A MULTICENTRE TRIAL OF THE EPILATION EFFICACY OF A NEW LARGE SPOT SIZE, CONSTANT SPECTRUM EMISSION IPL DEVICE

<table>
<thead>
<tr>
<th>Journal:</th>
<th>Journal of Cosmetic and Laser Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manuscript ID:</td>
<td>MCLT-2007-0002.R1</td>
</tr>
<tr>
<td>Manuscript Categories:</td>
<td>Original Research Reports</td>
</tr>
<tr>
<td>Date Submitted by the Author:</td>
<td>18-Jan-2007</td>
</tr>
<tr>
<td>Complete List of Authors:</td>
<td>Trelles, Mario; Instituto Médico Vilafortuny Ancona, Dvora; Medico Chirurgo Stuve, Ragnhild; Klinikk-Haugesund</td>
</tr>
<tr>
<td>Keyword:</td>
<td>Lasers and light sources, IPL, depilation, wavelength shift, stem cells, selective photothermolysis</td>
</tr>
</tbody>
</table>
A MULTICENTRE TRIAL OF THE EPILATION EFFICACY OF A NEW LARGE SPOT SIZE, CONSTANT SPECTRUM EMISSION IPL DEVICE

Dvora Ancona¹, Ranghild Stuve² and Mario A Trelles³

¹Milan, Italy; ²Haugesund, Norway; and ³Instituto Médico Vilafortuny/Antoni de Gimbernat Foundation, Cambrils, Spain

Running title: New IPL system for epilation

Addressee for correspondence:
Mario A Trelles MD PhD,
Instituto Médico Vilafortuny /ANTONI DE GIMBERNAT FOUNDATION
Av. Vilafortuny 31,
E-43850 Cambrils, Spain.
Tel: +34 977 361320     Fax: +34 977 791024
E-mail: imv@laser-spain.com
Abstract

This study assesses efficacy of a new, low fluence, constant spectrum IPL device.

In four European centres, 52 females underwent epilation of one arm axilla with the new IPL, the contralateral axilla serving as a treatment control. Satisfied patients at one-month assessment received no further treatments and in the other patients up to five further monthly sessions were given. Clinical photography was taken at pretreatment baseline, and at approximately one-month follow-up. Side effects and hair attributes were graded. Patient satisfaction was graded.

All patients completed the study. 11 required one treatment, with 8, 13, 11, and 9 requiring two, three, four and five sessions, respectively. Side effects were minimal. 44 patients were very satisfied with the final result, 8 were somewhat satisfied and no patient expressed dissatisfaction giving an overall satisfaction score of 84.6%. In all cases, hair regrowth in the treated side was finer and lighter. Greatest efficacy was seen in coarse dark hair in darker skin, and least efficacy was noted in fine blonde hair in lighter skin.

Epilation with this constant spectrum IPL was safe, effective, well tolerated, with high patient satisfaction. Repeated sessions were required in some lighter hair and skin patients.

Introduction

The removal of unwanted axillary hair is a problem faced by many women, and by the clinician they ask to remove it. The problem is compounded by the different skin types of the patients, their hair colour and hair calibre and the timing of their normal hair cycle, as the ideal point to treat hair with any light source is when as much of the hair as possible is in the growth or anagen phase. It is now well-recognized that it is not enough to destroy the hair in its follicle, but to ensure that the pluripotential stem cells residing along the hair shaft, and particularly at the bulb, are also destroyed,(1) as these cells are responsible for hair follicle growth and regeneration. Light sources, including lasers and intense pulsed light (IPL) systems, have been reported as having varying degrees of efficacy in the removal of axillary hair. The concept of selective photothermolysis as proposed by Anderson and Parrish(2) has had to be extended in hair removal with pulsed light sources to allow ‘cooking’ of as much as possible of the hair and its adnexa so as to achieve damage of the stem cells(3). Broadband ‘white’ pulsed light, as delivered by IPL systems, offers several potential advantages over monochromatic laser energy as it can target the hair shaft and follicle in both a selective (visible waveband, melanin and blood vessels in the bulb) and nonselective (near
infrared waveband, proteinous targets and water) manner, with longer pulse widths than the usual laser pulse. The longer pulses give more uniform, progressive and better heating of the hair shaft and follicle under a cooled epidermis. Traditional IPL systems have non-uniform pulse characteristics, however, with a wavelength shift in a time-dependent manner through the pulse, whereby there is a shift from more red/infrared through the shorter blue wavelengths in the mid-pulse, back to longer red/infrared towards the end of the pulse\(^4\). A new type of IPL system has been developed, which is capable of constant spectrum emission that allows the application of a single dichroic reflectance filter. The result is that more light energy of the correct wavelengths is incident on the target hairs, with a comparatively large treatment area\(^4\). The present study examined the efficacy of this new generation of constant spectrum emission IPL system for axillary hair removal in three geographically separate European centres.
Subjects and Methods

Trial centres
The study was conducted concomitantly in three centres, one each in Spain, Norway and Italy. The same protocol was observed in each centre, and a standardized patient report form was used in all centres to record patient demographics, hair colour and calibre, usual method of depilation, normal regrowth rhythm, treatment sessions, regrowth rhythm and hair density after treatment, side effects (pain, itching and postinflammatory hyperpigmentation) and patient satisfaction. One of the authors (MAT) served as a trial ‘marshal’ and visited the other centres to ensure that the protocol was properly adhered to.

Subjects
Fifty-two female subjects participated in the study, 30 in the Spanish centre, 10 in the Norwegian center and 12 in the Italian centre, the individual patient demographics are shown in Tables 1-3, respectively. The average age of the subjects was 34.9 yrs (range, 21-51 yrs), with 1, 18, 31 and 2 patients falling into Fitzpatrick skin types I, II, III and IV, respectively. As for the hair colour, there were 5 blonde, 18 light brown, 26 dark brown and 3 black-haired subjects. Seven subjects had fine, 33 had medium and 22 had coarse hair. Subjects were asked about their normal hair removal method: 26 used waxing, 7 used plucking, 12 shaved with a conventional razor, 3 used an electric razor, 2 used depilatory cream and 2 did not depilate at all. No major differences could be seen in the demographics among the individual groups and although the numbers were too small to allow meaningful statistical examination, the Italian group had a tendency to be older (average age of 40.2 yrs compared with the overall average of 34.9 yrs).

The study was approved by the Ethics Committee of each individual centre. All subjects had the purpose of the trial explained to them, and gave written informed consent both to participate in the trial and for the subsequent use of their clinical photography. Subjects enrolled in the study were not paid to participate and did not pay for treatment.

Treatment
Photoepilation on one randomly chosen axilla was performed with the iPulse i200 (Cyden, Ltd, Swansea, UK) with a 35 ms pulse delivering 16 J/cm² over a treatment area per pulse of 8.9 cm². The waveband was from approximately 530 nm to 1200 nm. The contralateral axilla served as the
untreated control. Subjects did not use any other method of epilation on either the treated or untreated axilla throughout the duration of the study.

Immediately before each treatment, both the treatment and control armpits were shaved using a regular metal blade razor. Ice pack cooling was used before treatment, and three passes were given on the treated axilla, each IPL shot was placed next to the previous shot with no overlapping. Ice pack cooling was used between passes. Once the first pass and cooling was complete, a further two passes with ice pack pre- and post-cooling ensured that no untreated gaps existed between the previous shots. No other cooling method was used. Aloe vera cream was gently rubbed into the treated area when the treatment session was completed. No other creams or preparations were used.

Patients returned approximately one month after the first treatment session for evaluation, including clinical photography. Those who were satisfied received no further treatment, and patients who were not satisfied could receive up to a maximum of four further treatment sessions with the same protocol as above, until the final assessment point when the patient felt satisfied with the result, or agreed that no further improvement could be seen.

