

The efficacy of a low energy constant spectrum emission device for Hair Epilation

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Mario A. Trelles, MD.PhD.

Instituto Médico Vilafortuny / FUNDACIÓN ANTONI DE GIMBERNAT
E-43850 CAMBRILS (Tarragona) Spain, imv@laser-spain.com

The selection of optical parameters for hair removal such as wavelength, energy, exposure time and fluence, are important to induce the best thermal effects on the hair follicle, considered as a principal target. To increase epilation efficacy, transfer of heat to the whole hair structure is mandatory in order to obtain permanent hair reduction.

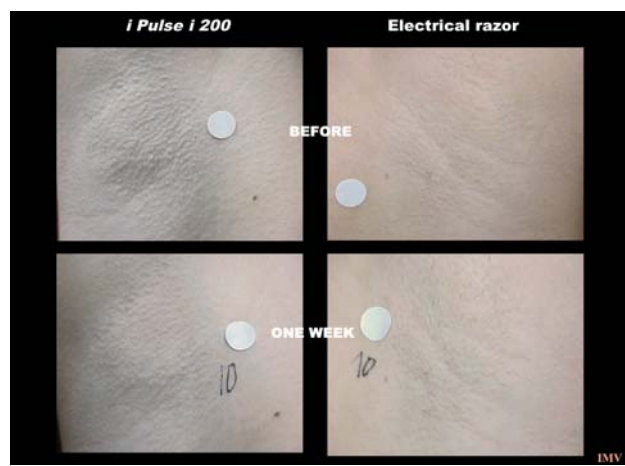
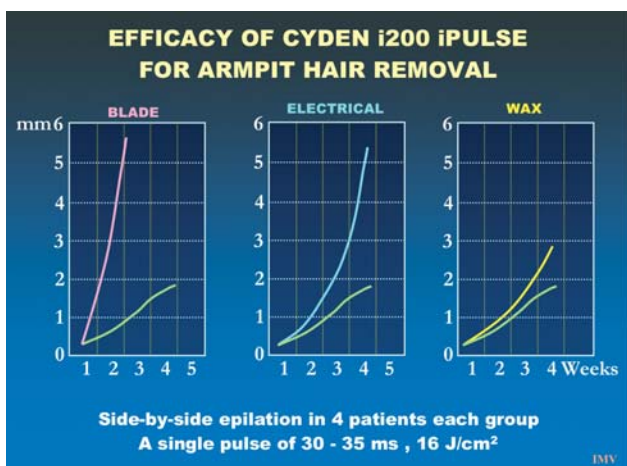
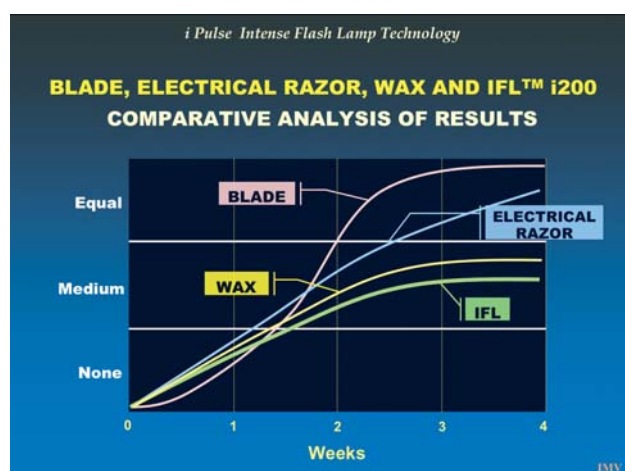
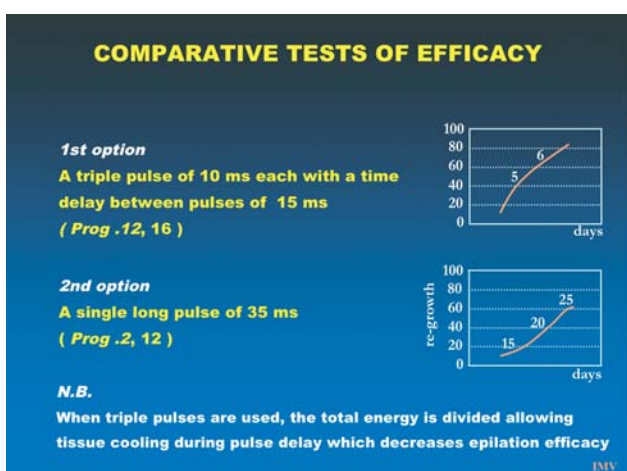
The chromophore target in hair is melanin, which absorbs energy relatively efficiently across a wide range of optical wavelengths. Most intense pulse light devices (IPLs) emit several wavelengths when programmed for hair removal treatment. The interaction of multiple broad-band output wavelengths with the skin, as is the case of IPLs emitting in the spectrum of visible and short infrared wavelengths is not selective, therefore, few wavelengths are filtered at the time of treatment, with the consequent wasting of energy.

