Physical Modalities for Treating ACNE

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Disclosures

- Allergan
- Galderma
- Valeant
- Bayer
- Ferndale
- J & J
- Aclaris
- P & G
- SkinFix
- Taro
- Revance
Clinical Questions

• What is the effectiveness and potential side effects of physical modalities for the treatment of acne vulgaris in adolescents to adults including?
  – Intralesional steroids
  – Chemical peels (glycolic acid, salicylic acid, lactic acid, polyhydroxy acid, amino fruit acid, pyruvic acid, trichloroacetic acid, Jessner's peel)
  – Comedo removal
  – Lasers and photodynamic therapy
Old Clinical Guidelines

• Did not address:
  – Other types of chemical peels apart from glycolic or salicylic acid peels
  – Lasers
  – Photodynamic therapy
New Evidence Reviewed

• Chemical peels
• Lasers
  – KTP laser
  – Pulsed dye laser
  – Infrared laser
  – CO2 laser
• Lights
  – Intense pulsed light (IPL)
  – Handheld at-home devices (including LED devices)
  – Radiofrequency devices
  – Blue light
• Photodynamic therapy
  – Incubation with aminolevulinic acid (ALA) and methyl aminolevulinate (MAL)
  – Activation with: IPL, blue light, red light
Peels

• Adjunct to medical therapy

• SA, LHA (B-Lipohydroxy Acid), GA, TCA, Mandelic Acid
  - lipophilic, comedolytic, remove epidermal melanin, enhance penetration topicals
  - acne, PIH, oily skin, enlarged pores, surface roughness and texture, early scarring
  - ↓ arachidonic acid cascade - antiinflammatory
Lasers and Light sources for Acne

- Blue and red light – bacteria (porphyrins in p. acnes), inflammation
- PDT – add photosensitizer (ALA, MAL)
- IPL, KTP, PDL – erythema
- 1450 nm laser – sebaceous glands, scarring
- Photopneumatic therapy (PPX) – broad band light + vacuum
- Radiofrequency – pores, scarring
- Q – switched ND: YAG laser – PIP, pores
- Fractional lasers – scarring, pigment
- Needling devices – neocollagenesis → acne scars
PDL – Effectiveness and Side Effects

- Few studies
- Multiple treatments needed for any benefit
  - Multiple treatments (i.e. six) needed for benefit similar to topical regimen of benzoyl peroxide and tretinoin
  - Results may be sustained for 2 – 5 months
- PDL also improves erythema from residual acne lesions
- Well tolerated, side effects are mild transient erythema, edema
- Our opinion: PDL may have some, but minimal benefit for active acne. PDL is better utilized to treat residual acne erythema.
Infrared Lasers – Effectiveness and Side Effects

- 1450nm laser and 1320nm laser
- Multiple treatments needed
- Most studies with 3 – 4 treatments, some up to 8 treatments
  - Spaced apart weekly to every three weeks
- Reduction after several treatments 49% - 63%, some just show mild improvement in comedones
- Improvement noted up to 12 months
- Common:
  - Pain, erythema
  - Pain very pronounced and limited the utility of infrared lasers in many studies
- Rare:
  - Edema, hyperpigmentation, arcuate burns (crescent shaped burns)
- Our opinion: offers minimal benefit but too painful for patients to be a realistic option
IPL – Effectiveness and Side Effects

- Difficult to assess as many IPL devices on the market with varying specifications
- Multiple sessions needed
  - Four weekly sessions of IPL reduced overall lesion count by 51%
- Overall, minimal to no effect
- More efficacious when used as part of PDT
- Erythema and edema common side effects
- Our opinion: not beneficial unless part of PDT therapy
Radiofrequency Devices

• Little data
• Multiple treatments (weekly for 6 treatments)
• Reduction of 42%
• Short lasting improvement (2 - 4 weeks)
• Our opinion: not recommended for treating acne.
Blue Light

- Multiple, frequent treatments needed
  - Twice a week -
- Results not long lasting
- Safe with minimal side effects
- More efficacious for inflammatory rather than non-inflammatory lesions
- Our recommendation: safe, multiple treatments needed but limited efficacy and duration of effect.
PDT - Effectiveness

• Studies difficult to summarize as PDT performed with different incubators, different incubation times, and different light sources

• Incubators used in studies include:
  – Aminolevulinic acid (ALA), strengths vary from 10% – 20%
  – Liposomal aminolevulinic acid
  – Methyl aminolevulinate
  – Indole-3-acetic acid
  – Best incubator for acne treatment unclear

• Incubation times range from:
  – 30 min – 5 hours
  – Ideal incubation time unclear
PDT - Effectiveness

• Light sources include:
  – IPL
  – Red light (633nm)
  – PDL (595nm)
  – KPT (532nm)
  – Blue light

