

# light 'em up

## Your Guide to Aesthetic Light-based Treatments

Kevin Tan talks to Malaysian dermatologist Dr. Ko Chung Beng and U.S. cosmetic dermatologist Dr. William F. Groff to get enlightened about aesthetic light based treatments.

Since their discovery in the late 1950s, cosmetic lasers or aesthetic lasers have become an indispensable tool in the cosmetic surgery industry. Used by both plastic surgeons and dermatologists worldwide, aesthetic lasers are able to quickly, efficiently and safely treat a vast range of common skin problems like birthmarks, spider veins, acne and more.

In lieu of going under the knife, treatment with aesthetic lasers are also an anti-aging option as they are capable of rejuvenating aging skin and remove age spots and wrinkles.

Because of its minimally invasive nature, many aesthetic laser procedures can be performed in the space of the average lunch hour. Most skin conditions such as warts or liver spots can be resolved and treated in a single session. Other procedures like skin resurfacing, hair removal or treating acne, require several visits.

For those averse to pain, aesthetic lasers are a godsend. Many procedures only require topical anaesthesia instead of general or local anaesthesia – omitting the need for injections along with the inherent risks associated with stronger forms of anaesthesia, and also allowing the patient to be up and about after the procedure.

A variety of aesthetic lasers exist on the market. Available under a variety of different brand names, aesthetic lasers are primarily differentiated from one another based on what skin conditions each can effectively treat. Cosmetic dermatologist Dr. William F. Groff from the La Jolla Cosmetic Surgery Centre in San Diego, California explains,



Dr. William F. Groff, cosmetic dermatologist from the La Jolla Cosmetic Surgery Centre in San Diego, says that laser technology is overall much better today.

"Aesthetic lasers use specific wavelengths of light to heat up different targets in the skin. These targets absorb the laser's energy, which causes a controlled injury to improve the skin's appearance or to improve specific imperfections."

Because of this, aesthetic lasers are designed to treat specific skin conditions

by being calibrated to fire specific wavelengths of light. For example, a pulsed dye laser is great at getting rid of red coloured birthmarks and fine red facial veins as its wavelength of light is well absorbed by red blood vessels, while a diode laser is excellent at treating acne because it can specifically target and shrink the oil glands in the skin.

While effective, aesthetic lasers also have their limitations, particularly when treating darker skin types. When used on dark skin, some aesthetic lasers may cause burns, scarring or create hypopigmentation (where the

skin permanently loses its colour) or hyperpigmentation (where the skin turns even darker).

In this regard, darker skinned patients have to be careful and aware that certain aesthetic lasers may not be suitable for their skin tone. However, newer generations of aesthetic lasers entering the market like the Fraxel 2 or the Portrait PSR are able to safely treat darker skin with significantly less risk of injury.

Other than aesthetic lasers, a range of other treatments exist that use other forms of

### Lasers – Then, Now and Tomorrow

According to the American Society of Plastic Surgeons 2005 statistics report, over 271,418 patients in the U.S. sought laser skin resurfacing that year – a 65 per cent increase from 2004. In addition, 782,732 patients sought laser hair removal and over 155,235 patients sought laser treatment for leg veins. And the numbers keep growing every year.

"I think part of this rapid growth in terms of popularity is due to the technology advancements we've experienced over the last decade or so. Laser technology has brought many new devices in to the marketplace which are much more efficient, user friendly and affordable – making it more accessible to physicians and the public," says Dr. Groff.

Before aesthetic lasers, many skin conditions were untreatable and removable only with chemical peels or surgical excision. "Previously, there were a lot of aesthetic problems that couldn't be treated, and we had to tell patients that the only solution is a chemical peel or actually removing that section of skin through surgery. But problems like wrinkles, cellulite or a number of other aesthetic problems couldn't be treated this way," says Malaysian dermatologist Dr. Ko Chung Beng.

Newer lasers offer safer, more predictable and better results. Dr. Groff comments that, "The latest laser devices, in

most cases, work better than those that were available four to five years ago. It's like personal computers – PCs today are faster, more efficient and better overall than PCs made five years ago. The same holds true for laser devices."

