Quantifying Uptake of Eye Serum After 1440-nm or 1927-nm Non-ablative Fractional Diode Laser Treatment

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OBJECTIVE

- To quantify uptake of an eye serum, Obagi® Elastiderm (Long Beach, CA; 2010 formulation), using donor skin tissue pretreated with a 1440-nm or 1927-nm non-ablative fractional diode laser (320 MTZ/cm²; Clear + Brilliant® laser system; Solta Medical, Bothell, WA)

CONCLUSIONS

- In this ex vivo analysis, pretreatment with low-power 1440-nm or 1927-nm non-ablative fractional diode lasers not only increased overall uptake of mineral eye serum but also achieved more rapid absorption after application compared to untreated controls
- Pretreatment with the 1927-nm wavelength at low power (0.6 W) showed similar uptake enhancement to 1440-nm laser pretreatment at 3 W relative to untreated control (~1.6 vs 2 times)
- 1927-nm pretreatment at 1 W enhanced uptake of mineral eye serum by ~2.7 times relative to untreated control
- These results provide a foundation for guidance on the use of non-ablative lasers in clinical studies on topical uptake enhancement

SYNOPSIS

- The stratum corneum limits transdermal uptake of topical therapies, potentially reducing their clinical efficacy[1]
- Non-ablative fractional laser pretreatment enhances topical delivery and absorption, reduces thermal side effects, and creates microscopic treatment zones (MTZ) that spare the stratum corneum[2-4]
- Clinical practice may be improved by understanding the relationship between topical uptake and energy-device settings, such as wavelength, peak power, and spot density

METHODS

- Human donor skin tissue samples of 500-µm thickness were pretreated with a low-power 1440-nm diode laser, 1927-nm diode laser, or received no pretreatment prior to application of eye serum (Table)

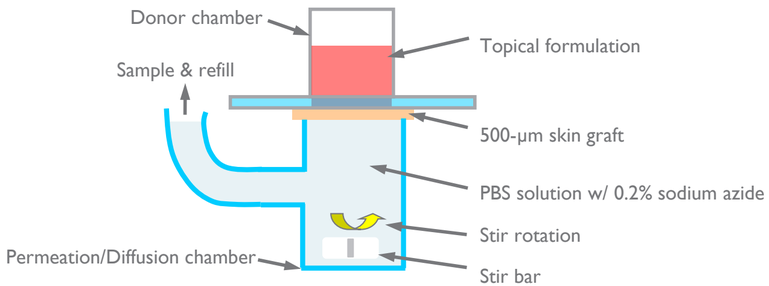
Table. Experimental Parameters for Uptake Analysis

Parameter	Setting		
Device wavelength, nm	1440	1927	1927
Spot density, MTZ/cm²	320	320	320
Peak power, W	3	0.6	1
Spot size, µm	130	130	130
Pulse energy, mJ	9	4.5	7.5

MTZ, microscopic treatment zones.

- Eye serum was applied to laser-treated skin and untreated controls, and permeation was measured up to 24 hours after application (Figure 1)
- Samples were filtered and analyzed using high-performance liquid chromatography to measure cumulative permeation and retention
- Total uptake was calculated as the sum of the normalized cumulative permeation and retention in each sample

Figure 1. Study design for testing uptake of topicals on skin tissue.



PBS, phosphate-buffered saline.

RESULTS

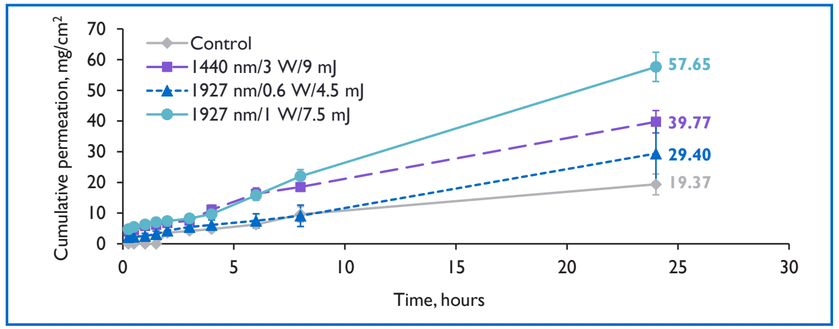
Uptake

- Pretreatment with the 1440-nm laser increased uptake of mineral eye serum at 24 hours posttreatment by almost 2 times compared to untreated controls (47.1 vs 23.7 mg/cm²)
- Pretreatment with the 1927-nm laser with lower power and energy settings (0.6 W, 4.5 mJ) enhanced uptake of mineral eye serum by ~1.6 times compared to untreated controls (39.0 vs 23.7 mg/cm²)
- Higher power and energy settings (1 W, 7.5 mJ) with the 1927-nm laser enhanced uptake of eye serum by ~2.7 times compared to untreated controls (63.6 vs 23.7 mg/cm²)

Permeation

- Permeation was increased by >2 times with 1440-nm laser pretreatment compared to untreated controls (39.7 vs 19.4 mg/cm²; Figure 2)
- Low-power 1927-nm pretreatment (0.6 W) increased permeation by 1.5 times compared to untreated controls (29.4 vs 19.4 mg/cm²)
- Higher-power 1927-nm pretreatment (1 W) increased permeation by almost 3 times compared to untreated controls (57.6 vs 19.4 mg/cm²)
- Laser-treated samples showed enhanced uptake within 15 minutes of application, whereas untreated controls did not demonstrate permeation until 2 hours

Figure 2. Cumulative permeation of mineral eye serum after laser pretreatment.



Values are mean ± standard deviation.

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Disclosures: JVW is an investigator for Solta Medical. PMF serves on the advisory board and speaker bureau for Solta Medical. AK and CP are employees of and may hold stock or stock options in Solta Medical. RGG is an investigator and advisory board member for Solta Medical.

References: 1. Lee et al. *Eur J Pharm Sci.* 2016;92:1-10. **2.** Machado et al. *Aesthetic Plast Surg.* 2021;45:1020-1032. **3.** Friedman et al. *J Drugs Dermatol.* 2020;19:s3-s11. **4.** Farkas et al. *Aesthet Surg J.* 2013;33:1059-1064.

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