• Unable to conclude which light source is optimal given lack of comparative studies
- Improvement in lesions can be seen with multiple incubators, incubation times and activation sources
- Improvement most noted more in inflammatory rather than non-inflammatory lesions (some evidence that comedones can also be treated)
- Does not clear every patient
  - 82% had at least 60% improvement
  - Inflammatory lesions decreased by 66%
  - 30% of patients had improvement of inflammatory lesions
  - Greater than 75% improvement in 72% of patients
- Multiple sequential treatments needed
  - Most studies have 2 – 4 treatments done weekly or every other week
- Short lived improvement, but follow-up time variable
  - Lasts 8 weeks – 6 months
PDT - Effectiveness

• Difficult to make comparison amongst different light sources used for PDT

• Multiple studies comparing a laser or light source alone to PDT using the laser or light source

• Consistently demonstrated that using the laser or light source in combination with and incubator (i.e. PDT) is more effective than the laser or light source alone

  – With the exception of one small study examining KTP laser alone vs PDT utilizing KTP laser
PDT – Side Effects

• Common:
  – Pain, erythema, edema

• Rare:
  – Hyperpigmentation, perifollicular eruption, pustular eruption, exudate, yellow crusting

• Side effects more pronounced for longer incubation times
• Our opinion: an effective, but temporary, treatment option for inflammatory acne. No consensus on best incubator, ideal incubation time, or best activating light source. Well tolerated at lower incubation times. Further studies are needed to standardize treatment protocols.

• Most evidence on lasers/light sources and acne involves PDT studies.

• Of studies currently available, PDT seems to have the most consistent evidence for temporarily improving acne.
Mechanism of Acne Clearance
650-Microsecond Laser Technology

1) Selective photothermolysis of blood vessels:
Coagulation of blood vessels blocks the inflammatory response and
reduces pressure on the surrounding tissue, reduces pain and reduces
inflammation/postinflammatory erythema.

2) Phototoxic or bactericidal effect:
Inhibition of bacterial cells or their apoptosis as a result of the light
radiation absorption by endogenous porphyrins Propionibacterium acne
or as a result of thermal destruction of bacteria.

3) Photothermal effect:
Deep-heating effect of lasers emitting in the mid infrared range causing
thermocoagulation of collagen and sebaceous glands, reducing sebum
output.
Clearance of Acne with 650-Microsecond Laser Technology

Before 3 Months After 5th Treatment

(photos courtesy of David Goldberg, MD)
Clearance of Acne with 650-Microsecond Laser Technology

Before 1 Month After 4th Treatment

(photos courtesy of David Goldberg, MD)
Clearance of Acne with 650-Microsecond Laser Technology

Before

After 2\textsuperscript{nd} Treatment

(photos courtesy of Michael Gold, MD)
Results: reduction in total lesions (all subjects)

- Both groups improved in total lesion counts

<table>
<thead>
<tr>
<th>Endpoint</th>
<th>Control</th>
<th>SNA-001</th>
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<tbody>
<tr>
<td>Mean change TLC BL to 12 weeks</td>
<td>-6.0</td>
<td>-5.5</td>
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<tr>
<td>Mean % reduction TLC BL to 12 weeks</td>
<td>-45.5</td>
<td>-62.8</td>
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TLC, total lesion count; SD, standard deviation; BL, baseline.

\(^a\) Laser + SNA-001, mean change BL to 12 weeks post-treatment.

\(^b\) Laser only (control), mean change BL to 12 weeks post-treatment.
## Overview of Blue Light Devices

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<th>TRIA Skin Perfecting Blue Light</th>
<th>Omnilux Clear-U</th>
<th>Tända</th>
<th>ANSR: BLU-U</th>
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| Percent Inflammatory Lesion Reduction | 70% within 2 to 4 weeks (Reference 1) | 38% by week 4 (Reference 2) | 39% by week 4 (Reference 3) | No published results | 37.5% within 3 weeks |
| Treatment Time            | 2.5 minutes twice per day | 20 minutes twice per week | 6 minutes per day | 10 minutes per day | 17 minutes twice per week |
| Power Density             | 400 mW/cm² | 40 mW/cm² | 50 mW/cm² | less than 40 mW/cm² | 10 mW/cm² |
| FDA OTC cleared           | Yes | Yes | Yes | No | Yes (Rx) |
| % output in therapeutic band | 100% (412 nm) | 100% (415 nm) | 100% (415 nm) | 0% (440 nm) | 100% (417 nm) |

### References
CO$_2$ Laser – Effectiveness and Side Effects

- Few studies
- Not significantly helpful for acne
- Side effects marked and include: pain, erythema, edema, hyperpigmentation, crusting
- Our opinion: do not recommend for acne as this is an aggressive laser with marked side effects
Polymethylmethacrylate (PMMA) microspheres in collagen

- Correction of moderate to severe rolling atrophic facial acne scars
- 1-2 treatments – 2 point improvement ≥ 50% of scars
- 64% successful responders
- Patients followed up to 6 months → 12 months
- Excellent safety profile, minimal downtime
Summary

- Laser and Light devices may be beneficial for acne
- Most devices are used as adjunct to other therapies
- Newer in office and at home devices have been developed
- Further studies required