Lasers are not Effective for Melasma in Darkly Pigmented Skin

Sir,

We read with interest the study of Puri *et al*.,[1] and we would like to point out certain facts, coupled with our experience regarding the use of lasers in melasma.[2-4] This is relevant as recent expert reviews [4,5] have cast a doubt on the use of lasers in melasma.

The variation in results due to the use of the subjective MASI scores in favour of the better and objective Mexameter reading assessment is crucial to interpretation of results.[3] The evaluation using MASI even by clinical photographs is not reliable, which is mirrored by the images depicted in the study, and do not depict the profound improvement noted by the authors.[1] Also the pigment in the epidermis alters the laser physics dynamics specially in pigmented skin accounting for the variable results.[2] The pigment in melasma is not homogeneous either in distribution or depth[3] and it is difficult to understand how the authors ensured that the two groups had a similar type of melasma (epidermal/dermal or mixed). It would also have been informative to know at which sitting the improvement in melasma was noted. Also the duration of melasma prior to initiation of treatment is a determinant in results in melasma, which is not mentioned in the study. A more crucial and relevant aspect is seasonal variation, which has been highlighted by a previous study[3] wherein to account for the spontaneous improvement of melasma that is usually observed during autumn and winter months, all the patients were included at the end of winter season and a final visit was scheduled after the summer, at least 2 months after the last treatment in melasma. Thus probably a split-face trial design is ideal for meaningful melasma studies.

All the lasers tried for melasma, including the pigment-specific lasers (Q-switched, long-pulsed lasers and IPL), ablative lasers (Er: YAG) and fractional lasers have had indifferent results [Table 1]. Transient results have been seen for the epidermal subtype, but dermal melasma and the mixed type, which constitute the majority of patients in pigmented skin are difficult to treat.[6,7] "Laser toning" involves the use of large spot size, and a low-fluence, QS 1064-nm Nd: YAG laser (6- to 8-mm spot size, 1.6-2.3 J/cm^2) requires a fairer skin types,[7] a large spot size and can lead to mottled de-pigmentation.

Though peels have been touted as an useful intervention it is a universal "practical" experience that without triple combination (TC) creams the results are not great,

Table 1: Chronological Summary of the salient work on Lasers and their combinations in Melasma

