

Microneedles and their use in dermatology

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Microneedles have been in development over the past decade and are needles designed to penetrate into either the epidermis or the dermis. Initially developed to enhance transdermal drug delivery, there has been an enormous growth in the number of studies exploring microneedles of various designs in shape, materials, and sizes. Microneedles can be subdivided into multiple subtypes including hollow vs solid, shallow vs deep, dissolving vs non-dissolving, and coated vs uncoated. Although microneedles were initially made of silicon and prohibitively expensive for mass production, subsequent designs out of metal, polymers, and sugars have made commercialization feasible. Because microneedles are inherently designed for use on the skin, it has large potential for use within the field of dermatology. Microneedles may be useful for multiple clinical indications although only a few clinical studies have been conducted. Clinical applications will be reviewed including cosmetic applications such as dermal remodeling and medical applications such as enhancement of topical treatments, anesthesia and photodynamic therapy.

In particular, the use of microneedles in photodynamic treatment will be highlighted and the results of studies involving photodynamic therapy and anesthesia will be discussed. The side effect profile for microneedles will be reviewed and this is largely determined by the size of the microneedles.

Biography

Raja Sivamani completed an undergraduate degree and Master's degree in bioengineering from the University of California, Berkeley and University of California, San Francisco conducted the first clinical study investigating the utility of hollow microneedles in human subjects. He completed his medical training at the University of California, Davis. During his medical training he served as a Howard Hughes Medical Institute Research Fellow. He is currently a chief resident physician in the Department of Dermatology at the University of California, Davis. He has published over 20 peer-reviewed manuscripts on several topics within dermatology including tribology, microneedles, mesenchymal stem cells, and wound healing. His unique training in both bioengineering and dermatology allows him to bridge the gap between the two disciplines to develop novel therapeutic strategies within dermatology.

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