at least two predefined points of the implant such that upon actuation of the actuation mechanism, said tear line (3) is at least partially ruptured.~~

~~63. A delivery device according to claim 62, wherein the actuation mechanism includes an inflatable balloon (B).~~

~~64. A delivery device according to one of the claims 62 or 63, wherein the delivery device (C), preferably the implant holder, has a retention element (129) for a suture (125) that is adapted to retain at least one suture (125) connected or connectable to the medical implant (1).~~

~~65. A delivery device according to one of the claims 62 to 64, further comprising a gauge (114', 114'') preferably arranged on a handle (113), for indicating an adhesion force between the medical implant (1) and a tissue.~~

~~66. A medical implant (1), preferably a patch, preferably a medical implant (1) according to one of the claims 1 to 25 or 42 to 61, that is adapted to close a defect (D), preferably a an opening in a heart or vessel wall (W), comprising~~

~~at least one connecting element (9,22), preferably a bead (9), located at the outer edge (OC) of the implant,~~

~~said connecting element having a size that is larger than a size, in particular the thickness (T), of the implant (1) such that the connecting element (9,22) is adapted to be brought into engagement with a delivery device (C) having an appropriate counter element (10,11,12,21) for a connection with said connecting element.~~

~~67. A medical implant (1) according to claim 66, wherein the connecting elements (9,22) comprise a polymeric or metallic material.~~

~~68. A delivery device to deliver a medical implant (1), preferably a medical implant (1) according to claim 66, comprising~~

~~at least one tube (10) comprising an actuation element (11), preferably a wire located within said tube,~~

~~at least one holder (12a,12b), preferably at least two holders, in operative connection with said actuation element (11), preferably attached to said wire,~~

~~wherein the tube (10) and the at least one holder (12a,12b), preferably the at least two holders, are adapted such that a medical implant (1), preferably a medical implant (1) according to claim 66, is held by the at least one holder (12a,12b) in a first state,~~

~~and wherein the medical implant (1), preferably a medical implant (1) according to claim 66, can be released by actuation of the actuation element (11).~~

~~69.~~45. A method of producing a medical implant, preferably a medical implant (1) according to one of the preceding claims,

wherein an adhesive composition is at least partially liquid and is arranged on at least one surface of the medical implant, further comprising a step of drying the adhesive composition.

~~70. A method of producing a medical implant, preferably a method according to claim 69, preferably a medical implant according to one of the claims 21 to 25, comprising the steps of arranging at least one extension element (120, 126) at an outer circumference of the medical implant (1), wherein the extension element (120, 126) preferably comprises a predetermined breaking point (122, 127), configure the at least one extension element (120, 126) to form a retaining element (123, 124), in particular such that an end of the extension element (120, 126) is arranged on a surface of the medical implant (1) and such that the extension element (120, 126) forms a substantially closed loop, bonding an end of the extension element (120, 126) such as to fix the extension element (120, 126) it a configuration comprising a retaining element (123, 124), preferably further comprising the step of arranging a suture (125) in the retaining element (123, 124), preferably in the substantially closed loop.~~

~~71. Method according to one of the claims 69 or 71, wherein the adhesive composition is arranged on the medical implant (1) via inkjet printing.~~

~~72. Method according to one of the claims 69 or 71, wherein the adhesive composition is arranged on the medical implant (1) in a pre-defined pattern.~~

~~73. Method of treating a defect (D), preferably an opening in a ventricular or atrial or vessel wall (W), comprising the steps of implanting a medical implant, preferably a medical~~

~~implant according to one of the claims 1 to 25, or 42 to 61, or 66, or 67, wherein the medical implant comprises an adhesive composition, further comprising the step of hydrating the adhesive composition in situ.~~

~~74. Method of treating a defect (D), preferably an opening in a ventricular or atrial or vessel wall (W), comprising the steps of implanting a medical implant (1), preferably a medical implant according to one of the claims 21 to 25, and pulling at least one suture (125), wherein the medical implant (1) is released by pulling the suture (125).~~