Author	Therapy	Demography	Trial	Dosages	Assess	Results
Monotherapy						
Polder *et al.*, 2012	Fractional thulium laser (1927 nm)	14 patients	0	10-20 mJ,6-8 passes, 3-4 sessions/4 weekly	Blinded physician and patient assessment(subjective)	51% decrease in MASI at 1 month follow up($P<0.05$)
Zhou *et al.*, 2011	Qsw Nd: YAG 1064 nm	50 patients FP IV-VI	0	2.5-3.4 J/cm^2 Spot size: 6 mm 9 sessions/ weekly	MASI, Melanin Index	Mean decrease in MI by 35.8% ($P<0.001$) MASI decreased by 61.3% ($P<0.001$) 70% had >50% clearance
Jang *et al.*, 2011	Fractional Q Sw 694 nm ruby laser	15 korean patients Dermal/mixed melasma	0	6 sessions at 2 week interval	MASI, skin reflectance	Mean decrease in MASI 15.1-10.6. Skin reflectance increase from 56.6 to 59.9
Suh *et al.*, 2011	Low dose Nd: YAG 1064 nm	23 Korean patients FP III-V	0	2-4 J/cm^2 Spot size: 4, 6, 8 mm 10 sessions (once/week)	MASI Satisfaction Index	Mean MASI decreased significantly even at 3 month f/u visit
Chan *et al.*, 2010	Low fluence QSw Nd: YAG (1064 nm)	5 Asian patients	CS	1.6-3.5 J/cm^2 Spot size: 6-8 mm 6-50 sessions (22.67)	UV photographic images	All patients failed to show improvement in melasma
Choi *et al.*, 2010	Low dose 1 QSw Nd: YAG (1064 nm)	20 patients FP-III-IV	0	2.0-3.5 J/cm^2 Spot size 6 mm 5 sessions at weekly interval	Mexameter, Cutometer, Chromameter, corneometer, visiometer	L value increased and Melanin Index decreased
Sardana* *et al.*	IPL Er: YAG AFR (Er: YAG) NAFR (Er: Glass) QSw Nd: YAG	3 IPL 2 Er: YAg 7 AFR 1 NAFR 2 Nd: YAG	0	22 J/cm^2 5 J/cm^2 90 /cm^2 70 mJ/mb 5-6 J/cm^2	MASI Percentile Score	The results with AFR, NAFR and IPL were disappointing With Er: YAG and Qsw Nd: YAG temporary
Combination therapy						
Kauvar, 2012	Microdermabrasion with QSw Nd: YAG with HQ and sunscreens	27 female patients FP II-IV Mixed resistant melasma	0	1.6-2.0 J/cm^2/4 weeks Average no. of sessions- 2.6	Blinded comparison of digital photographs using Quartile system (Subjective)	40% patiets achieved >95% clearance 81% patiets achieved >75% clearance Remission lasted 6 months
Park *et al.*, 2011	1064 nm Qsw Nd: YAG Laser with 30% GA peels Vs Laser monotherapy	16 patiets, Mixed melasma	RCT SF	Laser: 2.0-2.3 J/ cm^2, 6 mm spotsize 6 sessions (once/week) GA peels -3 sessions (once/2 weeks)	Mexameter m MASI	Combined therapy 32.6% improvement with mexameter and 37.4% in mMASI Vs 22% and 16.7%, respectively, by laser alone ($P<0.05$)
Wattanakrai *et al.*, 2010	Qsw Nd: YAG with 2% HQ vs 2% HQ	22 patients Dermal/ mixed melasma/ FP II-IV	RCT SF	3.0-3.8 J/cm^2 Spot size: 6 mm 5 sessions at weekly intervals	Colorimetric (objective) and mMASI (subjective)	73% patiens in the combination group had excellent results
Angsuwarangsee *et al.*, 2003	Up CO2 laser & Q-sw Alexandrite laser (QSAL) vs QSAL alone	6 Thai patients FP II-V refractory melasma	SF	CO_2: 300 mJ; Power: 5 W; Spot size: 3 mm QSAL: 5-7 J/cm^2 Spot size 3 mm	mMASI and the Melanin Index score	Combination treatment had a statistically significant reduction compared to QSAL side
Combination therapy with TC creams						
Goldman *et al.*, 2011	IPL with TC (4% HQ) cream vs IPL with control cream	56 patients Symmetrical melasma	RCT SF	2 IPL treatments at 2 and 6 weeks	MASI	Significant improvement in melasma severity in the combination group vs IPL alone
Passerson *et al.*, 2011	PDL and TC vs TC cream	17 patients FP II-III	RCT SF	7-10 J/cm^2 Pulse duration: 1.5 ms 3 sessions at 3 weekly interval	MASI, satisfaction index	Greater patient satisfaction in combination group
Trelles *et al.*, 2010	TC alone vs AFR (CO_2) vs combination therapy	30 females FP II-IV	0	High power fixed pulse width, low frequency	MASI, satisfaction index	100% improvement in all 3 groups, results were maintained, however, only in combination Group at 12 months
Wind *et al.*, 2010	NAFR, 550 nm vs TC (5% HQ)	29 patients	RCT SF	15 mJ/mb, 2000-2500 MTZ/cm^2 4-5 sessions vs TC for 15 weeks	(PGA), patient's satisfaction, (PhGA), melanin index, and lightness (L-value)	Mean PGA and satisfaction index were significantly lower for laser treated site. PhGA, melanin index and L-value showed a significant worsening of hyperpigmentation at the laser side. At 6 months follow-up, most patients preferred TC

Table 1: (Continued)

Author	Therapy	Demography	Trial	Dosages	Assess	Results
Jeong *et al.*, 2010	Low dose Qsw Nd Yag 1064 nm with pre- and post-TC cream	13 patients FP III- IV	RCT SF cross ver	3.0-3.8 J/cm^2 6 mm spot size 5 sessions (once/week)	Lightness Index/ colorimetry)	Mean MASI decreased significantly on laser side

HQ: Hydroquinone, FP: Fitzpatrick type, AFR: Ablative fractional laser, NAFR: Non-ablative fractional laser, O: Observational therapy, RCT: Randomized control trial, SF: Split face trial, CS: Case series, m MASI: Modified melasma area and severity index score, PGA: Patient's global assessment, PhGA: Physician's global assessment; Combinations with microdermabrasion, Up CO 2, AFR, HQ, Peels and QSw Alex. *Data of the laser clinic, Maulana Azad Medical College, Delhi (2008-2012)

