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Rahul Pillai

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Editorial Note

Laser Hair Removal on Skin of Colour

Rahul Pillai
Kkris skin care center & laser clinic, Kerala, India.

Corresponding Author: Rahul Pillai, Kkris skin care center & laser clinic, Kerala, India. **E-mail:** rahuloc@yahoo.com

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When it comes to laser hair removal in ethnic skin, there's a very narrow spectrum of treatment options and it has always been challenging due to the the higher competing epidermal melanocyte.The Aesthetic industry has been constantly trying to develop an ideal platform to treat all skin types(Fitzpatrick 1-6),however we are yet to find that ideal laser that would treat a a skin type 1 and 6 with same efficiency,also irrespective of thick or thin hair.The technologies to offer remains the same for the last two decades,however there has been modifications on existing technology to suite various skin types,faster treatment and lesser complication and definitely better results,making it truly a swift lunch time procedure.

Principles of removal

The principle behind hair removal is selective photothermolysis(heat is being absorbed by melanin, which eventually heats up the hair shaft, the hair follicle, the surrounding area and the germinating layers in such a way that the melanin helps in destroying the hair.The chromophore here is melanin, which is competing with other chromophores that are oxyhemoglobin and water[1,5].

The spectrum of 600 nm to 1,100 nm wavelength is useful in destroying the hair follicle, but the more specific we are, the lesser chance of complications. This brings us down to a few technologies utilising different wavelength, such as Pulsed Diode,Nd-Yag,Alexandrite,Ruby, which are a little more specific when it comes to heating the melanin which helps in destroying the hair.

The latest statistics on population from the US show that by 2020 ethnic skin will become a far more significant demographic proportion. (http://nationalequityatlas.org/data-summaries,PERE-Policy Link). European trends are similar –the ethnic skin majority is increasing in number – and that's one reason why understanding how to treat an ethnic skin will become important if you want to maintain a good practice.

The US FDA definition of permanent hair reduction matches with the results that are currently being achieved. Permanent hair reduction is defined as the long-term, stable reduction in the number of hairs re-growing after a treatment regime, which may include several sessions. The number of hairs redrawing must be stable over time greater than the duration of the complete growth cycle of hair follicles, which varies from four to twelve months according to body location. Permanent hair reduction does not necessarily imply the elimination of all hairs in the treatment area. In practical experience once a patient has completed about 9-13 sittings, usually there is very minimal or no significant hair growth for about 3-10 years unless there are some hair growth stimulating factors involved like hormone variations,certains drugs,etc.(Source:http://www.fda.gov/RadiationEmittingProducts/ResourcesforYouRadiationEmittingProducts).

Patient selection

Different areas of the body respond differently to lasers. A place like upper lip requires multiple numbers of sittings. Promising that you'll be able to do a permanent hair reduction in six to nine sittings is risky – you'll probably require more.The rest of the cheeks, or the arms or legs respond better and the back of the body also respondsdifferently.

Ideally, when we look at ethnic skin, we are looking at a patient who comes with realistic expectations, somebody who's got normal endocrine activities – so not with polycystic ovarian syndrome, hirsutism or hyperandrogenism. This factors are very important because that will influence the number of sittings that we are going to do, no matter what technology we are going to use.

An ideal patient has thick, dark hair, but light skin ton [4,8].However, this is challenging when it comes to Indian skin because there are huge variations between different people across the states. .

The differences from one Indian state to another are probably greater than between Czech and Slovak – yet India is one country. You may have a patient who's fair in skin, with dark hair and light-brown eyes and expect that using a high energy will be safe, but she gets a burn. On the other hand you might have to treat a darker skin tone, which doesn't respond the same. It's challenging because you can't judge an Indian patient or a darker skin Indian simply by looking at them.Its with experience repeatedly treating such patients the we get an idea of how a such skin tones react.Offcourse we have the option of doing a test dose and deciding our fluence and pulse width or to be on safer side always start with a higher pulse width and lesser fluence.

