Treatment of Pigmentary disorders in Asian skin with 1064nm Q-switched Nd:YAG laser

Peter Kim FACCS
Why treat pigmentation disorder in Asians?

- Prevalent – especially in Asians
- High demand
  - Fore-ever try to disguise it with thick make ups, cosmeceuticals and other remedies.
- Self esteem

- Softer and clearer skin is a key to looking younger and improved self satisfaction
Why treat pigmentation disorder in Asians?

“My grandma told me..
You have to have a good teeth
and good skin”
even when you get older...
Why treat pigmentation disorder in Asians?

Now I am Happy, I have good teeth and GOOD SKIN.
What are Asians presenting with?

• Various different types of pigmentations and other skin conditions

• Depends on the age group

• We commonly see:
  – Younger: 18-30
  – Middle: 30-45
  – Middle & above: 45 +
What are Asians presenting with?
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Clearer Skin – “my friend ask me whether i had face lift”
KEY IS:

Selective Photothermolysis

R. Rox Anderson
John A. Parrish

Department of Dermatology, Harvard Medical School, Massachusetts General Hospital, Boston 02114
How does it work? Selective Photothermolysis

Selective Photothermolysis: Precise Microsurgery by Selective Absorption of Pulsed Radiation

Abstract. Suitably brief pulses of selectively absorbed optical radiation can cause selective damage to pigmented structures, cells, and organelles in vivo. Precise aiming is unnecessary in this unique form of radiation injury because inherent optical and thermal properties provide target selectivity. A simple, predictive model is presented. Selective damage to cutaneous microvessels and to melanosomes within melanocytes is shown after 577-nanometer ($3 \times 10^{-7}$ second) and 351-nanometer ($2 \times 10^{-8}$ second) pulses, respectively. Hemodynamic, histological, and ultrastructural responses are discussed.

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How does it work? Selective Photothermolysis

Fig. 1. Schematic temperature profiles during selective photothermolysis: $T_0$, before laser exposure (uniform body temperature); $T_1$, during laser exposure (selective rapid target heating); $T_2$, at the end of laser exposure (targets irreversibly damaged); $T_3$, one thermal relaxation time after laser pulse (targets cooling, surrounding tissue warming); $T_4$, two thermal relaxation times after laser pulse; $T_5$, five thermal relaxation times after laser pulse; and $T_6$, tissue slowly returning to ambient thermal equilibrium.

vascular damage. Electron microscopy showed enlarged, focally disrupted, and centrally electron-lucent melanosomes within affected melanocytes and basa keratinocytes (Fig. 2), whereas organelles of adjacent nonpigmented cells (for example, Langerhans cells) were unaltered. Biopsies taken immediately after exposure disclosed similar changes occurring selectively in melanosomes; these results suggest that these melanin-containing organelles are the primary sites of injury. Grossly acute inflammation for several days was followed by hypopigmentation developing 7 to 10 days after exposure, without gross epidermal sloughing. Exposed sites then gradually repigmented without apparent scarring.
How does it work? Selective Photothermolysis

This technique relies on selective absorption of a brief radiation pulse to generate and confine heat at certain pigmented targets. An absolute requirement

The primary concern in choosing the laser wavelength for SP is to maximize selective optical absorption in the desired targets. The fraction of energy inci-

No matter how judiciously one has chosen the laser wavelength, poorly confined damage will result if the exposure duration is too long. During long expo-
ULTRASTRUCTURAL FINDINGS
Two melanocytes are seen in 3D, reconstructed from the data from 500 x 50 nm slices and computer rendered: color is for illustrative purposes only. Image is of skin from a melasma patient before skin toning.

