

Claims

1. A device for a medical thermal treatment of a sclera by coagulation, the device comprising a single applicator connected to a shaft, wherein:

5 the applicator is configured to be placed into the Tenon's space;

 the applicator has a first surface, wherein the first surface of the applicator is superficially contactable to the surface of an area of the sclera so as to superficially cover said area; and

 the applicator comprises a single optical outlet connected to a single optical guiding
10 element extending from a proximal end of the shaft to the single distal optical outlet at the first surface of the applicator, the optical guiding element being configured for guiding electromagnetic waves towards the optical outlet, wherein the optical guiding element is configured to guide electromagnetic waves of a wavelength adapted for thermal treatment of the sclera at a spot by protein coagulation,

15 wherein the applicator further comprises a single monopolar or bipolar electrode connected to a single electrical conductor element extending from a proximal end of the shaft to the electrode at the first surface of the applicator, or wherein the applicator further comprises multiple monopolar or bipolar electrodes connected to multiple electrical conductor elements extending from a proximal end of the shaft to the electrodes at the first surface of the
20 applicator, wherein the electrodes provide electrical protein coagulation at a spot, or

 wherein distal surface of the optical outlet is at least partially coloured adapted for generating heat for thermal treatment of the sclera at a spot by protein coagulation.

25 2. The device of claim 1, wherein the applicator comprises a plurality of individual optical outlets connected to the single optical guiding element.

3. The device of claim 2, wherein the distal surface of at least one of the optical outlets is coloured adapted for generating heat.

30 4. The device of claim 2 or 3, wherein the optical outlets are regularly, irregularly or distinct distributed with respect to the first surface of the applicator, and the first surface of the applicator is preferably virtually subdivided into different areas having different distributions of the optical outlets.

5. The device of claim 4, wherein the density of the optical outlets vary with respect to the first surface of the applicator.
6. The device of any one of claims 2 to 5, wherein the applicator has a symmetric shape,
5 and the optical outlets are arranged symmetrically in accordance with the symmetry of the applicator.
7. The device of any one of the preceding claims, wherein the applicator comprises a single agent channel extending from a proximal end of the shaft to a distal channel opening at
10 the first surface of the applicator, the proximal end of the agent channel being connectable to an agent supply.
8. The device of claim 7, wherein the single agent channel extends from a proximal end of the shaft to at least two distal channel openings at the first surface of the applicator.
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9. The device of claim 7 or 8, wherein the applicator further comprises a channel for sucking away superfluous agent.
10. The device of any one of claims 1 to 7, wherein the applicator comprises a plurality of
20 agent channels.
11. The device of claim 10, wherein each agent channel extends from a proximal end of the shaft to at least two distal channel openings at the first surface of the applicator.
- 25 12. The device of claim 10 or 11, wherein one or more agent channels are for the application of an agent such as riboflavin, whereas one or more of the remaining channels are for sucking away superfluous agent.
- 30 13. The device of any one of claims 8 to 12, wherein the agent channel(s) is/are at least partly isolated against electromagnetic radiation, preferably isolated against electromagnetic radiation with a wavelength in the range between 100 nm and 2000 nm, and most preferably isolated against electromagnetic radiation with a wavelength in the range between 300 nm and 800 nm.

14. The device of any one of claims 8 to 13, wherein the first surface of the applicator has a structure adapted to allow for an improved distribution of agent when agent is lead through the agent channel.

5 15. The device of claim 14, wherein the first surface structure comprises chamfers, or elements such as bars, half-spheres, pyramids or cones.

16. The device according to any one of the preceding claims, wherein the applicator further comprises a single optical outlet connected to a single optical guiding element
10 extending from a proximal end of the shaft to the single distal optical outlet at the first surface of the applicator, the optical guiding element being configured for guiding electromagnetic waves configured for crosslinking sclera tissue towards the optical outlet.

17. The device of claim 16, wherein the applicator comprises a plurality of individual
15 optical surface areas connected to the optical guiding element.

18. The device according to any one of the preceding claims, wherein the applicator comprises a plurality of individual first optical surface areas connected to a first optical guiding element and a plurality of individual second optical surface areas connected to a
20 second optical guiding element, the first and second optical guiding element extending from a proximal end of the shaft to the respective distal optical surface areas at the first surface of the applicator, the first optical guiding element being configured for guiding electromagnetic waves towards the optical first optical surface areas, and the second guiding element being associated with a photosensitizer.