Considerations

Three important parameters to consider when treating are pulse width, the spot size, and fluence.

Pulse Width

We all talk about thermal relaxation time, although this may not be the appropriate term to be used.Thermal containment time is more relevant and more important thermal destruction time, because a specific amount of energy is needed within the hair shaft so that it heats up the tissue,and the melanin gets heated up, in such a way that the hair gets destroyed. That should be ideally something with the pulse width not less than 10. A 10 ms could actually burn the patient, but something about 100ms won't give good results, so we're looking for something between 10 to 90 ms pulse width,optimally between 15-30 ms .

Thermal destruction time should give a heat sufficient to destroy the primary as well as the secondary germinating layers. The main reason hair returns,is not because the primary germinating layer is not getting destroyed – the secondary germinating layer is not getting destroyed, and which is located near the arrector pili muscle.Besides not all hair are in the same phase.So ideally enough energy should be present to heat up and destroy this layer too, this is why different variations of same technology work, such diode laser which produces single shots of high energy or in motion technology which gradually heats up the tissue. No particular technology can be called the best technology as all of them work provided you know to make them work .

So this is how technologies provided from Alma(Alma Lasers Ltd.Caesarea,Israel) and Lumenis(Lumenis Inc.Medical,Santa Clara,California,USA) work. These are contrasting machines, but they both work and give differing explanations for their efficacy, but as a doctor, the physics is an important consideration.Both machines gradually create heat within the hair shaft, which increases and destroys the primary and secondary germinating layers. So, it doesn't matter what technology you use, if you understand the physics, you can make it work[1,10].

Spot size

A larger the spot size creates more dispersion or scattering of energy. A

large hand-piece, for example from LightSheer Dezire which is (22mmX35mm),can do an entire back in 15 minutes, or the entire body in one hour, without any complications and give good results. It is because a large spot size requires smaller fluence, and hence lesser complications ,also it gives the same results because the dispersion is more than a small spot size.

Fluence

Understanding the implications of this isn't entirely simple. One should not confuse the terms of fluence, energy, power, or peak intensityof a laser – they're all different terms.

Using them as synonyms should be corrected.Fluence is the amount of energy that we are delivering per treated area, in joules per square cm. So fluence is the same as Energy Density.

A burn happens when the dermal-epidermal junction is being destroyed – so epidermal cooling is important.A burn will never occur if the dermal-epidermal junction remains intact. There are cooling devices but most lasers have inbuilt cooling system in the hand piece itself , so that theoretically, if you are cooling the area well enough, using any energy level is safe. That's true in theory, but must be implemented practically.

Types of technology

IPL

IPL's broad spectrum Intense Pulse Light which is very useful when it comes to fine vellus hair.Since it targets a broad spectrum between 600 - 1100nm it is not very specific for hair reduction and never the first go to machine but an optional one to have, as IPL has high versatility although not much specificity[11].

Ruby:

Ruby ,694 nm,was the first such laser for hair reduction. It was quite effective, but had many complications such as burns and pigmentary changes, hence its not favoured in treating ethnic skin[12,14].

Alexandrite

Alexandrite was initially very popular because it gave great results, but because of the complications the diode took over, however now the alexandrite is back in fashion again. Although having a single handpiece of Alex alone is definitely not the right laser for treating skin of colour. You rather see a patient for a few more sittings rather than having less with alexandrite and expecting some kind of complications such as pigmentations or burns.Because laser is a voluntary procedure, if it burns, patients simply aren't going to come back to you.One has to note companies which promote Alexandrite laser is not actually selling an Alexandrite laser but a Diode laser with a wavelength of Alexandrite ,755nm [13-14].

The Nd:YAG

The Nd:YAG has got the longest wavelength, but the melanin absorption is less, making it very safe on darker skin types. Low melanin absorption means it can be used safely with high energy and the penetration is comparatively less, but more energy can be used.It is safer, but we require more number of sittings and still Diode is preffered as Gold standard for Laser hair removal and also for ethnic skin [12-14].