Moreover, distribution of the optical output across the broad spectrum of wavelengths in most of IPLs is not the same, with variation at the start, middle and end of the pulse energy emission. The energy distribution varies throughout the pulse duration resulting in the need for high energies to be effective for hair removal. This situation limits efficacy and safety parameters which are of paramount concern in hair removal. A device that uses a computer-controlled low power lamp that gives a constant current discharge and a stable spectral output across the entire pulse is presented as a valuable advance for permanent hair reduction keeping efficacy at high level in correspondence with simplicity of operation and solid safety parameters.

Material and Methods

Previous trials to assess device efficacy

Comparative hair growth rates comparing various settings of pulsed light treatment and efficacy were carried out, contrasted to wax, electric razor and a regular blade. Results were plotted on a graph to show, comparatively, the efficacy of these three methods of shaving against the iPulse. Length of hair growth was also measured.



Significantly less hair growth was observed on all patients epilated with the iPulse, in comparison to the other armpit used as test with the alternative methods of shaving.

Material and Methods

Previous trials to assess device efficacy

Tests of technical reliability were performed independently (by Dr J.L Levy, Marseille, 2004-05) and questionnaires were filled in on recognized side effects, symptoms at the time of epilation, and complications. Upon histological examination, no lesion of the epidermis was noted after the treatment and the hair follicle was damaged.

i Pulse Intense Flash Lamp Technology

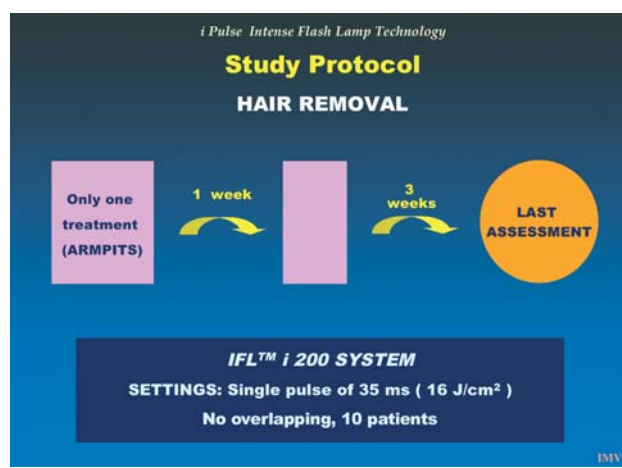
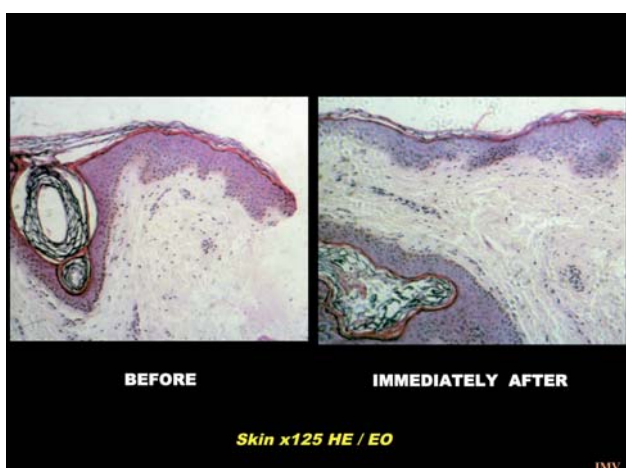
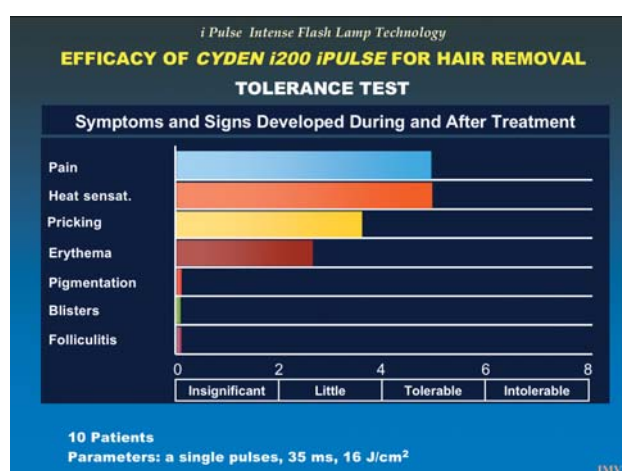
**Random Energy Measurements (Consistence of Emission)
SYSTEM RELIABILITY**

Energy meter 1 Fluence J / cm ²	P4 25 ms Energy	Fluence	P5 30 ms Energy	Fluence	P6 35 ms Energy	Fluence
10	61.2	8.5	61.9	8.5	64.4	8.9
11	66.4	9.2	70	9.7	71.2	9.8
12	70.7	9.8	72.5	10	77	10.6
13	76.3	10.5	78.7	10.9	82.7	11.4
14	80.3	11.15	83.6	11.6	89.3	12.4

Energy meter 1 Fluence J/cm ²	P12 Triple pulse on : 10 ms, 15 ms off Energy	Fluence
14	87	12.08
15	91.3	12.6
16	102.7	14.2
17	107.2	14.8
18	116	16.11

Energymeter 1 : ophir n° 79844
 Quartz de la pAM: 7.2 cm²
 Ecart moyen : 19 % par rapport à la fluence affichée avec les 2 energymeter
 Ecart minimum : 15%
 Ecart maximum : 30%

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Material and Methods

Hair removal on patients

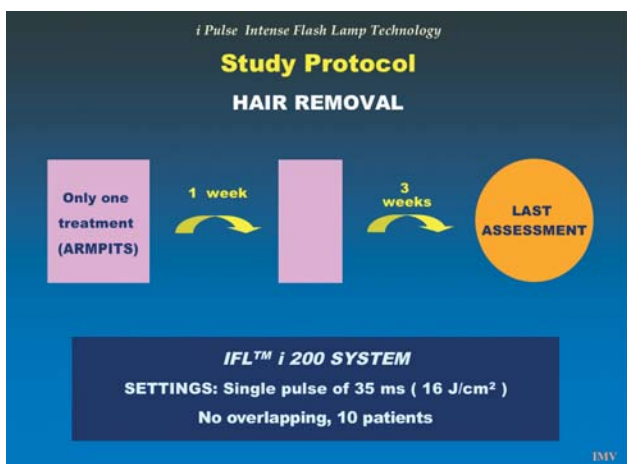
10 patients were enrolled for hair epilation of one armpit, the other remaining untreated to serve as a control.

Setting used: single pulse of 35 ms, 16 J/cm², no overlapping, but 2 passes to cover the “non treated” areas

between the first shots of pulses. Before treatment all armpits were shaved using a regular metal blade. Ice pack skin cooling was used before and immediately after treatment. A second pass of pulses was only undertaken once the area was completely treated. AloeVera cream was gently applied after iPulse epilation treatment. To objectively assess efficacy, hair counting and image follow-up before and after was carried out via computer analysis. Hair size and characteristics, as well as histologies were also examined.

Subjectively, efficacy of results was scored by patients by giving them questionnaires. Results were used to determine patients' Satisfaction Index (SI): Good and Very Good results were taken together to illustrate the overall Satisfaction Index.

Extra interviews were carried out by a physician not directly involved in the study.



