cut length L	mm	0.484	0.027	1.06
cut distance P	mm	0.798	0.017	1.75
spirality angle α	degrees	11.8	0.362	not applicable

Table 7Y (size 0 barbed suture)

Measurement	Units	Average	Standard Deviation	Ratio of D, L, P over Suture Diameter (0.457 mm)
cut angle θ	degrees	155.4	0.560	not applicable
cut depth D	mm	0.196	0.008	0.43
cut length L	mm	0.471	0.017	1.03
cut distance P	mm	0.799	0.019	1.75
spirality angle α	degrees	11.8	0.496	not applicable

Table 7Z

Barbed Suture	Straight Pull Strength (pounds)	Chamois Cloth Closure Strength (pounds to rupture)
Sample 1 (Tables 7K – 7M)	7.29	11.23
Sample 2 (Tables 7N – 7P)	8.73	12.14
Sample 3 (Tables 7Q – 7S)	8.5	9.22
Sample 4 (Tables 7T – 7V)	5.92	9.27
Sample 5 (Tables 7W – 7Y)	7.69	9.97

a relatively thin diameter of about 0.020 inch, about 0.51 mm) took 5.88 pounds until wound disruption occurred and the specimen pulled apart back into 2 pieces, whereas the second specimen (which was stitched with the needle that had a suitably thin diameter of about 0.032 inch, about 0.81 mm, but not as thin as the needle for the first specimen) took only 2.88 pounds until the wound disruption and the specimen pulled apart back into 2 pieces.

The results are summarized in Table 13A below.

Table 13A (Chamois Cloth Closure Strength)

Specimen	Needle Diameter	Barbed Suture Diameter	Ratio*	Pounds to Rupture
First	0.020 inch	0.0115 inch	1.74	5.88
Second	0.032 inch	0.0115 inch	2.78	2.88

*Ratio of surgical needle diameter to barbed suture diameter.

Also, various pieces of rat skin were cut and stitched for testing of more surgical needles swaged with barbed sutures as follows.

Three freshly killed Sprague-Dawley rats, each about 600 to 700 g, were used. Two full-thickness skin incisions were made on the back of each rat to create wounds. Each wound was about 4 cm in length and parallel to the spine.

For each rat, one of the two wounds was closed with a drilled end, curved surgical needle that was a Sulzle item no. 382273A, which was 3/8 circle. The needle had a length of 18mm and a diameter of about 0.022 inch (about 0.56 mm). Also, the needle had a taper point needle tip where the needle tip had been ground to a 3-facet cut to approximate a taper cutting needle tip to facilitate penetration of rat tissue. The needle was swaged to a barbed suture.

The other of the two wounds was closed using the same suturing technique, but with a drilled end, curved surgical needle that was a Sulzle item no. 832679A, which was 3/8 circle. The needle had a length of about 18 mm and a diameter of about 0.026 inch (about 0.66 mm). Also, the needle had a diamond point needle tip. The needle was swaged to a barbed suture.

Each barbed suture for each specimen was a bi-directional, twist cut multiple spiral, polydioxanone barbed suture like suture 70 in Figure 6A, except that each barbed suture had a diameter of about 0.015 inch (about 0.381 mm, which is slightly larger than the USP requirement for a size 2-0 synthetic absorbable suture), instead of a suture diameter of about 0.018 inch (about 0.457 mm).

For each stitched wound, a tissue specimen that was approximately a square measuring about 4 cm x about 4 cm, with the stitched wound in the middle paralleling two opposing tissue edges, was retrieved for closure strength testing.

The force to open each wound was determined using a Test Resources Universal Tester, Model 200Q. For each tissue specimen, the two edges paralleling each stitched wound were mounted in the two respective serrated jaws of the tester.

Then, each specimen was pulled longitudinally at a rate of about 2 inches per minute (about 51 mm per minute) until complete rupture occurred. The maximum force encountered before complete wound disruption was recorded as the closure strength.