Throughout his career, Dr. Groff has treated thousands of patients across the complete range of skin types using almost every aesthetic laser on the market and he even participated in research that led to U.S. Food and Drug Administration (FDA) approval of aesthetic lasers. "We oftentimes will be the first to get access to the prototypes of any particular laser device from several laser companies and we help develop and find out what the best settings for each particular device are," says Dr. Groff.

With an eagle's eye view on the industry, Dr. Groff believes that the future of laser devices lies in a gradual migration from the doctor's office into the home. "There's going to be a trend for more home devices that people can use alone or in conjunction with treatment by a dermatologist and right now there are several companies working on devices for hair reduction."

Technology-wise, he believes that there is going to be more of an industry focus on removing fat. "In the next few years, I think we'll be seeing lasers and light devices that are capable of remodelling and helping to remove fat."



Dr. Koh Chung Beng says that choosing a doctor is a highly personal choice and one should choose a doctor whom they trust.

energy such as radio frequency, plasma or infrared energy as alternatives to improve skin texture and treat cellulite. Together, they fall under a catchall term known as aesthetic light-based treatments or cosmetic laser surgery. In short, aesthetic light-based treat-

ments represent a solution for patients that are seeking minimally invasive procedures that offer results with minimal downtime.

### WHAT IS RIGHT FOR ME?

Individuals seeking treatment for skin conditions are often surrounded by marketing hype and complicated terminology spilling from brochures and newspaper advertisements that confuse as much as they promise miracles. Due in part to the massive boom in the aesthetic dermatology market, a plethora of beauty salons have sprouted like mushrooms, each promising cures that no legitimate doctor would promise and using aes-

## A PLETHORA OF BEAUTY SALONS HAVE SPROUTED LIKE MUSHROOMS, EACH PROMISING CURES THAT NO LEGITIMATE DOCTOR WOULD PROMISE AND USING AESTHETIC LASERS THAT MAY BE WATERED DOWN VERSIONS OF ACTUAL LASERS OR WORSE, THE REAL-DEAL BUT HELD IN THE HANDS OF SOMEONE WITHOUT THE TRAINING TO USE IT.

thetic lasers that may be watered down versions of actual lasers or worse, the real-deal but held in the hands of someone without the training to use it.

So, how do you tell if you're getting the real deal and not some quack?

Dr. Groff advises, "The most important thing for patients to consider when undergoing treatment is to seek a properly certified dermatologist that is registered with the country's medical board. A dermatologist is the best specialist to go to for skin-related treatments because it is our specialty, and we deal with skin exclusively."

An accredited dermatologist can show you his certification, which can be further verified with the local medical board. In Malaysia, a practicing dermatologist is registered with the Malaysian Dermatology Association.

To validate your choice for a dermatologist, ask to see before and after photos. "You should always ask to see the dermatologist's before and after photos and ask which of the patients he or she actually treated. These should be actual case photos, not the photos that a manufacturer of a laser gives to a physician. What you want to see is his or her handiwork," says Dr. Groff.

Even though these may all check out, another widespread problem remains – physicians will often have other staff members, such as nurses and technicians, conducting the procedures. In this regard, a patient may not be getting the right, or even safe treatment.

Dr. Groff advises, "Always choose a facility where the dermatologist does all the consultations and treatments on patients. I wouldn't go to a facility where the treatment is delegated to medical staff who are not physicians and have no formal dermatology or laser training – consequences of this can be serious. I see complications from facilities like these on a daily basis."

According to Dr. Groff, patients who receive treatment from unqualified individuals could end up with burns, blistering, permanent scars, hypo- or hyperpigmentation and possibly, even craters and lumps in the skin.

"A large part of the patient and doctor experience is through a level of trust, rapport and understanding," says Dr. Ko. He adds that choosing a doctor is a highly personal choice and that one should choose a doctor they trust and feel comfortable with as well

as being able to address their concerns.

