Pigmented lesions form the major chunk of dermatology practice. These lesions result from excessive or abnormally deposited melanin or other pigment in epidermis, dermis or both.

Many treatment options such topicals, chemical peels, microdermabrasion etc. are available for treatment of epidermal pigmented lesions. These options are usually gives less satisfactory results in mixed or dermal pigmentation.

Q switched laser with longer wavelength such as Q switched Nd-YAG is a safe and effective option in treatment of these conditions.

**Mechanism of action:**
Melanin is present in the skin stored into melanosomes in keratinocytes or melanophages in dermis. Melanin has broad absorption spectrum- UV to infrared. So almost every laser which work from UV to infrared spectrum has some effect on melanin. However longer wavelengths are preferred since they has less affinity for melanin and thus absorption by epidermal melanin is less and also they penetrate deeper increasing the safety and efficacy of the laser.

As with all new generation lasers Q switched laser work on principle of selective photothermolysis. Thermal relaxation time [TRT] of melanosomes ranges from 0.25 to 1 us. Lasers used for treatment of pigmentary disorders should have equal or shorter TRT than the target. This can be achieved by using laser pulses in the nanosecond range.

Lasers capable of producing such short light bursts are called quality-[Q] - switched lasers.

When laser energy is absorbed by the pigment within such a short times; it generates the shock waves. These waves then cause vibrational damage to cellular structures and rupture of cell membranes. It also results in rapid heating of melanosomes leading to intracellular steam formation resulting in sudden change in light scattering properties; evident clinically whitening. Thus the mechanism of traditional q switched laser is ‘Photo-acoustic’.

**Indications:**
Q switched Nd YAG at 1064nm and frequency doubled 532nm is effective in treatment of variety of pigmented lesions. Base on their efficacy the indication can be classified as:

**Freckles—Spectra Laser**
532nm, 2.6mm spot, 0.95 J/cm2, 1 sitting.

1. **Indications with best response to treatment:**
   a) Freckles, Lentigens: treatment with 532nm results in complete clearance of these lesions in 1 or 2 sittings. Adherence to sun protection is a must, otherwise recurrence is a rule.
   b) Nevus of Ota/Ito: one of the best indications to treat with q switched Nd-YAG.
Q Switched Nd: YAG Laser In Dermatology

April 2014

Generally 4 to 10 sessions placed 3 to 6 months apart result in minimum 70% clearance of the lesion.

c)ABNOMS/Horisnevu:

d)Tattoos:

Q switched Nd YAG is gold standard treatment for various tattoos in Indian skin. Treatment is given once a month. A total of 6 to 10 sessions are required for professional tattoos. Amateur tattoos responds in 3 to 5 sessions. With newer tattoo removal techniques such as R20 or R0 method tattoo removal is now achieved within 2 or 3 sessions.

e)Pigmented seborrhoeic keratosis/ DPN

2. Indications with moderate response:

a) Naevocellularnaevi
b) Melasma
c) PIH
d) Lichen planus pigmentosus

Spectra Laser : 3 sessions

As discussed above the traditional use of Q SL is based on principle of selective photothermolysis. There are few selected indications where it can be used successfully ant that makes it is a difficult to maintain laser. However careful manipulation of beam parameters may often produce very interesting and appropriate clinical results.

Melasma: Laser toning

Post burn pigmentation. Treated with spectra laser toning at 1.2 J
8mm spot size 10 HZ once in days for 4 sessions. We used topical Vit C lotion and sunscreen. 11/11/12 and 9/2/13

PIH—post burn : Spectra Laser toning

Laser toning, soft peel and spectra [carbon] peel is introduced for the day to day clinical problems such as acne, wrinkles, PIH, Melasma etc.

Laser Toning is a treatment method using a 1064nm wavelength in Q-Switch mode (5ns) without carbon lotion for melasma, pigmentation, PIH and intractable scars. It uses a low fluence, large spot and multi-pass technique. The treatments based on principle of Selective photothermolysis results in destruction and death of pigment containing cell.In response to cell death, inflammation follows and results in repigmentation and recurrence of pigmentation.Using the high peak power, ultrashort pulse duration [5ns], and flat top or top hat beam results in uniform destruction of only melanin in target cell but leaving the cell alive—Subcellular Selective Photothermolysis. Since fluence used is very less and there is no death, inflammation and heating is kept to minimum resulting in less recurrence.

The procedure is as follows

After washing and cleaning the place laser is set in 1064nm mode. Fluence is adjusted based on color of melasma. In darker skin or dark pigmentation lower starting fluence should be used. The fluence should never exceed 1.2 to 1.6 J/cm2 in Indian skin. Treatment is given with 8 mm spot size and 5 or 10 Hz with less than 50% overlap. The end point is mild erythema or 2~3 passes. Treatment is given once a week to once in 10 days. A total of 6 to 12 sittings are required for effective clearing of melasma or PIH.