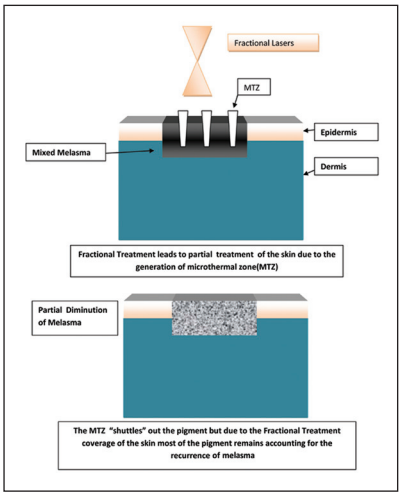

Figure 1: A pictoral depiction of the effect of fractional lasers in Melasma

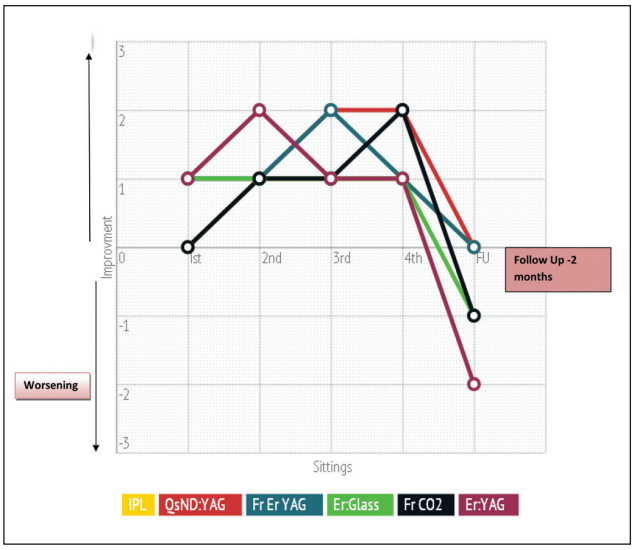

Figure 2: A retrospective overview of Lasers used in Melasma (2007–2013) Improvement/Worsening (0–25%; 1: 26–50%; 2: 51–75%; 3: 76% >; 4). The maximum improvement attained (26–50%) by the QswNd: YAg, Fractional Er: YAg, Fractional CO² and Er: YAG (Erbium Peel) was followed by a deterioration 2 months after the last sitting. This post inflammatory pigmentation (PIH) subsided after a mean of 3.2 months

especially in pigmented skin. This is probably as deep peels (papillary dermis level), which are useful in the common mixed dermal melasma cases, are difficult to use in pigmented skin due to their potential for PIH. Hurley *et al.*,[8] conducted the first randomised, investigator-blinded, controlled, split-faced study and compared the use of hydroquinone (HQ) alone with HQ plus Glycolic acid (GA) peels in a homogeneous (Hispanic) population using objective (photography, mexameter readings and MASI) and subjective measures. The authors found that though the combination of GA and HQ improved melasma, there were *no significant* differences in skin lightening between regimens. This highly accessed article (2266 times!) in conjunction with another study[9] with similar findings have brought forth the evident fact that probably the results of 4% HQ are better than the chemical peels used. Thus logically a TC cream would have superior results to the chemical peel! This is highlighted by the studies where TC have been combined and compared with lasers and have been found to have superior results,[10-12] which probably puts a question mark on the unnecessary use of lasers in melasma.

The principles of laser therapy involve a pertinent target (melanocytes in melasma), appropriate wavelength and the right pulse duration. The fractional lasers are selective for water and their pulse duration is in milliseconds unlike the microsecond thermal relaxation time (TRT) of melanocyte making them intrinsically inappropriate in melasma. This coupled with the fact that only a "fraction" of the skin is damaged, makes the technology inherently ineffective for melasma [Figure 1]. Fractionated laser treatment may work by expelling columns of microscopic epidermal debris that contains melanin but is probably insufficient to make a clinical difference.[4-7] Melasma has a high risk of recurrence with fractional laser therapy[7] and the relative high rate of re-pigmentation and sometimes even an increase in pigmentation after the treatment makes it a risky option.[7,13]

Our experience with patients of melasma using various lasers, such as the IPL (3), Qsw Nd: YAG (2), fractional Er: Yag (7) and ablative Er:YAG (2 cases), mirror the fact that the results in melasma are transient with rapid recurrence [Figure 2]. In fact with the fractional lasers, a rebound hyperpigmentation has been noted in our analysis, which is similar to the results noted by Karsai *et al.*,[13]

Two recent reviews[4,5] aptly summarise the present

evidence on melasma. The use of lasers for the treatment of melasma cannot be recommended as a first line treatment of melasma due to their unpredictable efficacy and safety.[10-24] They can be considered as third line treatment when all other modalities have failed and patient wishes to try alternative treatment. Such treatments are not curative and should be made clear to patients when such treatments are offered to the patient. Patients should be informed of their high chance of recurrence upon stopping treatment and risk of complications.[5] Combination therapies including TC are probably more effective.[4] Thus probably melasma is nature's way to compensate for the high ambient ultraviolet flux in tropical countries and any method to remove it would probably lead to indifferent results and rapid recurrence. Though we have no experience in treating fair skin types, in our skin type, lasers should not be the preferred treatment for melasma.

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