Dr. Groff adds, "Nothing is stronger than a referral from a relative or a friend. If a friend or family member has had a positive experience with their dermatologist, this is a good indication that you will too. It's a combination of all these things that ensures a successful treatment with your cosmetic dermatologist."

With that comes another quandary. With the proliferation of new and improved technologies, logic will have it that you'd go for



Acne scars before treatment.

## Important questions

to ask your dermatologist when discussing light-based therapy treatment options.

1. How many patients have you treated with this laser/treatment?
2. How many years of experience do you have treating this condition?
3. What sort of results can I expect from this machine/treatment?
4. How many treatment sessions are required to achieve the results I want and how much does each treatment session cost?
5. How long is the downtime for this treatment?
6. Are there any risks for my skin type and physical condition?
7. What are the potential complications that can happen and what will you do if they do indeed happen?
8. Do you have any positive testimonials or before/after photos of patients you have treated?
9. Will the treatment be conducted by you or by someone else?

**WHEN IN DOUBT, ALWAYS SEEK A SECOND OPINION.**

the physician with the most up to date equipment. Unfortunately, in some instances, while a physician may have cutting edge technology at his practice, he may not necessarily have the experience to handle it.

So which comes first? Dr. Ko believes that, "Both the experience of the physician and the need to get the latest technologies are equally important. With experience but without the latest tools, a doctor can't offer you the best treatment possible. With the best tools but without experience, the same applies and additionally, may possibly harm you or cause unintended side effects." He emphasises both skill and technology are needed. But most important of all is patient education, awareness and their rapport with the doctor.



Faded scars a week after one session of Fraxel.

Pictures courtesy of Dr. Ko Chung Beng.