The results were averaged from the first set of three wounds closed with a needle having a diameter of about 0.022 inch (about 0.56 mm) and swaged to a barbed suture. Also, the results were averaged from the second set of three wounds closed with a needle having a diameter of about 0.026 inch (about 0.66 mm) and swaged to a barbed suture.

The results are summarized in Table 13B below.

Table 13B (Rat Skin Closure Strength)

Wounds Specimens	Needle Diameter	Barbed Suture Diameter	Ratio*	Average of 3 Pounds to Rupture
First set of 3	0.022 inch	0.015 inch	1.47	11.9
Second set of 3	0.026 inch	0.015 inch	1.73	8.1

*Ratio of surgical needle diameter to barbed suture diameter.

Thus, the lower the ratio of surgical needle diameter to barbed suture diameter, then the better the closure strength when suturing a wound closed with a surgical needle attached to a barbed suture. In general, the thinner the surgical needle, the better the closure strength, particularly for delicate tissues; however, for tough tissues, such as muscle and bowel, thicker needles are preferred. Thus, what is important, regardless of whether the needle is thick or thin or somewhere in the middle, is that the ratio of surgical needle diameter to barbed suture diameter should be about 3:1 or less, more preferably about 2:1 or less.

Although the present invention has been shown and described in detail with regard to only a few exemplary embodiments of the invention, it should be understood by those skilled

CLAIMS

1. A barbed suture for connecting human or animal tissue, said suture comprising (a) an elongated body having a first end and a second end and a diameter and (b) a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture, when in tissue, in an opposite direction from the direction in which the barb faces, wherein:

(I) the barbs have a disposition on the body selected from the group consisting of a staggered disposition, a twist cut multiple spiral disposition, an overlapping disposition, a random disposition, and combinations thereof, and

(II) the barbs have a configuration selected from the group consisting of a barb cut angle θ ranging from about 140 degrees to about 175 degrees, a barb cut depth with a ratio of the barb cut depth to the suture diameter ranging from about 0.05 to about 0.6, a barb cut length with a ratio of the barb cut length to the suture diameter ranging from about 0.2 to about 2, a barb cut distance with a ratio of the barb cut distance to the suture diameter ranging from about 0.1 to about 6, a corrugated barb underside, an arcuate barb base, at least two sets of barbs with each set having a barb size different from the barb size of the other set, and combinations thereof.

2. The barbed suture according to claim 1, wherein the staggered disposition includes a first set of the barbs being radially spaced about 180 degrees from a second set of the barbs.

3. The barbed suture according to claims 1 or 2, wherein the staggered disposition includes a first set of the barbs being radially spaced about 120 degrees from a second set of the barbs and the second set of the barbs being radially spaced about 120 degrees from a third set of the barbs.

4. The barbed suture according to any one of claims 1 to 3, wherein the barbs are all facing in a direction toward only one of the first end and the second end.

5. The barbed suture according to any one of claims 1 to 4, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only the first end and the barbs of the second portion are facing in a direction toward only the second end.

6. The barbed suture according to any one of claims 1 to 5, wherein the suture is made from a material selected from the group consisting of a bio-absorbable material, a non-absorbable material, and combinations thereof.

7. The barbed suture according to claim 6, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

8. The barbed suture according to claim 6, wherein the non-absorbable material is selected from the group consisting of a polymer, a metal, a metal alloy, a natural fiber, and combinations thereof.

9. The barbed suture according to claim 8, wherein the polymer is selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyether-ester, and combinations thereof.

10. A barbed suture for connecting human or animal tissue, said suture comprising (a) an elongated body having a first end, a second end and a diameter and (b) a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture, when in tissue, in an opposite direction from the direction in which the barb faces, wherein:

(I) the barbs have a disposition on the body comprising a staggered disposition, and

(II) the barbs have a configuration comprising (i) a barb cut θ angle ranging from about 140° to about 175°, (ii) a barb cut depth with a ratio of the barb cut depth to the suture diameter ranging from about 0.05 to about 0.6, (iii) a barb cut length with a ratio of the barb cut length to the suture diameter ranging from about

0.2 to about 2, and (iv) a barb cut distance with a ratio of the barb cut distance to the suture diameter ranges from about 0.1 to about 6.