Soft Peel is a skin rejuvenation treatment with a 1064nm wavelength in Q-Switched Mode (5ns) using Carbon Lotion. This treatment effectively destroys melanin which is abnormally dispersed in the epidermis causing epidermal Melasma. This treatment may be combined with Laser toning for treating dermal Melasma as well. It also can be used for post acne pigmentation, post acne erythema.

Indications for Laser toning and soft peel are

1. Melasma: Current management of mixed and dermal melasma remains unsatisfactory. Light based treatments of melasma are associated with unsatisfactory response, risk of rebound hyperpigmentation or hypo and depigmentation. With availability of laser toning these patients can now be effectively treated with q switched YAG laser. However not all patients of melasma are candidate for treatment. Only non-responder after careful
counseling should be treated with laser toning.

2. PIH: Laser toning is an effective modality of treatment for PIH arising from trauma, burns or other dermatosurgical procedures.

3. Photomelanosis
4. Dark Lip and complexion improvement.

5. Periorbital melanosis

Advantages of Laser toning

- Convenient and easy to perform.
- Short operation time less than 15 min.
- No bleeding, crusting and scabbing.
- No downtime.
- Minimized PIH and recurrence.
- Can be used as a combination therapy.

Photomelanosis: Soft peel

2 sessions

Carbon peel: quasi long pulse Nd YAG - soft peel:
Acne treatments using laser and light devices have been reported to have varying degrees of efficacy. Traditionally, Q-switched YAG is not a modality for acne treatment. When the 1064-nm Nd:YAG laser is used for treatment at two very different pulse widths, such as the quasi-long pulse [300 usec] and the Q-switched pulse [5ns], the absorption characteristics of carbon at 1064 nm are capable of producing totally different biological effects.

When the carbon suspension is applied, the carbon particles are distributed to the stratum corneum, and some of them also penetrated into the hair follicles. The first pass with a fluence less than 1.5/cm2 and 300 usec pulse width gradually heat the carbon particles without explosion. This heating could be associated with non-specific coagulation or non-selective mild photothermolysis, in the epidermis, upper dermis, and the pilosebaceous units. The combined effect of I pass resulted in destruction of P. acnes, helping in controlling the dermal inflammation, thermal ablation of sebaceous gland, and can also affect dermal vasculature. The second pass was delivered at a Q-switched pulse width of 5 nanoseconds, which produced high incident irradiance at 1 to 1.6 J/cm2. This results in rapid explosive heating of carbon resulting in superficial epidermal peeling and also correction of hypercornification of follicular epithelium. The third pass was similar to laser toning mode and results additional dermal heating and pigment clearance.

The indications for carbon peel are:
- Acne [inflammatory and comedonal]: Lasers may be a good alternative therapeutic modality for those patients who fail to respond to or could not tolerate other acne treatments. It also can be combined with existing anti-acne medications for faster and better results. Treatments are generally given once in 15 days to once a month for 3 to 4 sessions. There is not only a good clinical improvement but the histopathological examination of the acne lesions showed decreased inflammation and immunostaining intensity for inflammatory cytokines.
- Skin roughness and irregular skin tone
- Fine wrinkles
- Seborrhea with dilated pore

GOLD TONING:

585 nm wavelength has high absorption for hemoglobin as well as melanin. This wavelength is available with most Q-switched YAG lasers but with small spot size a relatively high fluence which makes it difficult to use for other indications except tattoos. One of the factor in etiology of melasma is vascular factor which is not addressed by any of the treatment modality. Spectra’s gold handpiece [with replaceable solid dye] has 5mm spot size with very low starting fluence.

Simultaneous put on Doxycycline and Clindamycin with sunscreen. For post acne erythema we have just done a sitting of gold toning.

The indications for peel carbon are:
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Premarriage acne. Spectra peel mode 1.2J for 1000 pulses and soft peel mode 5 ns at 1.2 J for 1600 pulses. Simultaneously put on Doxycycline and Clindamycin. 10/11/12 and 2/2/13. 2 sessions one month apart

Premarriage acne. Spectra peel 1.3J at 300 usec for 1200 pulses and soft peel 5 ns at 1.2 J for 1600 pulses. Simultaneous put on Doxycycline and Clindamycin with sunscreen. For post acne erythema we have just done a sitting of gold toning.
Complications: although rare; few complications can arise with laser treatment

- Failure to respond to treatment.
- Recurrence after
- Pigmentary changes: hyper/hypo or depigmentation. If we use high fluence confetti like leukoderma.
- Purpura, petechiae and crusting.
- Scarring

Conclusion: recent advances in laser technology has made Q-switched Nd:YAG laser a versatile tool in a dermatologist’s armamentarium in treating various aesthetic problems. A good Q-switched machine must have a large spot size, pulse duration as short as possible, good power, top hat beam profile, high frequency and should be a stable system.

Suggested further reading:


