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Combination of Light and Energy-Based Technologies With Topical Drug Delivery

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The future of lasers and energy-based technologies lay in expanding their application to the delivery of compounds or drugs. By combining technologies with drug delivery, efficacy of either therapeutic modality may be augmented and applications expanded. One such area of great potential is combining laser and energy-based technologies with topical anti-aging ingredients. Fractional laser resurfacing methods have been employed to enhance the penetration of vitamin C derivatives,[1,2] hyaluronic acid,[3] and platelet-rich plasma[4] in the treatment of rhytids, dyspigmentation, and photoaging. Such an approach has been employed with triamcinolone in the treatment of hypertrophic scars[5] and imiquimod for actinic keratosis.[6] Another area of active research is the enhancement of photodynamic therapy protocols through antecedent fractional laser resurfacing prior to photosensitizer application in the treatment of actinic keratoses, squamous cell carcinoma, and photoaging.[7-9] The reverse approach currently under exploration is the application of topical anti-aging ingredients followed by a laser or energy-based technology to enhance penetration without thermal or ablative injury. Such an experimental approach currently being tested by the author includes the application of anti-aging compounds or photosensitizer followed by a novel ultrasound technology to increase penetration of active ingredients.[10,11] The future is bright for laser and energy-based technologies, where combination with topical therapy serves to facilitate drug penetration, potentially augmenting efficacy, and expanding treatment applications.

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References

1. Alexiades-Armenakas M. Fractional Laser Resurfacing to Enhance Skin Permeation. *Derm Surg* 2012; 38(8): 1294-1295.
2. Hsiao CY, Huang CH, Hu S, Ko YS, Sung HC, Chen CC, Huang SY. Fractional carbon dioxide laser treatment to enhance skin permeation of ascorbic acid 2-glucoside with minimal skin disruption. *Dermatol Surg.* 2012 Aug; 38(8):1284-1293.
3. Ribé A, Ribé N. Neck skin rejuvenation: histological and clinical changes after combined therapy with a fractional non-ablative laser and stabilized hyaluronic acid-based gel of non-animal origin. *J Cosmet Laser Ther.* 2011;13(4):154-161. Epub 2011 Jun 23.
4. Na JI, Choi JW, Choi HR, Jeong JB, Park KC, Youn SW, Huh CH. Rapid healing and reduced erythema after ablative fractional carbon dioxide laser resurfacing combined with the application of autologous platelet-rich plasma. *Dermatol Surg.* 2011;37(4):463-468.
5. Issa MC, Kassuga LE, Chevrand NS, Pires MT. Topical delivery of triamcinolone via skin pretreated with ablative radiofrequency: a new method in hypertrophic scar treatment. *Int J Dermatol.* 2013 Mar;52(3):367-370.
6. Lee WR, Shen SC, Al-Suwayeh SA, Yang HH, Yuan CY, Fang JY.Laser-assisted topical drug delivery by using a low-fluence fractional laser: imiquimod and macromolecules. *J Control Release.* 2011 10;153(3):240-248.
7. Helsing P, Togsverd-Bo K, Veierød MB, Mørk G, Haedersdal M. Intensified fractional CO2 laser-assisted photodynamic therapy versus laser alone for organ transplant recipients with multiple actinic keratoses and wart-like lesions: A randomized half-side comparative trial on dorsal hands. *Br J Dermatol.* 2013 Jul 16. doi: 10.1111/bjd.12507. [Epub ahead of print]
8. Ko DY, Kim KH, Song KH. A randomised trial comparing methyl aminolaevulinate photodynamic therapy with and without Er:YAG ablative fractional laser treatment in Asian patients with lower extremity Bowen's disease: results from a 12-month follow-up. *Br J Dermatol.* 2013 Sep 14. doi: 10.1111/bjd.12627. [Epub ahead of print]
9. Ruiz-Rodriguez R, López L, Candelas D, Zelickson B. Enhanced efficacy of photodynamic therapy after fractional resurfacing: fractional photodynamic rejuvenation. *J Drugs Dermatol.* 2007 Aug;6(8):818-820.
10. Alexiades-Armenakas M.R. Red light, Blue light, Any light? Cutting Edge: Laser and Skin Session, Amer Soc Laser Med Surg Ann Meeting, April 21, 2012, Kissimmee, FL.
11. Liu Y, Yan J, Prausnitz MR. Can ultrasound enable efficient intracellular uptake of molecules? A retrospective literature review and analysis. *Ultrasound Med Biol.* 2012 May;38(5):876-888.