ENHANCED DELIVERY OF VISMODEGIB BY MICRONEEDLE TREATMENT: EFFECT OF NEEDLE LENGTH, EQUILIBRATION TIME AND TREATMENT DURATION

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Purposes

The study investigated the effect of microneedle treatment (Maltose microneedles, Admin Pen™ 1200 and Admin Pen™ 1500) on in vitro transdermal delivery of vismodegib with different needle lengths (500; 1100; 1400 μm), skin equilibration time (0; 30 minutes) and microneedle insertion duration (1; 2; 4 minutes).

Methods

- The microneedle shape, dimension, surface morphology and distribution pattern on array by Pharem™ field emission SEM system.
- Dynamic viscoelasticity of porcine ear skin by an oscillatory rheometer.
- The formation of microchannels on skin by dye binding studies (Proscope HR microscope, histology studies (Moiron HM506E)).
- The depth and surface area of microchannels by a computerized Leica SP 8 confocal laser microscope.
- The pore uniformity and relative flux values by calcium imaging studies.
- The barrier integrity and humidity of skin by transepidermal water loss (TEWL) measurement.
- The rate and extent of drug transported across skin and drug retention in skin by in vitro permeation studies using vertical Franz diffusion cells.
- The effect of EpiDerm™ skin irritation test of vismodegib solution in PG 7 mg/ml by 3D in vitro reconstructed human epidermal model EpiDerm.

Results

- The total surface area and average depth of microchannels. An increase in needle length enhanced the depth of the channels
- In vitro permeability of vismodegib through microneedle-treated porcine ear skin Maltose MN (MOE), Admin Pen™ 1200 (AOE1200), Admin Pen™ 1500 (AOE1500) MDE(2min (2-min treatment), MDE4min (4-min treatment), MDE30min (30-min equilibration), MOE (No equilibration), OM (No treatment) (n=4)
- Microneedles significantly enhanced vismodegib permeability through skin. Maltose MN delivered a statistically significant smaller amount of drug to the skin than Admin Pen™ 1200, Admin Pen™ 1500. The 30-min post-MN treatment equilibration time enhanced the drug delivery. A positive correlation between MN treatment duration and the drug delivery.

Conclusions

- Changes in microneedle length, equilibration time and treatment duration altered vismodegib transdermal delivery.

References