# THE BREAKDOWN

LASER/LIGHT TREATMENTS	INDICATIONS	HOW DOES IT WORK?	LIMITATIONS AND DRAWBACKS
<b>Fraxel</b> – Alternative brands: Mosaic Fractional Erbium Glass Laser (Korea)	Wrinkle reduction, scars, superficial melasma, skin tightening, skin rejuvenation and open pore reduction. Fraxel is the treatment of choice for dealing with acne scarring.	Uses a process called 'Fractional Photothermolysis' to create thousands of super fine, but deep holes in the skin. The injury effect spurs the skin to regenerate and firm up and remove excessive pigmentation. Can be used safely anywhere on the body.	Requires 3 to 5 visits for optimum results. Overtreatment or too many passes of the handpiece in the same area may result in hyperpigmentation and significant downtime. Can be painful without topical anaesthesia.
<b>Thermage</b> – Alternative brands: Alma RF, Syneron, Antilax and many more.	Skin firming, reduction of cellulite.	Not a laser. Uses radio frequency to penetrate deep into the skin to heat up collagen and fibrous strands of fatty tissue. The deep heating effect causes collagen to contract causing scars and wrinkles to be less prominent and also encouraging new collagen to form.	If improperly done, Thermage can cause burning, scarring, fat atrophy and even cavitation (craters in the skin) where fat shrinks in one area more than others.
<b>Titan</b> – Alternative brands: NovaPlus, Emax and many more	Skin tightening of the superficial and medium depth layers of the skin and helps with acne reduction. Also helps to stimulate long term collagen production in the skin.	Uses infrared waves to stimulate and heat up collagen in the superficial and medium depth layers of the skin. May also be indicated for those who are averse to pain.	Because the depth of penetration is not as deep as radio frequency treatment, it is not as effective for deep firming and more sessions may be needed.
<b>Lumenis Intense Pulsed Light</b> – Many competing brands	Hair removal, superficial skin rejuvenation, skin tightening, open pore reduction, superficial pigmentation removal like freckles, age spots and wrinkle reduction.	Uses a very broad spectrum of light to burn off pigments, broken capillaries and blemishes as well as heat up the skin surface which helps to tighten the skin, close open pores and help to clear up acne.	Indiscriminate because of its broad spectrum so it is not recommended for dark skinned people who will blister easily under IPL.
<b>Light Emitting Diode (LED)</b> – Many competing brands	Minor acne and skin rejuvenation, normally used as a finisher after other laser or skin treatments.	Comes in several colours each with a specific purpose. Some act to reduce redness, others act to make the face fairer or firm up skin. Some models act to specifically kill the bacteria that causes acne. This light also has a therapeutic effect on skin.	Effects are generally too mild to cause any problems or complications. On the other hand, it may be too mild to actually give you your money's worth.
<b>Q Switch Nd:YAG Laser/ Pulsed Nd:YAG/ Q Switch: Alexandrite</b> – Alternative brands: Medlite and many other competing brands	Pigmentation, superficial and dermal pigmentation (freckles, birthmarks, skin lesions), tattoo removal and skin rejuvenation.	The Q Switch fires short but intense pulses of energy. Comes in three wavelengths – 1064nm, 755nm, 532nm. 532nm treats red coloured tattoos and pigmentation. 1064nm can penetrate deeper into the skin to create a skin firming effect. 755nm is excellent for freckles, lentigos, dermal pigmented lesions, brown spots and removal of dark tattoos.	532nm may cause reactional hyperpigmentation. 1064nm can cause redness, bleeding spots or permanent hypopigmentation if used at excessively high power. 755nm can cause hyper or hypopigmentation with temporary redness and swelling.
<b>Long Pulse Nd:YAG</b> – Alternative brands: Gentle YAG and many other competing brands	Hair removal in darker skinned patients, removing varicose veins (on legs) and prominent capillaries, facial vessels, port wine stains, red birth marks, deep tissue firming and skin tightening.	The Long Pulse Nd:YAG penetrates more deeply than any other laser and is the safest laser for hair removal in darker skin types.	At very high energy settings can burn skin and create blistering or ulceration but this is very rare. At the proper energy settings, it is a very safe device.