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19. A device for a medical thermal treatment of a sclera by coagulation, the device comprising two, three, four or more applicators each connected to a respective shaft, wherein:

each applicator is configured to be placed into the Tenon's space;

each applicator has a first surface, wherein the first surface of the applicator is
30 superficially contactable to the surface of an area of the sclera so as to superficially cover said area;

each applicator comprises a single optical outlet connected to a single optical guiding element extending from a proximal end of the respective shaft to the single distal optical

outlet at the first surface of the applicator, the optical guiding element being configured for guiding electromagnetic waves towards the optical outlet, wherein the optical guiding element is configured to guide electromagnetic waves of a wavelength adapted for thermal treatment of the sclera at a spot by protein coagulation; and

5 wherein the shafts of the applicators are proximally connected to a single proximal shaft,

wherein each applicator further comprises a single monopolar or bipolar electrode connected to a single electrical conductor element extending from a proximal end of the shaft to the electrode at the first surface of the applicator, or wherein each applicator further
10 comprises multiple monopolar or bipolar electrodes connected to multiple electrical conductor elements extending from a proximal end of the shaft to the electrodes at the first surface of the applicator, wherein the electrodes provide electrical protein coagulation at a spot, or

wherein the distal surface of the optical outlet is at least partially coloured adapted for generating heat for thermal treatment of the sclera at a spot by protein coagulation.

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20. The device of claim 19, wherein each applicator comprises a plurality of individual optical outlets connected to the single optical guiding element.

21. The device of claim 20, wherein the distal surface of at least one of the optical outlets
20 is coloured adapted for generating heat.

22. The device of claim 20 or 21, wherein the optical outlets are regularly, irregularly or distinct distributed with respect to the first surface of the applicator, and the first surface of the applicator is preferably virtually subdivided into different areas having different
25 distributions of the optical outlets.

23. The device of claim 22, wherein the density of the optical outlets vary with respect to the first surface of the applicator.

30 24. The device of any one of claims 20 to 23, wherein the applicator has a symmetric shape, and the optical outlets are arranged symmetrically in accordance with the symmetry of the applicator.

25. The device of any one of claims 19 to 24, wherein each applicator comprises a single agent channel extending from a proximal end of the shaft to a distal channel opening at the first surface of the applicator, the proximal end of the agent channel being connectable to an agent supply.

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26. The device of claim 25, wherein the single agent channel extends from a proximal end of the shaft to at least two distal channel openings at the first surface of the applicator.

27. The device of claim 24 or 25, wherein each applicator further comprises a channel for sucking away superfluous agent.

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28. The device of any one of claims 19 to 27, wherein each applicator comprises a plurality of agent channels.

29. The device of claim 28, wherein each agent channel extends from a proximal end of the shaft to at least two distal channel openings at the first surface of the applicator.

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30. The device of claim 28 or 29, wherein one or more agent channels are for the application of an agent such as riboflavin, whereas one or more of the remaining channels are for sucking away superfluous agent.

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31. The device of any one of claims 26 to 30, wherein the agent channel(s) is/are at least partly isolated against electromagnetic radiation, preferably isolated against electromagnetic radiation with a wavelength in the range between 100 nm and 2000 nm, and most preferably isolated against electromagnetic radiation with a wavelength in the range between 300 nm and 800 nm.

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32. The device of any one of claims 26 to 31, wherein the first surface of each applicator has a structure adapted to allow for an improved distribution of agent when agent is lead through the agent channel.

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33. The device of claim 32, wherein the first surface structure comprises chamfers, or elements such as bars, half-spheres, pyramids or cones.

34. The device according to any one of claims 19 to 33, wherein each applicator further comprises a single optical outlet connected to a single optical guiding element extending from a proximal end of the shaft to the single distal optical outlet at the first surface of the applicator, the optical guiding element being configured for guiding electromagnetic waves
5 configured for crosslinking sclera tissue towards the optical outlet.

35. The device of claim 34, wherein each applicator comprises a plurality of individual optical surface areas connected to the optical guiding element.

10 36. The device according to any one of claims 19 to 35, wherein each applicator comprises a plurality of individual first optical surface areas connected to a first optical guiding element and a plurality of individual second optical surface areas connected to a second optical guiding element, the first and second optical guiding element extending from a proximal end of the shaft to the respective distal optical surface areas at the first surface of the applicator,
15 the first optical guiding element being configured for guiding electromagnetic waves towards the optical first optical surface areas, and the second guiding element being associated with a photosensitizer.

20 37. The device of any one of the preceding claims, further comprising a shield element sized and shaped to at least partially cover the cornea during use of the device.

38. The device of any one of the preceding claims, further comprising one or more recesses are formed in the edge of the applicator, wherein the one or more recesses may be positioned and formed such that the recesses leave free space for eye muscles, blood vessels
25 and/or nerves when the applicator is positioned on said area of the sclera.

39. The device of any one of the preceding claims, wherein the applicator comprises a base layer made from a material being at least one of sterilisable and heat-resistant, for example medical steel or plastic, and is preferably impervious to light.

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40. The device of any one of the preceding claims, wherein the applicator comprises one or more additional layers, wherein the base layer and the one or more additional layers are arranged as stacked layers with the base layer on the outer side of the applicator so as to

support the additional layers, and wherein each of the one or more additional layers is preferably made from a plastic or a metal material, more preferably light-diffusing, light blocking and/or sponge like material.

- 5 41. The device of claim 40, wherein at least one of the additional layers is a diffuser adapted for diffusing electromagnetic waves, and wherein at least part of the distal openings are arranged within or at the outer side of the additional layer(s) being a diffuser.