A melanocyte from the same patient after laser toning. The cell is still alive, but appears to have undergone a ‘dendrectomy’.
Why QS 1064nm Nd:Yag?
### Why QS 1064? Appropriate wavelength

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**Table I. Ultrastructural Changes of Guinea Pig Skin**

<table>
<thead>
<tr>
<th>Wave length (nm)</th>
<th>Radiant Exposure (J/cm²)</th>
<th>Epidermal Alteration</th>
<th>Hair Follicle Alteration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Nucleus</td>
<td>Cytoplasm</td>
</tr>
<tr>
<td>1064</td>
<td>3.0</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>1.0a</td>
<td>+</td>
<td>+</td>
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<tr>
<td></td>
<td>0.25</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>532</td>
<td>0.8</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>0.2a</td>
<td>±</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>355</td>
<td>0.44</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>0.11a</td>
<td>±</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td>0.028</td>
<td>–</td>
<td>+</td>
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### Pigments absorb light over wide range of light spectrum, including 1064nm

<table>
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<tr>
<th>Wavelength (nm)</th>
<th>Black Guinea</th>
<th>Melanosome Rupture</th>
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<tr>
<td>1064</td>
<td>++</td>
<td>+</td>
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Increasing the power of delivered laser produces deeper SP.

MECHANISM OF ACTION

Q-Switched Nd:YAG Laser

Pigment or ink particles

Explosion

Absorption and drainage by human immune system

Macrophage
In Simple Summary

- Laser Skin Treatment Technique
- Uses Light (Q/S 1064nm Nd:YagLaser)
- Selectively “heat & destroy” specific structure in skin (pigmented cosmetic blemishes as shown)
- Limit collateral damage or surrounding structures (without major skin complications)
In Simple Summary:

3 essential Laser variables needs to be corrected:

• **Pulse Duration:**
  – Duration of laser exposure has to be short – longer the duration more collateral damage

• **Appropriate wavelength for:**
  – Maximal selective optical absorption of desired skin structure
  – Determine tissue depth at which SP occurs

• **Appropriate power**
  – Enough to shutter the pigments
  – Some effect on the depth of SP
Is it effective in Asian Skin?

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<tr>
<th>AUTHOR</th>
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<tr>
<td>a GJ Dover JS</td>
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Is it effective in Asian Skin?

Outcomes of 52 patients with congenital melanocytic naevi treated with UltraPulse Carbon Dioxide and Frequency Doubled Q-Switched Nd-Yag laser.


Kar HK Gupta L
1064 nm Q switched Nd: YAG laser treatment of nevus of Ota: an Indian open label prospective study of 50 patients.


Kim SD Kim SW Huh CH Suh DH Eun HC
Changes of biophysical properties of the skin measured by non-invasive techniques after Q-switched Nd-YAG laser therapy in patients with nevus of Ota.

Skin Research & Technology. 7(4):262-71, 2001 Nov.

Li Y Yang K
Treatment of recalcitrant-pigmented flat warts using frequency-doubled Q-switched Nd-YAG laser.


Peach AH Thomas K Kenealy J
Colour shift following tattoo removal with Q-switched Nd-YAG laser (1064/532).


Ogata H
Evaluation of the effect of Q-switched ruby and Q-switched Nd-YAG laser irradiation on melanosomes in dermal melanocytosis.


Kilmer SL Wheeland RG Goldberg DJ Anderson RR Margolis DJ Flotte T Hruz GJ Dover JS


Li Y Yang K
Treatment of recalcitrant-pigmented flat warts using frequency-doubled Q-switched Nd-YAG laser.

Advantages of using QS Nd:Yag Laser:

– Quick, no down time

– Minimal discomfort (no need anesthetic oint)

– Good result (progressive improvement)

– Very low risk of complications
Treatment of Pigmentary disorders in Korean/Asian skin with 1064nm Q-switched Nd:YAG laser is SIMPLE & EFFECTIVE.

HYUNSAE KIM MD, Ph.D
Peter Kim FACCS

Slim-Korea lipoplasty network
1064 QS Nd:YAG Laser is effective in Asian Skin Pigmentation

Now I am Happy, I have good teeth and GOOD SKIN!