<b>Long Pulsed Alexandrite Laser</b> – Alternative brands: GentleLase and many other competing brands	Skin rejuvenation, removal of hair, freckles, and superficial pigmentation (e.g. brown spots). Wavelength of choice to remove hair in lighter skinned patients.	Uses a 755nm wavelength which is well absorbed by brownish and dark pigments and fine hairs, making it excellent for treating superficial problems like freckles and hair removal on areas with very fine hairs like the nape of the neck.	A risk of burns and hyperpigmentation when improperly used.
<b>CO<sub>2</sub> Laser</b> – Many competing brands	Wrinkle reduction, improvement in pigmentation, skin texture, lines, wrinkles, scar treatment and skin resurfacing.	Ablates tissue in the path of the beam, allowing removal of warts, lumps and unsightly tissue. Can also be used for skin resurfacing. A newer version of the CO <sub>2</sub> laser called the Lumenis UltraPulse Encore exists on the market that redevelops the way the CO <sub>2</sub> laser fires and is safer for use on all skin types than the older version.	Can cause hypopigmentation in darker skinned people. Downtime ranges from 5 to 14 days depending on depth of treatment. Persistent redness and hyperpigmentation that lasts a few months afterwards can occur. Requires topical anaesthesia.
<b>Erbium laser</b> – Many competing brands	Skin resurfacing, removal of skin lesions (warts, lumps, etc.), can also be used to ablate tattoos.	Uses a 2940nm wavelength and operates similar to the CO <sub>2</sub> laser. Used for smaller, softer lesions and for those that cannot tolerate pain. Less painful than using the CO <sub>2</sub> laser and there is less incidence of post inflammatory hyperpigmentation.	Slightly safer for use on dark skin types, though caution is still required. When used wrongly, the patient can suffer from post inflammatory hyperpigmentation or hypopigmentation.
<b>Cooltouch</b> – Many competing brands	Acne scarring, wrinkle reduction, tightening open skin pores and facial firming.	Uses a 1320nm wavelength laser to heat up the skin and through that encourages the production of collagen while firming up existing collagen.	Excessively high settings can result in the formation of blisters or brown coloured craters in the skin.
<b>Pulsed Dye Laser</b> – Alternative brands: Candela Vbeam Perfecta other competing brands	Shrink capillaries, treat spider veins, red coloured birthmarks, periorbital wrinkles, skin rejuvenation, helps flatten keloids. Helps with certain kinds of dermatitis. Can treat darker skinned patients with minimal risks and capable of treating brown spots.	Comes in two wavelengths: 585nm and 595nm. Both are absorbed by red coloured blood vessels and other tissue. Excellent at targeting red coloured burn marks and spider veins. The heating effect helps with skin rejuvenation.	Very safe for use in Asian and darker skin types, less chance of post inflammatory hyperpigmentation with the new compression handpiece in the Vbeam Perfecta when compared to the Q Switched Nd: YAG and Alexandrite lasers.
<b>Diode laser</b> – Alternative brands: Smoothbeam and other competing brands	Acne reduction, scarring and wrinkle reduction.	Uses 1450nm wavelength which shrinks and destroys oil producing glands. Heat from the laser stimulates collagen production and tightens existing collagen deposits. Patients notice and appreciate a significant reduction in oil on their skin after treatment.	May cause blistering or hyperpigmentation if used improperly.
<b>Portrait PSR (Plasma Skin Rejuvenation)</b>	Wrinkle reduction, treating scars, dealing with pre-cancerous lesions, skin tightening and total facial rejuvenation. Has been shown to safely treat most skin types though studies are still pending for African skin.	Employs plasma energy which delivers uniform heat energy under the skin while bypassing the skin surface, without burning or ablating the skin. After treatment, the patient's own skin acts as a dressing and peels off in about a week with new, healthy skin underneath.	No scarring observed in patients but there may be risk of hyperpigmentation in darker skinned patients.

