neck lifts, brow lifts, thigh lifts, and breast lifts. Self-retaining sutures used in tissue repositioning procedures may vary depending on the tissue being repositioned; for example, sutures with larger and further spaced-apart retainers may be suitably employed with relatively soft tissues such as fatty tissues.

[0103] Self-retaining sutures described herein may also be used in microsurgical procedures that are performed under a surgical microscope (and thus may be referred to as "self-retaining microsutures"). Such surgical procedures include, but are not limited to, reattachment and repair of peripheral nerves, spinal microsurgery, microsurgery of the hand, various plastic microsurgical procedures (e.g., facial reconstruction), microsurgery of the male or female reproductive systems, and various types of reconstructive microsurgery. Microsurgical reconstruction is used for complex reconstructive surgery problems when other options such as primary closure, healing by secondary intention, skin grafting, local flap transfer, and distant flap transfer are not adequate. Self-retaining microsutures have a very small caliber, often as small as USP 9-0 or USP 10-0, and may have an attached needle of corresponding size. They may be degradable or non-degradable.

[0104] Self-retaining sutures as described herein may be used in similarly small caliber ranges for ophthalmic surgical procedures and thus may be referred to as "ophthalmic self-retaining sutures". Such procedures include but are not limited to keratoplasty, cataract, and vitreous retinal microsurgical procedures. Ophthalmic self-retaining sutures may be degradable or non-degradable, and have an attached needle of correspondingly-small caliber.

[0105] Self-retaining sutures can be used in a variety of veterinary applications for a wide number of surgical and traumatic purposes in animal health.

[0106] Although the embodiments of 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 in the art that it is not intended to limit the invention to the specific embodiments disclosed. Various modifications, omissions, and additions may be made to the disclosed embodiments without materially departing from the novel teachings and advantages of the invention, particularly in light of the foregoing teachings. Accordingly, it is intended to cover all such modifications,

omissions, additions, and equivalents as may be included within the spirit and scope of the invention as defined by the following claims.

CLAIMS

What is claimed is:

1. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality of conical shaped retainers spaced apart from one another and extending from said elongated suture body between said first and second ends; and

tissue engaging protrusions that extend from at least one of

edges of the conical shaped retainers, and

angled walls of the conical shaped retainers.

2. The suture of claim 1, wherein the tissue engaging protrusions extend from the edges of the conical shaped retainers.

3. The suture of claim 1, wherein the tissue engaging protrusions extend from the angled walls of the conical shaped retainers.

4. The suture of claim 1, wherein:

the elongated suture body includes first and second longitudinal portions;

a first group of said retainers extend from the first longitudinal portion and substantially yield to motion of the elongated suture body within the tissue when the elongated suture body is drawn in a first direction and resist motion of the elongated suture body in a second direction generally opposite the first direction; and

a second group of said retainers extend from the second longitudinal portion and substantially yield to motion of the elongated suture body within the tissue when the elongated suture body is drawn in the second direction and resist motion of the elongated suture body in the first direction.

5. The suture of claim 1, wherein said conical shaped retainers include vents to prevent air from getting trapped by the retainers.

6. The suture of claim 5, wherein said vents extend through the angled walls of said conical shaped retainers.

7. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality of conical shaped retainers spaced apart from one another and extending from said elongated suture body between said first and second ends;

wherein said conical shaped retainers include vents to prevent air from getting trapped by the retainers.

8. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality of conical shaped retainers spaced apart from one another and extending from said elongated suture body between said first and second ends;

wherein said conical shaped retainers are formed from a mesh material.

9. The suture of claim 8, wherein openings in the mesh material prevent air from getting trapped by the retainers.

10. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality of conical shaped retainers spaced apart from one another and extending from said elongated suture body between said first and second ends;

wherein said conical shaped retainers are perforated or porous to prevent air from getting trapped by the retainers.

11. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality retainers spaced apart from one another and extending from said elongated suture body between said first and second ends;

wherein said retainers are perforated or porous or made from a mesh material to prevent air from getting trapped by the retainers.

neck lifts, brow lifts, thigh lifts, and breast lifts. Self-retaining sutures used in tissue repositioning procedures may vary depending on the tissue being repositioned; for example, sutures with larger and further spaced-apart retainers may be suitably employed with relatively soft tissues such as fatty tissues.

[0103] Self-retaining sutures described herein may also be used in microsurgical procedures that are performed under a surgical microscope (and thus may be referred to as "self-retaining microsutures"). Such surgical procedures include, but are not limited to, reattachment and repair of peripheral nerves, spinal microsurgery, microsurgery of the hand, various plastic microsurgical procedures (e.g., facial reconstruction), microsurgery of the male or female reproductive systems, and various types of reconstructive microsurgery. Microsurgical reconstruction is used for complex reconstructive surgery problems when other options such as primary closure, healing by secondary intention, skin grafting, local flap transfer, and distant flap transfer are not adequate. Self-retaining microsutures have a very small caliber, often as small as USP 9-0 or USP 10-0, and may have an attached needle of corresponding size. They may be degradable or non-degradable.

[0104] Self-retaining sutures as described herein may be used in similarly small caliber ranges for ophthalmic surgical procedures and thus may be referred to as "ophthalmic self-retaining sutures". Such procedures include but are not limited to keratoplasty, cataract, and vitreous retinal microsurgical procedures. Ophthalmic self-retaining sutures may be degradable or non-degradable, and have an attached needle of correspondingly-small caliber.

[0105] Although the embodiments of 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 in the art that it is not intended to limit the invention to the specific embodiments disclosed. Various modifications, omissions, and additions may be made to the disclosed embodiments without materially departing from the novel teachings and advantages of the invention, particularly in light of the foregoing teachings. Accordingly, it is intended to cover all such modifications,

omissions, additions, and equivalents as may be included within the spirit and scope of the invention as defined by the following claims.

CLAIMS

What is claimed is:

1. A suture to be used in a procedure applied to tissue, comprising:

an elongated suture body including first and second ends; and

a plurality of conical shaped retainers spaced apart from one another and extending from said elongated suture body between said first and second ends; and

tissue engaging protrusions that extend from at least one of

edges of the conical shaped retainers, and

angled walls of the conical shaped retainers.

2. The suture of claim 1, wherein the tissue engaging protrusions extend from the edges of the conical shaped retainers.

3. The suture of claim 1, wherein the tissue engaging protrusions extend from the angled walls of the conical shaped retainers.

4. The suture of claim 1, wherein:

the elongated suture body includes first and second longitudinal portions;

a first group of said retainers extend from the first longitudinal portion and substantially yield to motion of the elongated suture body within the tissue when the elongated suture body is drawn in a first direction and resist motion of the elongated suture body in a second direction generally opposite the first direction; and

a second group of said retainers extend from the second longitudinal portion and substantially yield to motion of the elongated suture body within the tissue when the elongated suture body is drawn in the second direction and resist motion of the elongated suture body in the first direction.

5. The suture of claim 1, wherein said conical shaped retainers include vents to prevent air from getting trapped by the retainers.

6. The suture of claim 5, wherein said vents extend through the angled walls of said conical shaped retainers.