Fiber Array for Optical Imaging and Therapeutics

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Technology description

A biomedical device that allows increased light penetration in skin and can substantially improve a variety of light-based therapeutic and diagnostic procedures.The device has an array of optically transparent fibers (either nano- or microscale in diameter) which are guided into a patient's skin by the simultaneous application of a guidance ferrule template and an elastomeric material. A feedback and control mechanism monitors treatment for penetration depth and force. Diffuse optical tomography (DOT) may then be used to optically identify and characterize tissue structures beneath the epidermis layer, such as cancerous cells, hair follicles, freckles, tattoo particles, blood vessels, epidermal/dermal junctions, and dermal/adipose junctions. In concert with DOT, a treatment can targeted, therefore reducing collateral damage and pain during treatment and allowing faster wound healing.
This device has applications in cosmetic surgery, oncology treatment, dermatology, and alternative medicine protocols. This technology solves a fundamental problem when laser light is applied to skin: absorption and scattering of the laser’ s photons within the epidermis and dermis. Since photons scatter around water-encapsulated and water-containing cells too much to allow focused light penetration into subcutaneous tissue, maximum typical photonic penetration depth is only a few millimeter. Enhancing photonic transmission depth without absorption and scattering to allow imaging below the epidermis (top 100 μm) and dermis (1-2 mm thick below epidermis) also has applications in basic research, individual cell imaging, tissue engineering, and clinical research.

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