COST	COMMENTS
<p>About RM3800 and up for treating the face. SG\$8000 and up in Singapore. Prices in the U.S. range from US\$500 to US\$1500 per treatment depending on the area being treated with a regimen of 3-4 treatments spaced 4 weeks apart.</p>	<p><b>Dr. Groff:</b> "An improved version called the Fraxel 2 exists and allows a depth of penetration twice as deep as the previous version, can safely treat up to 35% of the skin in any one treatment session and offers less painful treatment at higher, safer energy settings. It shows better results with treating acne scarring and photodamaged wrinkled skin. Another major advantage of the Fraxel 2 is that there is a significant reduction in developing post-inflammatory hyperpigmentation in Asian patients."</p>
<p>RM5,000 and up for one session. Prices in the U.S. range anywhere from US\$1500 to US\$4000 or higher. Pricing depends on the areas treated.</p>	<p><b>Dr. Groff:</b> "Thermage is the pre-eminent skin tightening device used by many physicians. It can be used to safely treat any part of the upper and lower body with no downtime. However, it is not meant to be a replacement for a facelift. There is a small subset of patients that appear to be candidates but do not seem to respond to treatment. This happens in approximately 10% to 20% of patients. Patients should be aware that they may fall into this category."</p>
<p>Approximately RM1800 – RM2800 per session with 3-6 sessions required for best effect.</p>	<p><b>Dr. Ko:</b> "Popular because it is relatively painless, non-invasive and doesn't require local anaesthesia." <b>Dr. Groff:</b> "The problem with it is the same as Thermage in that a small percentage of patients do not respond to treatment."</p>
<p>Prices vary tremendously. Results can be visible after one treatment but varies from patient to patient. Prices start at RM300 and up per session.</p>	<p><b>Dr. Ko:</b> "It's a machine that can do a bit of everything though it does not particularly excel in one area or another." <b>Dr. Groff:</b> "There is a higher chance of complications due to the broad spectrum of light that IPL uses. There are comparative lasers that perform better in a given category than IPL and a physician has to be careful when using IPL on darker skinned individuals."</p>
<p>RM180 and up per treatment with at least 4-6 treatments before any results can be seen.</p>	<p><b>Dr. Ko:</b> "It's mildness is both a strength and a weakness in that it's too mild on its own to be considered a viable solution. Very popular with beauty salons and also in medical practice as a 'finisher' to complete a stronger course of treatment from other light based treatments."</p>
<p>RM300 and up depending on area treated and number of sessions. Prices in the U.S. range from US\$200 to US\$1500 depending on the size of the area per treatment. Deep dermal pigmentation requires up to 8 treatments while tattoo removal needs at least 3-6 treatments.</p>	<p><b>Dr. Ko:</b> "One of the most common lasers used for pigmentation, tattoo removal and skin rejuvenation." <b>Dr. Groff:</b> "The Q Switch: Alexandrite 755nm is my favourite device for tattoo removal, treating brown spots, freckles and any brown lesions."</p>
<p>RM300 and up per session. Number and prices for sessions vary depending on area and extent to be treated.</p>	<p><b>Dr. Ko:</b> "Highly effective on darker skin types – the longer wavelength of the laser means it's less likely to burn the skin surface." <b>Dr. Groff:</b> "It's the safest wavelength for hair removal in darker skinned individuals and is still the best wavelength for the treatment of spider veins in the lower legs. Also, studies show that the Gentle YAG is equal to or better than Thermage for skin tightening."</p>
<p>RM300 and up depending on area to be treated, number of shots and location.</p>	<p><b>Dr. Ko:</b> "It is not recommended for those with darker skin; even at low energies there is still a risk of burning and blistering." <b>Dr. Groff:</b> "It can be used in dark skin types but has to be used by experienced hands. It is the wavelength of choice to remove hair in lighter skinned patients."</p>
<p>Prices can range anywhere in the U.S. from US\$500 to US\$6000 depending on the area of treatment and degree of correction required. Prices in Malaysia vary tremendously depending on the practitioner and area as well as the degree of correction needed.</p>	<p><b>Dr. Groff:</b> "The CO<sub>2</sub> laser is the gold standard in skin rejuvenation by which everything else is measured. Instead of resurfacing 100% of the skin during a treatment session as in conventional CO<sub>2</sub> lasers, the newer version UltraPulse Encore has a redesigned scanning handpiece which enables the laser to be used more safely than in older CO<sub>2</sub> lasers. Not all patients need a 100% resurfacing and the UltraPulse's flexibility and safe features make it safer for use in patients."</p>
<p>RM300 and up per treatment session. RM100 and up for removing a few small lesions that take five minutes or so. Prices in the U.S. range from US\$500 to US\$4000 depending on the area of treatment.</p>	
<p>RM600 to RM800 per session and may require up to 20 sessions to see actual results.</p>	<p><b>Dr. Ko:</b> "Results are not particularly impressive and many sessions are required for results. Not recommended for those who want to see immediate results."</p>
<p>RM300 and up per session. US\$200 to US\$1500 and up depending on area size. Number of sessions vary depending on area and extent of treatment.</p>	<p><b>Dr. Groff:</b> "It is the gold standard for treating vascular lesions such as facial blood vessels, rosacea and port wine stains."</p>
<p>RM300 and up. May cost anywhere from US\$300 to US\$1000 in the U.S. depending on area treated.</p>	<p><b>Dr. Groff:</b> "It is the gold standard laser for acne reduction and studies show that 3 treatments spaced 4 weeks apart each can result in 80% improvement in acne."</p>
<p>Depending on the energy setting, it can be done as one high energy treatment session or a series of four low energy treatments spaced about four weeks apart. Prices range from US\$1500 to US\$4000 per treatment in the U.S.</p>	<p><b>Dr. Groff:</b> "The Portrait PSR is unique because it's not a laser and it uses plasma energy to create a rejuvenative effect in the skin. There's a low risk of infection because the patient's own skin acts as its own biological dressing and this in turn leads to a rapid recovery. Studies show that the skin will continue to improve for up to a year after treatment."</p>



Permanent hair reduction using the Gentle YAG.



Reduction in sun spots and freckles with Fraxel and the Q Switch Alexandrite laser in Asian skin.



Removal of varicose veins using the Gentle YAG laser.



Improvements in pigmented skin with the Portrait PSR in Caucasian skin.



Removal of pigmentation using the Vbeam Perfecta.

## Glossary

**Collagen** – Connective, fibrous protein that is part of skin tissue. When young, collagen in our skin is constantly regenerated to give firm, supple skin. As we age, this level and rate of regeneration declines, leading to sagging, wrinkly skin.

**Deep tightening** – A treatment targeting the deep dermis and beyond and subcutaneous (under the skin) fat.

**Dermis** – Layer of skin beneath the epidermis with many nerve endings that provide the sensation of touch and heat.

**Epidermis** – The uppermost layer of skin that consists of several sub layers. The topmost layer of the epidermis consists of dead skin cells.

**Intense Pulsed Light (IPL)** – Technically not a laser. Uses a broad spectrum of light that treats many conditions and to close open pores and help to clear up acne.

**Laser** – Stands for *Light Amplification by Stimulated Emission of Radiation*. Uses a beam of light to heat a targeted cell until it 'bursts' and disperses. Several lasers currently exist on the market differentiated by wavelength and what treatments they are optimised for.

**Alexandrite** – Refers to a family of lasers of 755nm. 755nm is indicated for the removal of fine hairs and superficial pigmentation.

**Erbium** – A range of lasers in the 2950nm wavelength and indicated for superficial skin resurfacing and superficial skin lesions.

**Nd:YAG** – Stands for Neodymium-doped: Yttrium Aluminium Garnet Laser, the components the laser consists of and its type. Used to treat spider veins, fine

facial veins, various skin lesions, pigmentation and for skin rejuvenation. Also refers to a series of lasers with the 532nm and 1064nm wavelength.

**Pulsed Dye** – Refers to a type of laser that uses organic dye as a component for firing the laser. Pulsed dye lasers use 585nm and 595nm and target red coloured vascular lesions like port wine stains, red scars, spider veins and facial fine veins. Can also be used for photorejuvenation. The latest generations can treat pigmented lesions as well.

**Ruby laser** – Refers to lasers in the 694.3nm wavelength. Indicated for removal of pigmentation but can lead to hypopigmentation. Today, other than specialist applications for hair removal, its role is superseded by newer Nd:YAG lasers.

**Long Pulse** – A control system for Nd:YAG lasers and Alexandrite lasers. Designed to fire the laser over a longer period of time to reach deep into the skin for hair removal and deep tissue firming.

**Nm** – Stands for nanometer, which is  $10^{-9}$  of a meter. Refers to the wavelength and how broad the wave of the laser is. The higher the nm, the deeper the laser goes up to a point.

**Photorejuvenation** – A collective name to define the effects achieved through treatments using a broad spectrum of light such as Intense Pulsed Light or lesser treatments using LEDs.

Encompasses various effects with varying degrees of efficacy that include superficial firming and tightening of tissue, closing of open pores and removal of minor pigmentation.

**Pulse duration** – A characteristic of the laser.

The longer the pulse, the longer it is fired over a period of time which gives a physician more time to gradually heat the deeper parts of the skin to achieve a stronger result. Shorter pulses mean the laser fires rapidly and mainly burns the superficial part of the skin.

**Q-switch** – A control system for Nd:YAG lasers and Alexandrite lasers to affect the pulse duration of the laser.

**Wavelength** – The longer the wavelength of a laser, the deeper its penetration into skin tissue. Shorter wavelengths are used mainly for more superficial skin lesions or actions while longer wavelengths have less chance of burning darker skin and can penetrate deeper into the skin.

**Radio frequency (RF)** – Uses radio frequency energy, similar to microwaves. Normally employs a form of contact cooling to reduce burning to the skin surface. Comes in two sub-varieties:

(i) **Monopolar**: Hand piece has one point only and the wave travels through the body and returns through a pad placed in the foot or the abdomen to complete a circuit of sorts.

(ii) **Bipolar**: RF energy comes out from one head and goes back to through another point in the same hand piece to complete a circuit. Used for superficial skin effect.

**Sapphire** – A crystal incorporated into a hand-piece for various lasers that cools the skin during treatment.

**Superficial** – Epidermis and top part of dermis.