

## Safety features and operation of the Lumina

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### Abstract

**The use of the Lumina (Lynton Lasers Ltd, Holmes Chapel, Cheshire, United Kingdom) in hair removal applications is discussed and the intrinsic safety features are reviewed. Treatment data from a sample of over 25 clinics throughout the UK, indicates safe operation of the Lumina during more than 10,000 treatment procedures.**

### Introduction

The use of intense pulsed light (IPL) systems for hair removal has been well established for a number of years<sup>1</sup>. It is an effective alternative to traditional methods such as electrolysis and waxing, allowing long-term, and often permanent, hair removal.

The efficacy of IPL technology for removal of unwanted hair is without question. It is the aim of this study to summarise and discuss the safety features of the Lumina IPL system and assess the safety of treatments carried out with

### The Lumina system

Understanding the principles behind the technology for IPL hair removal is important, especially since the Lumina is designed to be as safe a treatment for hair removal as possible. Laser and IPL hair removal is based on the theory of selective photothermolysis<sup>[2]</sup>.

The process of intense pulsed light hair removal is relatively simple. This theory holds that if one wishes to remove a particular target, an appropriate wavelength must be chosen that is preferentially absorbed by the target. The target should be exposed to a light source during a 'pulse duration' that is less than or equal to the thermal relaxation time of the target (thermal relaxation time is defined as the time it takes for the object to cool to half of its peak temperature). Also, the exposure fluence or power must be above the threshold fluence for irreversible damage to occur. In general, when light enters the skin the majority of it will be absorbed by blood, melanin and water. Different wavelengths of light (different colours) will be absorbed by different amounts; for example the wavelength 577nm (yellow) light is heavily absorbed in the blood. In general melanin is a good absorber of most wavelengths, which is why melanin is the skins defence against harmful

sunrays. Water is a relatively poor absorber of visible light but has a strong absorption at longer wavelengths (2000nm) such as infrared.

The Lumina emits light in broad spectrum, which consists of a range of different wavelengths from 600 to 1100 nanometres. All these wavelengths are absorbed by melanin, however certain wavelengths are removed using the Lumina filter such that absorption in the blood and water is negligible, allowing most of the energy to target the melanin in the hair follicle.

### Hair Removal with the Lumina

Utilising light to destroy hair follicles results in a conflict between the absorption of light by melanin in the hair shaft and absorption of light by melanin situated in the basal layer (which causes heating of the epidermis). Ideally the hair shaft needs to be heated enough to destroy the follicle while the epidermis remains cool and undamaged. The epidermis can rapidly expel excess heat as it is in contact with the air, whereas the hair follicle retains heat for a longer period of time. The Lumina operates in a pulsed burst mode, which administers the light in a sequence of pulses with a short delay between each one. The delay duration between each pulse is long enough to allow the epidermis to cool, yet short enough to prevent cooling of the hair follicle. Therefore the temperature of the hair follicle increases during the pulse sequence. The treatment is effective when the hair follicle reaches a temperature high enough to destroy the follicle whilst the epidermis remains below the damage threshold temperature. This minimises the risk of burning to the skin.

### The Consultation

All patients attend an initial consultation with a properly trained clinical operator of the Lumina. At

such a session, the area(s) to be treated can be assessed by the clinician. The process of treatment can be explained to them as well as aftercare and the need to wear appropriate patient goggles throughout the treatment.

Following consultation, and having obtained written consent, it is important to follow a set routine for all treatment sessions. The regime is as follows:

- Ask the patient if they are suffering from any medical conditions or are taking any medication and make appropriate records.
- Examine closely the area to be treated.
- Identify any signs of scarring, marks or underlying skin disorders such as eczema. If there are any broken areas or pustules the treatment should be delayed until the area has completely healed.
- If necessary, photograph the area together with the patient's identification number.
- Ensure the patient is comfortable and all safety precautions have been followed before commencing treatment.

A test patch is always necessary and vital in ensuring that no adverse reactions occur. The treatment parameters for a particular individual is based upon their 'skin type' and 'hair colour.' To discover the skin type of a patient, the Fitzpatrick Scale is used. Once the patient's skin type has been determined, the hair colour in the area to be treated is also determined. These details are then entered into the Lumina control software and safe starting parameters are displayed. The Lumina 650 operator can increase or decrease the fluence to suit the treatment. The Lumina software is designed specifically in which there is a limit to how high the fluence level can reach on each skin type and hair colour setting. This ensures that the patient will not be subjected to a fluence that is dangerous to their skin type, minimising risks of epidermal damage and/or burning.

### Safe Operation of Lumina system

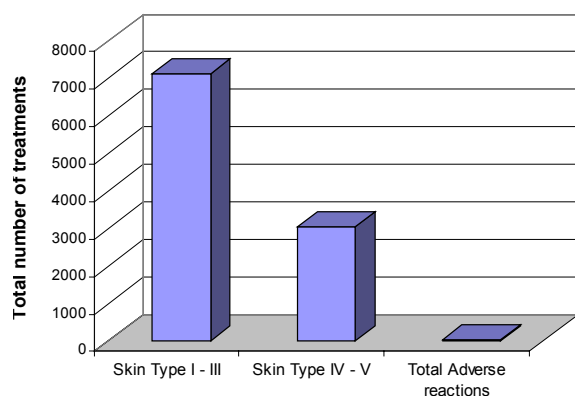
All Lumina operators should follow a set procedure for treatment. Before turning on the Lumina system, the operator must ensure that the handpiece has not been subjected to any damage. This is achieved by looking into the area of the handpiece where the interchangeable quartz block light-guides slot into. Before switching on the system, general checks should be made to ensure that the optical filter is intact, the quartz light-guides are clean and the system is generally ready for operation. In the

unlikely event of any problems occurring or if the user is in any doubt then the supplier should be contacted and they will rectify the problem.

The following steps should be adhered to for every treatment:

1. Clip or shave area to leave stubble.
2. Apply a layer of cold gel to the treatment area. This aids cooling and penetration of the light into the skin.
3. Operator and patient must wear goggles.
4. Place hand piece against the skin and depress the button to deliver the pulse of light.
5. Move hand piece along the skin, taking care not to overlap imprints.
6. Wipe off the gel and examine the site for reaction. The end points for treatment are erythema and swelling around the follicle. If none of these are present, then the parameters need to be increased. You can also try using tweezers to see how easily the hairs slide out.
7. If you feel there is need, reapply more gel and re-treat the area. This must not be repeated more than once.
8. After treating the area, cool it down using cold swabs, ice packs or aloe vera gel. This helps the patient feel more comfortable.

Although all patients may react differently, a number of post treatment reactions are commonly seen. An initial erythema of the treated area is the first sign of a positive reaction. This is normally followed within approximately ten minutes with a follicular reaction.



*Fig. 1: Treatment data for over 10,000 treatments showing patient skin types and instances of adverse reactions*

In the UK alone, the Lumina system is being used in over 25 clinics. Within these clinics a survey was carried out and indicated that in over 10,000 treatments only 34 occurrences of minor side effects such as epidermal burning and pigmentation were encountered, illustrated in Fig. 1, above.

## Conclusion

Hair removal using the Lumina is safe when the system is operated by the correct procedures which have been outlined earlier. These procedures are all part of the initial training which comes as standard when the Lumina is purchased.

The technology behind the Lumina system ensures that the epidermis cools very quickly after each pulse of light, which initially minimises any skin damage. All the cooling including ice packs and chilled gel add to reducing any damage to the skin. Finally, because the Lumina software has 'upper limits' in each skin type and hair colour setting, the

fluence is within a safe limit for the patient being treated. In addition. If all the procedures for correct operation and treatment are followed, absolute minimum risk is ensured.

## References

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