11. The barbed suture according to claim 10, wherein the suture is made from a material selected from the group consisting of a bio-absorbable material, a non-absorbable material, and combinations thereof.

12. The barbed suture according to claim 11, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

13. The barbed suture according to claim 11, wherein the non-absorbable material is selected from the group consisting of a polymer, a metal, a metal alloy, a natural fiber, and combinations thereof.

14. The barbed suture according to claim 13, wherein the polymer is selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyether-ester, and combinations thereof.

15. The barbed suture according to any one of claims 10 to 14, wherein the barbs are all facing in a direction toward only one of the first end and the second end.

16. The barbed suture according to any one of claims 10 to 15, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only the first end and the barbs of the second portion are facing in a direction toward only the second end.

17. A barbed suture for connecting human or animal tissue, said suture comprising (a) an elongated body having a first end, a second end and a diameter and (b) a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture, when in tissue, in an opposite direction from the direction in which the barb faces, wherein:

(I) the barbs have a disposition on the body comprising a twist cut multiple spiral disposition with a spirality angle a ranging from about 5° to about 25°, and (II) the barbs have a configuration comprising (i) a barb cut θ angle ranging from about 140° to about 175°, (ii) a barb cut depth with a ratio of the barb cut depth to the suture diameter ranging from about 0.05 to about 0.6, (iii) a barb cut length with a ratio of the barb cut length to the suture diameter ranging from about 0.02 to about 2, and (iv) a barb cut distance with a ratio of the barb cut distance to the suture diameter ranges from about 0.01 to about 6.

18. The barbed suture according to claim 17, wherein the suture is made from a material selected from the group consisting of a bio-absorbable material, a non-absorbable material, and combinations thereof.

19. The barbed suture according to claim 18, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

20. The barbed suture according to claim 18, wherein the non-absorbable material is selected from the group consisting of a polymer, a metal, a metal alloy, a natural fiber, and combinations thereof.

21. The barbed suture according to claim 20, wherein the polymer is selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyether-ester, and combinations thereof.

22. The barbed suture according to any one of claims 17 to 21, wherein the barbs are all facing in a direction toward only one of the first end and the second end.

23. The barbed suture according to any one of claims 17 to 22, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only the first end and the barbs of the second portion are facing in a direction toward only the second end.

24. A barbed suture for connecting human or animal tissue, said suture comprising (a) an elongated body having a first end, a second end and a diameter and (b) a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture, when in tissue, in an opposite direction from the direction in which the barb faces, wherein:

(I) the barbs have a disposition on the body comprising an overlapping disposition, and

(II) the barbs have a configuration comprising (i) a barb cut θ angle ranging from about 140° to about 175°, (ii) a barb cut depth with a ratio of the barb cut depth to the suture diameter ranging from about 0.05 to about 0.6, (iii) a barb cut length with a ratio of the barb cut length to the suture diameter ranging from about 0.2 to about 2, and (iv) a barb cut distance with a ratio of the barb cut distance to the suture diameter ranges from about 0.1 to about 6.

25. The barbed suture according to claim 24, wherein the suture is made from a material selected from the group consisting of a bio-absorbable material, a non-absorbable material, and combinations thereof.

26. The barbed suture according to claim 25, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

27. The barbed suture according to claim 25, wherein the non-absorbable material is selected from the group consisting of a polymer, a metal, a metal alloy, a natural fiber, and combinations thereof.

28. The barbed suture according to claim 27, wherein the polymer is selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyether-ester, and combinations thereof.

29. The barbed suture according to any one of claims 24 to 28, wherein the barbs

are all facing in a direction toward only one of the first end and the second end.

30. The barbed suture according to any one of claims 24 to 29, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only the first end and the barbs of the second portion are facing in a direction toward only the second end.