Diode

The diode absorption is probably not as good as alexandrite, the penetration is not as much as an Nd:YAG, but somewhere in between, and that makes it ideal for treating ethnic skin. Somewhere between 800 nm to 810 nm would be ideal for treating, and the various lasers that have come into the market right now are modifications of a Diode laser , because that's what is ideal in darker skin type and selling more in the emerging Asian aesthetic market[1,2,3,4,5,8].

Problems and solutions

The use of local anaesthesia is not widely accepted as you want your patient to react to avoid burns.That way onecan either decrease the fluence or increase the pulse width Cooling is a must.For example Lumenis lasers are have Sapphire Chilltip which cools the skin adequately before firing. Even the temperature of a room is very important when it comes to treating ethnic skin and also for the maintenance of a laser equiptment. Lower energy can be used if patients are feeling any pain, or pulse width can be increased so that the patient feels more comfort, however this may lead to a higher number of sittings being required[8,15,16,17].

Vacuum suction technology is unique . It's pretty effective because the skin is pulled closer to the hand-piece, in such a way that lesser energy is going to give better results hence less painfull. Using a 5.5 or 6 fluence larger hand piece (22x35 mm)will give the same results as something like 20 or 30 fluence in a smaller hand-piece(9x9 mm) . When vacuum technology pulls the skin up, the competing chromophores and the oxyhemoglobin move apart. Even the chromophores on the skin are reduced. Also the unique vacuum mechanism activates tactile and pressure skin receptors to inhibit the transmission of pain sensation,hence is less painfull. It's also a mechanism that creates pain in one area to reduce pain in another.

It's ideal for a patient who thinks they can't bear even minimal pain.

For treating thin hair there's no particular solution, except repeated number of sittings. An IPL is a good option if you have the finest, thin-haired patients or lighter-haired patients. It's inexpensive, and but low-efficiency or you can use a Diode laser with very short Pulse Width and high energy which has its own risk of burning but is effective.Here an Alexandrite like wavelength maybe usefull and many users feel its pretty safe,although risk of burning a darker skin type exists[18,23].

When it comes to the hand-pieces, the large hand-piece can be used for greater body surface areas with low fluence and smaller areas like upper lip with small hand piece and higher fluence.

Its been observed that patients generally don't see the results in the first or the second sitting with a large handpiece as compared to small hand piece but by the third or the fourth sitting they find that the results are the same . Hence it doesn't matter if you are using large piece for larger for larger body areas and small hand piece for lets say facial hair,eventually on a whole body treatments results are the same if you combine both for 6-9 sittings. So, this is one option you can look into when you're treating ethnic skin.

Lumenis had sometime back launched the INFINITYdevice which is a diode laser with a 805 and 1060 wavelength handpiece making it safe for use in even very dark skin yet get the benefit of a Diode laser. This is a good option as there are various wavelength and handpiece options making it truly versatile,so for very dark skin a 1060nm wavelength can be used and after a couple of sittings,once we understand how the skin reacts, shift to a diode laser, 805nm wavelength.Although it looked promising in the beginning with the introduction of multiwavelenghth platform with a single handpiece firing 3 wavelengths,the Infinity laser fell out of favour.

Using a Diode laser with a Nd-YAG like wavelength(1060nm) the results are not the same as a Nd-YAG laser (1064 nm) but after a follow-up of six months, 75% reduction was noted in most of the studies as an average. Alma IN-Motion technology gives good results. Both these companies Lumenis and Alma are good, and again, these are both what sell maximally in Asian countries.We get the same results whether we use in motion technology or single stamping method because the idea is the destroy the Bulb,Bulge and Papilla and eventually enough heat to destroy the primary and secondary germinative layer.So it really doesn't matter if we give maximum fluence at one shot or by repeated motion to generate enough heat to destroy the hair follicle.[1-5,8.23-29].