Assessments

Patients
At the first session and following sessions where required, patients assessed pain during the treatment and itching after the treatment as severe, moderate, mild or no pain or itching (scored from 3 to 0, respectively). On returning one month after the first session, and subsequent sessions where required, the appearance of postinflammatory hyperpigmentation was scored on the same scale. Patients reported how long it had taken for the reappearance of hair, and if the density had increased (+), remained the same (±) or decreased (–). They also rated their satisfaction with the result as very satisfied (VS), somewhat satisfied (S) or not satisfied (NS).

Clinical photography and Objective Computer Assessment
High-resolution digital clinical photography (Sony MAVICA MVC-FD91, 2 MPxL, Sony corporation, Tokyo, Japan) was taken before and after the first session, and at each monthly assessment point before any further treatment was given. Also, based on the clinical photography, a computer-based assessment program was employed objectively to analyse comparable images of treated and non treated areas to highlight the apparent density of hair regrowth.
Results

All 52 subjects completed the trial. Eleven subjects required only one treatment session, 8 required two, 13 required three, 11 required four and 9 required five sessions. Of the 11 subjects who had only one treatment, 10 were very satisfied and 1 was somewhat satisfied. Of the remaining 41 patients who had two or more treatments, 4 were very satisfied after the first treatment, 20 were somewhat satisfied and 17 were dissatisfied. By the final treatment session, 34 of the 41 were very satisfied and 7 were somewhat satisfied (Tables 1-3 and Figure 1), giving an overall satisfaction rate of 84.6%. Individual satisfaction ratios for very satisfied to somewhat satisfied (VS:S) at the final treatment were 4:2, 3:2 and 12:0 for the Spanish, Norwegian and Italian centres, respectively (Table 1).

Table 4 shows the patient assessment of pain, itching and appearance of secondary hyperpigmentation compared between the first and final treatment session for all subjects, including the 11 who needed only one session. No subjects felt the pain was unbearable, although 7 found it severe at the first session. A definite trend towards less pain and itching was seen between the first and final assessments, as illustrated clearly in Figure 2. The low level of postinflammatory hyperpigmentation was particularly interesting, despite the prevalence of darker skin types III and 2 subjects of skin type IV.

Clinical photography of three representative subjects from the multicentre study are shown in Figures 5-10. These include control and treated axilla after a single treatment, after two treatments and after final assessment.

The improvement in the overall average number of days (± SD) to recurrence of hair following IPL epilation in all subjects compared with conventional epilation was 12.52 ± 7.08 days (range, 0-26 days). For the Spanish, Norwegian and Italian centres, the respective individual values were 11.07 ± 6.36 (range 0-25 days), 11.44 ± 8.17 days (range 3-26 days) and 17.67 ± 4.7 days (range 8-23 days) (Tables 1-3). Once again, the number of subjects was too low to allow for any statistical significance in the comparison among the centres regarding the regrowth latency. Compared with the Italian centre, which had a longer period before hair regrowth than the average, both the Spanish and Norwegian centres had a period before hair regrowth, which was slightly shorter than the average. In all centres, the hair density on regrowth following the final session was less, and the
hair calibre finer after constant spectrum emission IPL treatment compared with the subjects’ conventional depilatory methods.

Discussion

Conventional IPL systems use what is called free discharge technology, in which a capacitor, an electrical storage component of comparatively low capacitance (storage value), is fully charged up and, when the system is fired, releases its entire electrical charge to the system flashlamp. With this technology, it takes some time for the discharge to reach maximum, and then it falls off again before finishing completely (rising, falling slope). These pumping power differentials result in a change in the spectral output of the flashlamp over the time of the pulse, with light emitted at the beginning and end of the pulse towards the red/infrared end of the spectrum, and more towards the shorter blue part of the spectrum in the centre of the pulse where the discharge is at its peak, referred to as ‘spectral jitter’. In photoepilation, the prime waveband for targeting hairs is from visible green (approximately 510 nm) through visible yellow and red into the near infrared (approximately 1,110 nm). This provides a mixture of selective photothermolysis of the melanin in the hair and epidermis invaginating the hair follicle in the visible part of the epidermal layer, particularly the green-yellow component and deeper penetrating red portion of the spectrum, and nonselective heating of the entire hair and adnexa by the deepest-penetrating near infrared component of the beam (Figure 3). Spectral jitter in free-discharge IPL systems indicates that the spectral output comprises the optimum waveband only at the beginning and end of the pulse, with inappropriate shorter blue wavelengths in the centre of the pulse. These have to be filtered out using a set of cut-off filters, thus reducing the available energy throughout the pulse. To compensate for this, higher energies need to be used to achieve the optimum thermal effect in the hair bulb, shaft and follicle.