31. A barbed suture for connecting human or animal tissue, said suture comprising (a) an elongated body having a first end, a second end and a diameter and (b) a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture, when in tissue, in an opposite direction from the direction in which the barb faces, wherein:

(I) the barbs have a disposition on the body comprising a random disposition, and

(II) the barbs have a configuration comprising (i) a barb cut θ angle ranging from about 140° to about 175°, (ii) a barb cut depth with a ratio of the barb cut depth to the suture diameter ranging from about 0.05 to about 0.6, (iii) a barb cut length with a ratio of the barb cut length to the suture diameter ranging from about 0.2 to about 2, and (iv) a barb cut distance with a ratio of the barb cut distance to the suture diameter ranges from about 0.1 to about 6.

32. The barbed suture according to claim 31, wherein the suture is made from a material selected from the group consisting of a bio-absorbable material, a non-absorbable material, and combinations thereof.

33. The barbed suture according to claim 32, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

34. The barbed suture according to claim 32, wherein the non-absorbable material is selected from the group consisting of a polymer, a metal, a metal alloy, a natural fiber, and combinations thereof.

35. The barbed suture according to claim 34, wherein the polymer is selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyether-ester, and combinations thereof.

36. The barbed suture according to any one of claims 31 to 35, wherein the barbs are all facing in a direction toward only one of the first end and the second end.

37. The barbed suture according to any one of claims 31 to 36, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only the first end and the barbs of the second portion are facing in a direction toward only the second end.

cut length L	mm	0.484	0.027	1.06
cut distance P	mm	0.798	0.017	1.75
spirality angle α	degrees	11.8	0.362	Not applicable

Table 7Y (size 0 barbed suture)

Measurement	Units	Average	Standard Deivation	Ratio of D.L. P over Suture Diameter (0.457 mm)
cut angle θ	degrees	155.4	0.560	Not applicable
cut depth D	mm	0.196	0.008	0.43
cut length L	mm	0.471	0.017	1.03
cut distance P	mm	0.799	0.019	1.75
spirality angle α	degrees	11.8	0.496	Not applicable

Table 7Z

Barbed Suture	Straight Pull Strength (pounds) [Newtons]	Chamois cloth closure Strength (pounds) [Newtons] to rupture)
Sample 1 (Tables 7K – 7M)	(7.29) [32.43]	(11.23) [49.95]
Sample 1 (Tables 7N – 7P)	(8.73) [38.83]	(12.14) [54.00]
Sample 3 (Tables 7Q – 7S)	(8.50) [37.81]	(9.22) [41.01]
Sample 4 (Tables 7T – 7V)	(5.92) [26.33]	(9.27) [41.24]
Sample 5 (Tables 7W – 7Y)	(7.69) [34.21]	(9.97) [44.35]

a relatively thin diameter of about 0.020 inch, about 0.51 mm) took 5.88 pounds [26.16 Newtons] until wound disruption occurred and the specimen pulled apart back into 2 pieces, whereas the second specimen (which was stitched with the needle that had a suitably thin diameter of about 0.032 inch, about 0.81 mm, but not as thin as the needle for the first specimen) took only 2.88 pounds [12.81 Newtons] until the wound disruption and the specimen pulled apart back into 2 pieces.

The results are summarized in Table 13A below.

Table 13A (Charmois Cloth Closure Strength)

Specimen	Needle Diameter (inches) [millimetres]	Barbed Suture Diameter	Ratio*	(Pounds) [Newtons] to Rupture
First	(0.0200 inch) [0.508 mm]	0.0115 inch [0.292 mm]	1.74	(5.88) [26.16]
Second	0.0320 inch [0.813 mm]	0.0115 inch [0.292 mm]	2.78	(2.88) [12.81]

*Ratio of surgical needle diameter to barbed suture diameter.

Also, various pieces of rat skin were cut and stitched for testing of more surgical needles swaged with barded sutures as follows.

Three freshly killed Sprague-Dawley rats, each about 600 to 700 g, were used. Two full-thickness skin incisions were made on the back of each rat to create wounds. Each wound was about 4 cm in length and parallel to the spine.