The alexandrite has been reintroduced by the new Alma company in a new platform called Soprano platinum Ice which combines 3 wavelengths(755nm,810nm & 1064nm) Combination of 3 different wavelengths in single handpiece was developed to target different tissue depth & anatomical structures within the hair follicle.This blend of Alexandrite 755nm, Diode 810nm & Nd:YAG 1064nm provides better results in fine hair reduction compared to conventional Diode laser. But needs to be used carefully in dark skin type patients.

One has to however keep in mind thats its coming from the same Diode platform form.They come with the option to buy 755,810,1064 nm

wavelength separate handpiece or a single hand piece firing 3 wavelengths at varying proportion.Example a single shot will contain 50% 810nm wavelength,25 % each of 755 & 1064 nm wavelengths.The latest introduction recently launched called Soprano Titanium has 4cm2 sized handpiece to treat fast and effectively type 1-6 Fitzpatrick Skin tones. It's effective when it comes to thin-hairs which last at the end, so you treat them with the diode laser, and finally when it comes to the last thin hair, you can treat that with the alexandrite if you have a separate handpiece,if not also since there is 25% of 755nm wavelength being fired,its quite effective to give faster results that 805 or 810 nm alone.These are additional luxuries you can have in your clinic if you have the financial capacity and the right kind of patients walkingin.

Another FDA approved laser for hair removal is from Cocoon Medical which has their flagship system Primelase HR (Cocoon Medical,Barcelona,Spain).Besides being a powerful laser ,it has advantages of handpieces of 755nm,810nm,1060nm in different spot size along with a hand piece in combined diode mode of 810nm,940nm and 1060nm.Since 755 Alex and 810 Diode has almost similar penetration depth and Nd:YAG penetrates very deep,there was a need to cover the large part of deep seated hair follicle.Hence amalgamation of 810, 940 & 1060 is better and covers entire length of follicle homogeneously.This was the idea for introducing this new wavelength and users are giving a positive feedback with this handpiece.However the catch in this laser is its Ultra short Pulse of 3ms which can be increased uptp 400ms and high peak power of 4800watts.The shorter the pulse and higher the fluence definitely better the result,however more the chances of damage to the skin besides the hair follicle alone,especially if darker skin type.Although Pulse width of 400ms is safe to use when starting of treatment on skin type 4,5 and 6,it doesn't give results beyond a point unless the pulse width is reduced to first 100 and than to 30ms.Eventually when its fine thin hair the lesser the pulse(especially if below 10ms) ,the better but more the chance of burns also.Hence while treating fine thin hair their 810nm diode wavelength handpiece is very efficient as the pulse width can be brought down to 3ms.

And the most recent introduction in the field of laser hair removal,its Lumenis Splendor X.SPLENDOR X, lets you customize hair removal and skin treatments across an infinite spectrum of skin tones blending Alexandrite (755nm) and Nd:Yag (1064nm) wavelengths.Here unlike other laser system which was a diode laser with wavelengths similar to Alexandrite or Nd:YAG,there are two laser system Alexandrite 755nm and Nd:YAG 1064nm,the wavelengths can be synchronized to fired independently or simultaneously, with varying proportions to tailor treatment, according to the individual's skin type, hair color and thickness allowing safe and effective treatment. 3.5KV power supply from each handpiece ,amounting to 7KV power makes it's the most powerful laser in the market as of now.It also has the options of various sizes of handpieces making LHR even more faster and efficient.Its introduction doesn't neccesorily mean Diode doesn't give the desired results,as mentioned earlier these are luxuries that one can have at their center based the ethinicity treated,footfalls in the center and financial capacity of the patients.

When it comes to speed now treating a whole body takes less than 30 minutes with any of the latest systems in the market with handpieces of varying sizes.

Summary

You can make any technology work as long as you understand the physics behind it. No technology is a bad technology. But understanding the skin is more important and also understanding the technology behind a laser, because you know how this skin is going to react, and you know what to do with the laser .Offcourse it would be a priviledge to have all types of lasers in your clinic if its financially viable and that would make any practise versatile. When it comes to treating darker skin types,Diode laser still has the edge when you consider the result-safety profile and it has been the gold standard and it still remains to be.

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