PIGMENTATION

DEVELOPMENT OF TRANEXAMIC ACID-EMBEDDED DISSOLVING MICRONEEDLES FOR TREATMENT OF MELASMA: A PILOT STUDY ON THE OPTIMAL APPLICATION DURATION

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Background: Melasma is a prominent skin problem affecting Asian women. Current standard treatment such as hydroquinone have potential side-effects of skin irritation and ochronosis. Recent studies show that oral and topical tranexamic acid (TA) is effective. However, these have varying levels of systemic side effects and efficacy in drug delivery.
We have developed hyaluronic acid dissolving microneedles embedded with 3% TA embedded at the distal half of the microneedles. These are expected to deliver TA into the epidermis and superficial dermis, increasing the efficacy of treatment while avoiding systemic side effects.

Objective: (1) To determine the optimal duration for 100% absorption of TA microneedles in healthy adults. (2) To validate depth of penetrance and deposition of TA microneedles in the skin.

Materials and Methods: Six volunteers (three females), aged 25 – 43 applied the microneedle patch for different time intervals at the malar position of the face.
Enface and cross-sectional images of the microneedle patches were obtained at 20x magnification after application. These were analyzed to determine percentage of microneedles dissolved.
Four volunteers were further imaged using high-definition Optical Coherence Tomography (HD-OCT) on a 1.8mm by 1.5mm spot before and after patch application to validate the deposition of the microneedles into the epidermis and superficial dermis.

Results: At 15 minutes, 26.7% of total microneedles and 26.7% microneedle height were dissolved. At 20 minutes, 73.82% of total microneedles and 64.14% of microneedle height were dissolved. At 30 minutes and 45 minutes, there was complete dissolution. HD-OCT imaging determined that the microneedles penetrated to and were embedded beyond the dermal epidermal junction.

Conclusions: 30 minutes is the optimal duration for application of the microneedles to achieve complete dissolution of the microneedles, allowing complete dissolution of the drug.

The microneedles are efficient in delivering TA to the sites of melanin accumulation in melasma.