For each rat, one of the two wounds was closed with a drilled end, curved surgical needle that was Sulzle intem no. 382273A, which was 3/8 circle. The needle had a length of 18 mm and a diameter of about 0.022 inch (about 0.56 mm). Also, the needle had a taper point needle tip where the needle tip had been ground to a 3-facet cut to approximately a taper cutting needle tip to facilitate penetration of rat issue. The needle was swaged to a barbed suture.

The other of the two wounds was closed using the same suturing technique, but with a drilled end, curved surgical needle that was a Sulzle item no. 832679A, which was 3/8 circle. The needle had a length of about 18 mm and a diameter of about 0.026 inch (about 0.66 mm). Also, the dinner had a diamond point needle tip. The needle was swaged to a barbed suture. Each barbed suture for each specimen was a bi-directional, twist cut multiple spiral, polydiosanone barbed suture like suture 70 in Figure 6A, except that each barbed suture had a diameter of about 0.015 inch (about 0.381 mm, which is slightly larger than the

USP requirement for a size 2-0 synthetic absorbable suture), instead of a suture diameter of about 0.018 inch (about 0.457 mm).

For each stitched wound, a tissue specimen that was approximately a square measuring about 4 cm x about 4 cm, with the stitched wound in the middle paralleling two opposing tissue edges, was retrieved for closure strength testing

The force to open each wound was determined using a Test Resources Universal Tester, Model 200Q. For each tissue specimen, the two edges paralleling each stitched Wound were mounted in the two respective serrated jaws of the tester.

Then, each specimen was pulled lontitudinally at the rate of about 2 inches per minute (about 51 mm per minute) until complete rupture occurred. The maximum force encountered before complete wound disruption was recorded as the closure strength.

The results were averaged from the first set of three wounds closed with a needle having a diameter of about 0.022 inch (about 0.56 mm) and swaged to a barded suture. Also, the results were averaged from the second set of three wounds closed with a needle having a diameter of about 0.026 inch (about 0.66 mm) and swaged to a barded suture.

The results are summarized in Table 13B below.

Table 13B (Rat Skin Closure Strength)

Wounds Specimen	Needle Diameter (inches) [millimetres]	Barbed Suture Diameter (inches) [millimetres]	Ratio*	Average of (Pounds) [Newtons] to Rupture
First set of 3	(0.022 inch) [0. 559 mm]	(0.015 inch) [0.381 mm]	1.47	(11.9) [52.93]
Second set of 3	(0.026 inch) [0.660 mm]	(0.015 inch) [0.381 mm]	1.73	(8.1) [36.03]

*Ratio of surgical needle diameter to barbed suture diameter.

Thus, the lower the ratio of surgical needle diameter to barbed suture diameter, then the better the closure strength when suturing a wound closed with a surgical needle attached to a barbed suture. In general, the thinner the surgical needle, the better the closure strength, particularly for delicate tissues; however, for tough tissues, such as muscle and bowel, thicker needles are preferred.

Thus, what is important, regardless of whether the needle is thick or thin or somewhere in the middle, is that the ratio of surgical needle diameter to barbed suture diameter should be about 1:1 or less, more preferably about 2:1 or less. Although the present invention has been shown and described in detail with regard to only a few exemplary embodiments of the invention, it should be understood by those skilled

CLAIMS

1. A barbed suture for connecting human or animal tissue, said suture comprising a suture needle and suture thread, each having a diameter, and a plurality of barbs projecting from the suture thread, each barb facing in a direction and being adapted for resisting movement of the suture thread, when in tissue, in an opposite direction from the direction in which the barb faces, wherein the barbs have a staggered disposition, and the barbs have a configuration selected from the group consisting of a barb cut angle θ ranging from 140° to 175°, a barb cut depth with a ratio of the barb cut depth to the suture thread diameter ranging from 0.05 to 0.6, a barb cut length with a ratio of the barb cut length to the suture thread diameter ranging from 0.2 to 2, a barb cut distance with a ratio of the barb cut distance to the suture thread diameter ranging from 3.5-1.5, and combinations thereof.