The system used in the present study uses a proprietary partial-discharge technology, in which a very high value capacitor, typically twice the capacitance of a free-discharge system, is fully charged at the beginning of the treatment session, only partially discharged for each ‘shot’ and then recharged between shots. This allows a recharge time, and a repetition rate comparable with typical free-discharge systems. In addition, a microprocessor-based control circuit ensures stable ‘pumping’ of the twin flash lamps used in this system, which eliminates spectral jitter and the inappropriate shorter blue waveband so that a single dichroic reflectance filter can be used, thus
maximizing the energy delivered over the constant ideal spectral output of around 530 nm to 1,100 nm. Figure 4 illustrates schematically the difference in the spatial and temporal characteristics of a free discharge and partial discharge pulse, whereby it can be seen that a consistent ‘top hat’ pulse can be achieved with less energy using the partial discharge technology than the almost Gaussian form of the free-discharge pulse, with wasted energy in inappropriate wavelengths which need to be filtered out.

Almost all IPL systems use a single flashlamp. Limiting the maximum treatment window to a narrow, long rectangle, such as 1 cm x 4.5 cm, giving a treatment area of 4.5 cm², but with an unavoidable ‘hot spot’ running down the longitudinal axis of the treatment window due to the plasma discharge of the single flashlamp. The system in the present study uses a double flashlamp, enabling the treatment window to be a much wider rectangle giving a treatment area of 8.9 cm² per shot. This not only increases the area of skin that can be covered, but because of the scattering and interference characteristics of a larger spot size, allows much deeper forward scattering into tissue than the same energy level from a smaller treatment area⁴.

Those subjects whose pre-study epilation method was by conventional razor between regrowth tended to have the greatest improvement with IPL treatment, and those who used wax tended to have shorter improvement times, since hair regrowth is slower after waxing versus shaving.

An explanation for the observations in Table 4, that some subjects had “severe” pain at the time of the first treatment session but not at subsequent sessions when the same treatment parameters were used may have been because the subjects that experienced severe pain had darker, thicker hair at the start of the study and the resulting high absorption of light energy at the time of the IPL pulse was translated into a greater amount of heat energy and therefore pain symptoms. The trend towards less pain sensation between first and final treatment (Figure 2) is supportive of the observation that treatment progressively decreases the thickness and density of hair regrowth. The greater the efficacy of treatment, the less pain is likely to be detected.

Of the 52 patients in the three centres, 44 were very satisfied by the final session, giving a satisfaction rate of 84.6%. The ratio of very satisfied to somewhat satisfied for the individual centres was, in descending order of efficacy, 12:0 for the Italian centre, 8:2 for the Spanish centre, and 3:2 for the Norwegian centre. The low satisfaction ratio in the Norwegian centre was seen in
spite of a comparatively high number of treatment sessions given (average of 4.1 sessions/subject and no subject had only one or two treatments) and an average improvement in hair regrowth of just over 11 days. This could be accounted for by the higher number of subjects with lighter and finer calibre hair, which did not respond to the IPL treatment as well as darker and coarser hair. Perhaps because the use of waxing as well as shaving of axillary hair was identified as being a common practice amongst the subjects recruited in the Spanish center, there was a poorer improvement in regrowth rates. Therefore it may be wise to indicate that in such cases more treatment sessions (at least at the beginning of a course of treatment) may be required to adapt the regrowth rate to within more natural limits. The improvement in hair regrowth rates in descending order, was 17.67 days for the Italian centre, 11.44 days for the Norwegian centre and 11.07 days for the Spanish centre, resulting in a shorter improvement time for hair regrowth when comparing waxing to IPL treatment.

