resulting in the aforementioned closure-induced scarring that can occur with the prior art techniques. Furthermore, in certain embodiments the wound closure devices disclosed herein may be appropriately secured to a wound without the need for adhesive, thus avoiding potential allergic complications.

SUMMARY

In one aspect, there is provided a wound closure device comprising two or more microstructure arrays, each microstructure array comprising at least two microstructures, wherein the ~~at least~~ two or more microstructure arrays are separated by an isthmus and are attached to a flexible backing.

The present disclosure relates generally to wound closure devices comprising one or more microstructures. In some examples, the microstructures are capable of penetrating into skin or tissue. In some examples, the device comprises a plurality of microstructures. The microstructures are fabricated on, affixed to, or connected to a base or backing that may optionally be made out of the same material as the microstructures, or a different material. In some examples, the base or backing is flexible, stretchable, or both flexible and stretchable. In some examples, the microstructures are fashioned into one or more microstructure arrays, upon a base. In particular examples, the wound closure devices comprise at least two microstructure arrays, each array being patterned upon a base (said base optionally comprising one or more arrays), and said arrays optionally being affixed to a backing, according to the present disclosure. In such examples, at least one of said arrays is capable of securing the device on one side of a wound, and at least one other of said arrays is capable of securing the device on another side of the wound. In other particular examples, the wound closure devices comprise only one microstructure array, said array fabricated on a base portion, and said base portion optionally being affixed to a backing. In such examples, at least one of the microstructures comprised in the array is capable of securing the device on one side of the wound and at least one other microstructure comprised on the array is capable of securing the device on the other side of the wound.

Devices of the present disclosure are useful wound closure products, capable of performing a variety functions (*e.g.*, protecting a wound from its surrounding environment, preventing infection, closing a wound, and increasing the delivery of therapeutic compounds through skin).

In particular examples, the devices are specifically designed such that their application does not result in inflammation. In some examples, the wound closure devices disclosed herein induce little to no inflammation and result in little to no additional scarring (*e.g.*, the railroad track effect that results from staples and sutures). In

CLAIMS

1. A wound closure device comprising two or more microstructure arrays, each microstructure array comprising at least two microstructures, wherein the two or more microstructure arrays are attached to a flexible backing.

2. The wound closure device of Claim 1, wherein the number of microstructure arrays comprised on the device is 2.

3. The wound closure device of Claim 1, wherein the flexible backing is not stretchable.

4. The wound closure device of Claim 1, wherein the microstructure arrays are attached to the flexible backing in a configuration such that at least one of said microstructure arrays is capable of penetrating the skin on one side of a wound, and another one of said microstructure arrays is capable of penetrating the skin on another side of the wound.

5. The wound closure device of Claim 1, wherein the flexible backing comprises an adhesive.

6. The wound closure device of Claim 5, wherein the adhesive is located on one or more removable tabs.

7. The wound closure device of Claim 1, wherein the flexible backing is in the form of a roll bandage.

8. The wound closure device of Claim 1, wherein the two or more microstructure arrays are attached to the flexible backing such that they are separated by an isthmus.

9. The wound closure device of Claim 1, wherein the at least two microstructures are at an angle of from 15-90 degrees relative to the backing.

10. The wound closure device of Claim 1, wherein at least one microstructure is curved.

11. The wound closure device of Claim 1, wherein at least one microstructure is straight.

12. The wound closure device of Claim 1, wherein the length of the at least two microstructures is between 1 μm and 2 mm.

13. The wound closure device of Claim 1, wherein after application to tissue surrounding a wound, the wound closure device is covered with a protective cover.

14. The wound closure device of Claim 1, wherein the at least two microstructures comprise a material selected from a group consisting of silicone, chitin, polymethyl methacrylate (PMMA), metal, and a combination thereof.

15. The wound closure device of Claim 14, wherein the metal is titanium or steel.

16. The wound closure device of Claim 1, wherein the at least two microstructures are selected from the group consisting of microneedles, microblades, microanchors, microfishscale, micropillars, and microhairs.

17. The wound closure device of Claim 1, wherein the at least two microstructures comprise a shape selected from a group consisting of a rod, cone, square, rectangle, pyramid, and cylinder.

18. The wound closure device of Claim 8, wherein the isthmus is from about 2 mm to about 15 mm such that the device cause less inflammation or scarring in tissue that it is affixed to than is caused by a suture or staples.

19. The wound closure device of claim 8, wherein the isthmus does not stretch.

20. The wound closure device of claim 8, wherein the array or array regions are stretchable.

CLAIMS

1. A wound closure device comprising two or more microstructure arrays, each microstructure array comprising at least two microstructures, wherein the two or more microstructure arrays are separated by an isthmus and are attached to a flexible backing.

2. The wound closure device of Claim 1, wherein the number of microstructure arrays comprised on the device is 2.

3. The wound closure device of Claim 1, wherein the flexible backing is not stretchable.

4. The wound closure device of Claim 1, wherein the microstructure arrays are attached to the flexible backing in a configuration such that at least one of said microstructure arrays is capable of penetrating the skin on one side of a wound, and another one of said microstructure arrays is capable of penetrating the skin on another side of the wound.

5. The wound closure device of Claim 1, wherein the flexible backing comprises an adhesive.

6. The wound closure device of Claim 5, wherein the adhesive is located on one or more removable tabs.

7. The wound closure device of Claim 1, wherein the flexible backing is in the form of a roll bandage.

8. The wound closure device of Claim 1, wherein the at least two microstructures are at an angle of from 15-90 degrees relative to the backing.

9. The wound closure device of Claim 1, wherein at least one microstructure is curved.

10. The wound closure device of Claim 1, wherein at least one microstructure is straight.

11. The wound closure device of Claim 1, wherein the length of the at least two microstructures is between 1 μm and 2 mm.

12. The wound closure device of Claim 1, wherein after application to tissue surrounding a wound, the wound closure device is covered with a protective cover.

13. The wound closure device of Claim 1, wherein the at least two microstructures comprise a material selected from a group consisting of silicone, chitin, polymethyl methacrylate (PMMA), metal, and a combination thereof.

14. The wound closure device of Claim 13, wherein the metal is titanium or steel.

15. The wound closure device of Claim 1, wherein the at least two microstructures are selected from the group consisting of microneedles, microblades, microanchors, microfishscale, micropillars, and microhairs.

16. The wound closure device of Claim 1, wherein the at least two microstructures comprise a shape selected from a group consisting of a rod, cone, square, rectangle, pyramid, and cylinder.

17. The wound closure device of Claim 1, wherein the isthmus is from about 2 mm to about 15 mm such that the device cause less inflammation or scarring in tissue that it is affixed to than is caused by a suture or staples.

18. The wound closure device of claim 1, wherein the isthmus does not stretch.

19. The wound closure device of claim 1, wherein the array or array regions are stretchable.