2. A barbed suture for connecting human or animal tissue, said suture comprising a suture needle and suture thread each having a diameter, and a plurality of barbs projecting from the suture thread, each barb facing in a direction and being adapted for resisting movement of the suture thread, when in tissue, in an opposite direction from the direction in which the barb faces, wherein the barbs have a twist cut multiple spiral disposition, and the barbs have a configuration selected from the group consisting of a barb cut angle θ ranging from 140° to 175°, a barb cut depth with a ratio of the barb cut depth to the suture thread diameter ranging from 0.05 to 0.6, a barb cut length with a ratio of the barb cut length to the suture thread diameter ranging from 0.2 to 2, a barb cut distance with a ratio of the barb cut distance to the suture thread diameter ranging from 3.5-1.5 and combinations thereof.

3. A barbed suture for connecting human or animal tissue, said suture comprising a suture needle and suture thread each having a diameter, and a plurality of barbs projecting from the suture thread, each barb facing in a direction and being adapted for resisting movement of the suture, thread when in tissue, in an opposite direction from the direction in which the barb faces, wherein the barbs have an overlapping disposition, and the barbs have a configuration selected from the group consisting of a barb cut angle θ ranging from 140° to 175°, a barb cut depth with a ratio of the barb cut depth to the suture thread diameter ranging from 0.05 to 0.6, a barb cut length with a ratio of the barb cut length to the suture thread diameter ranging from 0.2 to 2, a barb cut distance with a ratio of the barb cut distance to the

suture thread diameter ranging from 3.5-1.5 and combinations thereof.

4. A barbed suture for connecting human or animal tissue, said suture comprising a suture needle and suture thread each having a diameter, and a plurality of barbs projecting from the body, each barb facing in a direction and being adapted for resisting movement of the suture thread, when in tissue, in an opposite direction from the direction in which the barb faces, wherein the barbs have a random disposition and the barbs have a configuration selected from the group consisting of a barb cut angle θ ranging from 140° to 175°, a barb cut depth with a ratio of the barb cut depth to the suture thread diameter ranging from 0.05 to 0.6, a barb cut length with a ratio of the barb cut length to the suture thread diameter ranging from 0.2 to 2, a barb cut distance with a ratio of the barb cut distance to the suture thread diameter ranging from 3.5-1.5 and combinations thereof.

5. The suture according to claim 2, wherein a spirality angle ranges from 5° to 25°.

6. The suture according to any one of the preceding claims, wherein the disposition of the barbs on the body comprises any combination of those specified in claims 1 to 5.

7. The suture according to any one of the preceding claims, wherein the ratio of the barb cut distance to the suture diameter is in the range of 1.75-1.69.

8. The suture according to any one of claims 1 to 7, wherein the suture is made from a material comprising a combination of a bio-absorbable material and a non-absorbable material.

9. The suture according to claim 8, wherein the bio-absorbable material is selected from the group consisting of polydioxanone, polylactide, polyglycolide, polycaprolactone, and combinations thereof.

10. The suture according to claim 8, wherein the non-absorbable material is selected from the group consisting of a polymer (selected from the group consisting of polyamide, polyester, polypropylene, polyurethane, polytetrafluoroethylene, polyetherester, and combinations thereof), a metal, a metal alloy, a natural fiber, and combinations thereof.

11. The suture according to any one of the preceding claims, wherein the barbs are all facing in a direction toward only one of either end of the suture.

12. The suture according to any one of the preceding claims, wherein the barbed suture has at least a first barbed portion and a second barbed portion, and wherein the barbs of the first portion are facing in a direction toward only one end of the suture and the barbs of the second portion are facing in a direction toward only the other end.

13. The suture according to any one of the preceding claims, wherein the ratio of the suture needle diameter to the suture thread diameter is less than 2.78.

14. The suture according to claim 13, wherein the ratio of the suture needle diameter to the suture thread diameter is 1.74 or less.