However, such comparison between centres is skewed by the study design, which is a recognized limitation to this study. First of all, groups were not matched by age, skin type and hair colour and calibre. Second, subjects were allowed to return for treatments up to a maximum of five times, and because this was an official study, did not pay for their treatments. It would have been better, in retrospect, to have given all patients the same number of treatments regardless of the results. Third, it would have been preferable to have followed up all the subjects for longer than the maximum of four weeks after their final treatment, as there may well have been subjects who had longer than four weeks between the final treatment and the reappearance of hair.

Conclusions

Despite the limitations listed above, there was a satisfyingly high percentage of the subjects who were very satisfied, compared with 8 of the 52 who were somewhat satisfied. No subject expressed dissatisfaction, and there were no persistent adverse effects following axillary epilation with the constant spectrum IPL system despite the absence of aggressive epidermal cooling. The results suggest that partial discharge technology allows safe and effective epilation of the axilla in skin types I to IV, in all colours of hair and in all calibres with reasonably long periods between treatment and the reappearance of hair, though it tended to be more effective in darker skin types with dark and coarse hair. The application of multiple treatments appeared to extend the hair-free period, but will have to be applied on a case-by-case basis. More controlled demographically matched studies are warranted to confirm the good results of the present study.
Acknowledgement

The clinical and laboratory subject matter of this paper is registered in the activities of the FUNDACION ANTONI DE GIMBERNAT (2005/2006) whose grant helped support these investigations. Cyden Ltd, Swansea, Wales, UK provided the iPulse™ IPL devices used in this study. None of the authors have any financial interest in Cyden Ltd.
References


Figures

Figure 1:
a) The number of treatments required broken down by patient numbers.  b) Satisfaction rates for patients who had only 1 treatment and satisfaction rates for all others who had 2 or more treatments comparing the rates after the first session with those after the final session.  VS = very satisfied; S = somewhat satisfied; NS = dissatisfied.

Figure 2:
Comparison among patient assessments of pain, itching and postinflammatory hyperpigmentation (PIH) between the first and final treatment sessions.

Figure 3:
Photospectrogram of white light transmission through a human hand (in vivo) illustrating relative wavelength penetration. Based on Reference (6).

Figure 4:
Schematic illustration of the difference in the spatial and temporal characteristics of a free discharge and partial discharge pulse.

Figure 5:
Patient A – Untreated axilla serving as conventional treatment control, one month after shaving at the initiation of the study to observe extent of hair regrowth.

Figure 6:
Patient A - Photoepilation results using the iPulse i200 (35 ms pulse, 16 J/cm², 8.9 cm² treatment area per pulse, three passes per session) one month after a single treatment.

Figure 7:
Patient B - Hair regrowth at second assessment (Italian Centre), non treated axilla.

Figure 8:
Patient B - Hair regrowth at second assessment (Italian Centre), treated axilla.
Figure 9:
Patient C - Hair growth Final assessment (Italian centre), non treated axilla.

Figure 10:
Patient C - Hair growth Final assessment (Italian centre), treated axilla.
Table 1: Patient demographics, hair attributes and treatment results, Spanish centre (n = 20)

