INTRODUCTION:

예술 가수를, 노래를, 그리고 음악을 통해

• Fractional resurfacing one of most popular cosmetic procedures performed worldwide

• Post-operative downtime is a major factor for patients when considering an aesthetic procedure

INTRODUCTION: Effects of Vitamin C

#1 WOUND HEALING
Previous studies have shown that CE Ferulic’s unique antioxidants including vitamin C improves wound healing

#2 NEOCOLLAGENOSIS
1987 Dr. Pinnell wrote article describing possible mechanism of Vitamin C induction of collagen synthesis
OBJECTIVES:

**Primary Objective:**
The objective of this study was to prospectively evaluate the efficacy of Vitamin C, Vitamin E and Ferulic formula decreasing post-operative down time in fractional ablative laser resurfacing in photodamage in a split face model.

**Secondary Objective:**
Evaluate synergistic response of laser & Vitamin C, Vitamin E and Ferulic on the upregulation and formation of collagen.

FRACTIONAL LASER ASSISTED DELIVERY SYSTEMS
Topical drug delivery is essential to dermatological therapy.

Skin is a barrier to dermatologic therapy and therefore the skin presents a therapeutic challenge.

For a topical agent to be active, it must first traverse the rate-limiting outermost barrier of the stratum corneum.


STUDY DESIGN & METHODS

- Double blinded randomized prospective trial
- 15 patients were prospectively underwent one full face fractional ablative laser treatment.

| Full face laser resurfacing | Immediately post-operative split face treatment of active vitamin C vs placebo | Biopsies taken 6 patients baseline, day 5 & 6 months | Daily photographic evaluation |
INCLUSIONS & EXCLUSIONS

- **Inclusions:** Moderate photodamage via Glogau scale
- **Exclusions:** Not using cosmeceutical grade product line, no active skin infection, not pregnant or breastfeeding, no oral retinoids 6 months prior, no lesions suspicious for malignancy
- **15 patients:** 12 women & 3 men

EVALUATIONS

- **Day 1:** Baseline biopsies both sides of face taken for H&E, RT-PCR for mRNA collagen I, III and immuno for collagen I, III
- **Day 2:** Full face laser resurfacing and application Vitamin C or placebo
- **Day 3-7:** Daily patient photographs and patient questionnaires
- **Day 1, 3, 5, 7:** Physician Visual Assessment Scale
- **Day 5:** Biopsies for RT-PCR mRNA collagen I & III
- **6 Month:** Biopsies both sides face taken for H&E and immuno for collagen I & III

METHODS

**FULL FACE CO2 FRACTIONAL ABLATIVE LASER RESURFACING**

**APPLICATION OF VITAMIN C, VITAMIN E AND FERULIC TO FACE**
RESULTS:

**VITAMIN C, E, F DECREASED EDEMA VS. PLACEBO POST-OPERATIVE DAY 3**

- Edema usually worst within 48-72 post-operatively
- Vitamin C, Vitamin E and Ferulic treated side showed decreased edema on day 3

**RESULTS:**

**VITAMIN C, E, F DECREASED ERYTHEMA VS. PLACEBO POST-OPERATIVE DAY 3, 5**

Day 5 after fractional ablative CO2 laser treatment on Vitamin CEF side revealed a protective or increase of beta Fibroblast Growth Factor (bFGF) vs. laser only side.

Previous laser studies by Ozog et al. revealed results seen in placebo side that bFGF is decreased relative to baseline after laser resurfacing.
3 Classic phases of wound healing

- These are based on changes in tensile strength and collagen content in the wound
- Inflammatory (Lag) phase
  - Little change in strength of wound in first 3-4 days
  - Mono's predominate
- Proliferative phase
  - Rapid increase in collagen content, rapid increase in tensile strength
  - Macrophage/Fibroblast predominate
- Maturation phase
  - No net increase in collagen content, less cellular and vascular, continues to gain strength up to apx. 80% of normal

These phases described are dynamic, non-linear, overlapping and dependent upon both internal, individual as well as external interactions or forces.

Our study showed on day 5 increased or protected bFGF (fibroblast growth factor) which directly stimulates fibroblasts in the proliferative phase of wound healing to increase collagen to close wound. Time course and factor consistent with what is known about wound healing.

This is first study to show Vitamin CEF correlates the wound healing clinical effect seen in patients with a specific molecular mechanism of action.

1. Increased healing clinically on patients in initial days after injury (day 3 - 5)

2. Molecular marker bFGF elevated Vitamin C side only (day 5) – stimulates fibroblasts which are main wound healing cells.

POSSIBLE MOLECULAR PATHWAY OF VITAMIN CEF TO STIMULATE WOUND HEALING

- Molecular data that reveals that FGF was statistically significantly increased on day 5 after vitamin C,E,F
- This may be the first insight into Vitamin C induced pathway of wound healing
- Proposed pathway: Vitamin CEF protects or increases bFGF which in turn increases fibroblast activity to repair wound damage in initial days after injury.
- Next phases of research: need FGF antibody to measure levels of FGF and larger sample size

Upon injury to the skin, a set of complex biochemical events takes place in a closely orchestrated cascade to repair the damage.

Vitamin C may have wide implications for all wound healing in humans.
Next phase
6 month follow up
active side: evaluating neocollagenosis….

CONCLUSION & FUTURE:

- Overall Vitamin C, Vitamin E and Ferulic was well tolerated immediately post fractional ablative laser
- Initial data review (physician, patient) show trends of decreasing downtime 24-48 hours for fractional ablative (and non-ablative laser)
- Vitamin C may play a significant role in wound healing
- 2nd phase: evaluate if increased neocollagenesis in laser & Vitamin CEF side vs placebo
- Repeat molecular studies with higher numbers of patients

Acknowledgement to Clinical Trial Team

- David M Ozog MD, FAAD
- Qing-Sheng Mi, M.D., Ph.D.
- Research MDLI: Scott Combs, Melissa Bermudez, Ana Fox

Thank you