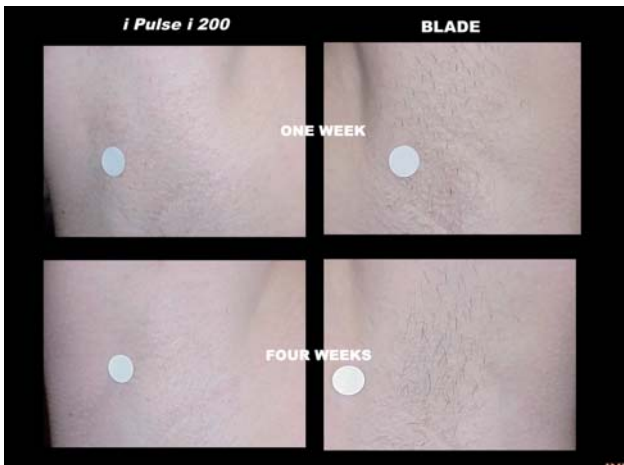
PATIENT CHARACTERISTICS

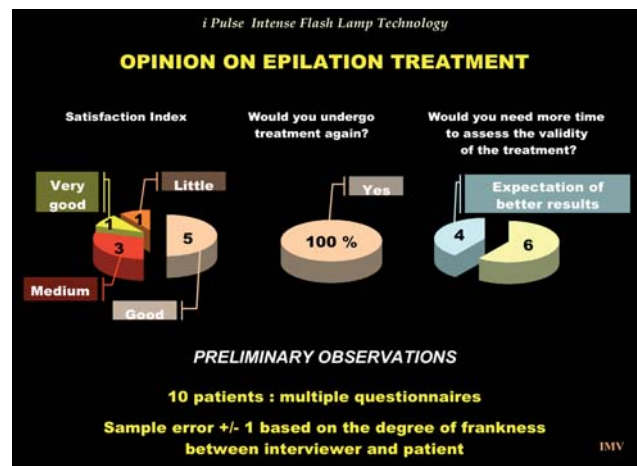
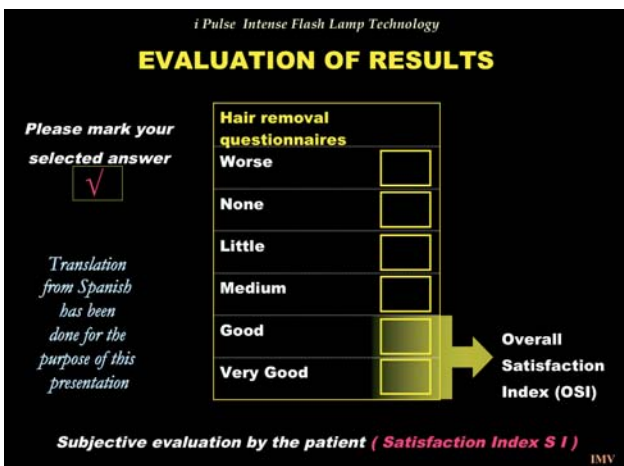
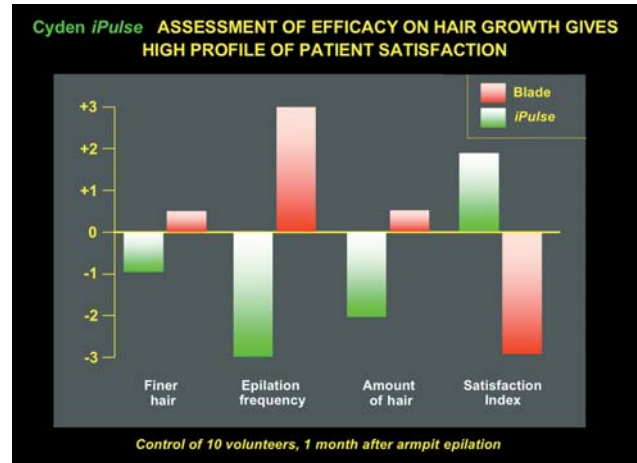
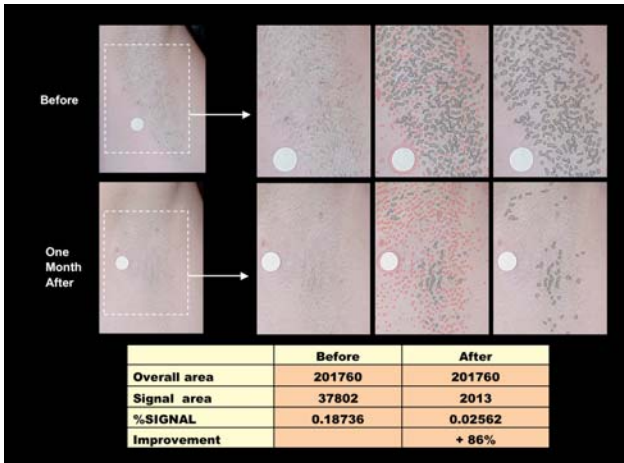
SATISFACTION INDEX (SI) RESULTS

	Patient	Physician	Computer	
Very Good	2	2	4	
Good	5	6	5	
Fair	3	2	1	
Nil	0	0	0	
	10	10	10	Total
	7	8	9	Total SI
%	70	80	90	

IMV

Results





Discussion

The iPulse system uses partial discharge technology which, in simple terms, means that a large value capacitor is fully charged but only partially discharged during every pulse. This control of the spectral output leads to greater treatment efficiency and efficacy. The relatively large spot size, resulting from the use of twin Xenon lamps, together with the wide range of wavelengths, specially that of the red and infrared spectrum act to provide depth of light penetration to the underlying follicle.

Conventional high power IPL white light systems use free-discharge technology i.e. electrical energy is completely released from a capacitor bank into the Xenon lamp. Such technology results in current in the discharge to build up from a low level to reach a peak and then fall away again. This effect of "spectral jitter" during the pulse means that the spectral output not only varies during the pulse but also differs significantly from one energy setting to another. This can mean that much of the pulse output is at wavelengths that are not useful for targeting the chromophores in question and much of the potentially useful energy is wasted, something which is avoided with iPulse technology.

Conclusions

- *Relatively low energy dosage with clear positive clinical effects*
- *Safe for the epidermis and phototype IV*
- *Simple to operate and light to transport*
- *No need for maintenance service*
- *Few disposables which can be self-serviced*
- *No necessity of gels or cooling system*
- *Large treatment window*
- *Prolonged follow-up needed*
- *Definition of optimal settings needed*
- *Comparative efficacy test needed*
- *More detailed theses are needed based on prolonged clinical follow-ups*