<table>
<thead>
<tr>
<th>Pat No.</th>
<th>Age</th>
<th>Skin type</th>
<th>Hair colour</th>
<th>Hair calibre</th>
<th>Prior treatment method(s)</th>
<th>Pre-study Epilation Frequency</th>
<th>Return of hair Pre-Tx (days)</th>
<th>No of Tx. needed</th>
<th>Return of hair Post-Tx (days)</th>
<th>Patient satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>W, ES</td>
<td>1 / 7 days</td>
<td>7</td>
<td>2</td>
<td>23</td>
<td>VS</td>
</tr>
<tr>
<td>2</td>
<td>45</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>W</td>
<td>1 / 20 days</td>
<td>10</td>
<td>3</td>
<td>22</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>34</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>S</td>
<td>1 / 10 days</td>
<td>7</td>
<td>1</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>4</td>
<td>44</td>
<td>II</td>
<td>LBr</td>
<td>C</td>
<td>Cr</td>
<td>1 / 10 days</td>
<td>2-3</td>
<td>1</td>
<td>21</td>
<td>VS</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>III</td>
<td>Br</td>
<td>C</td>
<td>W</td>
<td>1 / 30 days</td>
<td>14-15</td>
<td>2</td>
<td>22</td>
<td>VS</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>W</td>
<td>1 / 7 days</td>
<td>6-7</td>
<td>1</td>
<td>21</td>
<td>VS</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>W</td>
<td>1 / 20 days</td>
<td>10</td>
<td>1</td>
<td>24</td>
<td>VS</td>
</tr>
<tr>
<td>8</td>
<td>26</td>
<td>II</td>
<td>Bl</td>
<td>F</td>
<td>W</td>
<td>1 / 30 days</td>
<td>20</td>
<td>3</td>
<td>21</td>
<td>S</td>
</tr>
<tr>
<td>9</td>
<td>47</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>S</td>
<td>2 / 7 days</td>
<td>2-3</td>
<td>3</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>III</td>
<td>LBr</td>
<td>M</td>
<td>W</td>
<td>1 / 30 days</td>
<td>15</td>
<td>3</td>
<td>20</td>
<td>S</td>
</tr>
<tr>
<td>11</td>
<td>23</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>S</td>
<td>1 / 30 days</td>
<td>5-6</td>
<td>2</td>
<td>18</td>
<td>VS</td>
</tr>
<tr>
<td>12</td>
<td>25</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>W</td>
<td>1 / 15 days</td>
<td>7-8</td>
<td>5</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>13</td>
<td>29</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>W</td>
<td>1 / 20 days</td>
<td>15</td>
<td>2</td>
<td>18</td>
<td>S</td>
</tr>
<tr>
<td>14</td>
<td>25</td>
<td>III</td>
<td>LBr</td>
<td>M</td>
<td>W</td>
<td>1 / 30 days</td>
<td>15</td>
<td>5</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>15</td>
<td>35</td>
<td>III</td>
<td>LBr</td>
<td>M</td>
<td>Cr</td>
<td>1 / 4 days</td>
<td>2-3</td>
<td>1</td>
<td>15</td>
<td>VS</td>
</tr>
<tr>
<td>16</td>
<td>28</td>
<td>III</td>
<td>LBr</td>
<td>M</td>
<td>W</td>
<td>1 / 30 days</td>
<td>15</td>
<td>4</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>17</td>
<td>34</td>
<td>III</td>
<td>LBr</td>
<td>C</td>
<td>S</td>
<td>1 / 2 days</td>
<td>1</td>
<td>5</td>
<td>18</td>
<td>VS</td>
</tr>
<tr>
<td>18</td>
<td>35</td>
<td>III</td>
<td>LBr</td>
<td>C</td>
<td>P</td>
<td>1 / 14 days</td>
<td>8</td>
<td>1</td>
<td>14</td>
<td>VS</td>
</tr>
<tr>
<td>19</td>
<td>27</td>
<td>II</td>
<td>Bl</td>
<td>C</td>
<td>S</td>
<td>1 / 10 days</td>
<td>6-7</td>
<td>5</td>
<td>21</td>
<td>VS</td>
</tr>
<tr>
<td>20</td>
<td>29</td>
<td>II</td>
<td>LBr</td>
<td>C</td>
<td>----</td>
<td>------</td>
<td>-------</td>
<td>2</td>
<td>21</td>
<td>VS</td>
</tr>
</tbody>
</table>

Key to hair attributes

**Hair colour:** Bl = Blonde; LBr = Light brown; DBr = Dark brown; B = Black

**Hair calibre:** F = Fine; M = Medium; C = Coarse

**Prior treatment(s) used:** W = Wax (W); B = Bleaching; P = Plucking; S = Shaving; Et = Electrolysis;

ES = Electric shaver; Cr = Depilating cream
Table 2: Patient demographics hair attributes and treatment results, Norwegian centre (n = 10)

<table>
<thead>
<tr>
<th>Pat No.</th>
<th>Age</th>
<th>Skin type</th>
<th>Hair colour</th>
<th>Hair calibre</th>
<th>Prior treatment method(s)</th>
<th>Pre-study Epilation Frequency</th>
<th>Return of hair Pre-Tx (days)</th>
<th>No of Tx. needed</th>
<th>Return of hair Post-Tx (days)</th>
<th>Patient satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>II</td>
<td>Bl</td>
<td>F</td>
<td>W</td>
<td>1 / 3 weeks</td>
<td>10</td>
<td>4</td>
<td>16</td>
<td>S</td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>II</td>
<td>Bl</td>
<td>F</td>
<td>S</td>
<td>1 / 3 days</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>III</td>
<td>LBr</td>
<td>M</td>
<td>ES</td>
<td>1 / 20 days</td>
<td>15</td>
<td>4</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>4</td>
<td>38</td>
<td>II</td>
<td>LBr</td>
<td>F</td>
<td>W</td>
<td>1 / 2 weeks</td>
<td>9</td>
<td>5</td>
<td>16</td>
<td>VS</td>
</tr>
<tr>
<td>5</td>
<td>32</td>
<td>II</td>
<td>Bl</td>
<td>F</td>
<td>P</td>
<td>1 / 4 weeks</td>
<td>18</td>
<td>4</td>
<td>21</td>
<td>S</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>S</td>
<td>2 / 1 week</td>
<td>2</td>
<td>4</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>7</td>
<td>28</td>
<td>II</td>
<td>LBr</td>
<td>M</td>
<td>P</td>
<td>Daily</td>
<td>1</td>
<td>5</td>
<td>21</td>
<td>VS</td>
</tr>
<tr>
<td>8</td>
<td>34</td>
<td>III</td>
<td>LBr</td>
<td>F</td>
<td>P</td>
<td>1 / 3 days</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>S</td>
</tr>
<tr>
<td>9</td>
<td>51</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>4</td>
<td>21</td>
<td>VS</td>
</tr>
<tr>
<td>10</td>
<td>47</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>S</td>
<td>2 / 7 days</td>
<td>2-3</td>
<td>3</td>
<td>21</td>
<td>VS</td>
</tr>
</tbody>
</table>

Key to hair attributes

- **Hair colour:** Bl = Blonde; LBr = Light brown; DBr = Dark brown; B = Black
- **Hair calibre:** F = Fine; M = Medium; C = Coarse
- **Prior treatment(s) used:** W = Wax (W); B = Bleaching; P = Plucking; S = Shaving; Et = Electrolysis; ES = Electric shaver; Cr = Depilating cream

E-mail: jclt@skinandlasers.com URL: http://mc.manuscriptcentral.com/mclt
Table 3: Patient demographics hair attributes and treatment results, Italian centre (n = 12)

<table>
<thead>
<tr>
<th>Pat No.</th>
<th>Age</th>
<th>Skin type</th>
<th>Hair colour</th>
<th>Hair calibre</th>
<th>Prior treatment method(s)</th>
<th>Pre-study Epilation Frequency</th>
<th>Return of hair Pre-Tx (days)</th>
<th>No of Tx. needed</th>
<th>Return of hair Post-Tx (days)</th>
<th>Patient satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>29</td>
<td>I</td>
<td>LBr</td>
<td>F</td>
<td>S+P</td>
<td>1/week</td>
<td>7</td>
<td>5</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>III</td>
<td>B</td>
<td>M</td>
<td>S</td>
<td>3/week</td>
<td>2</td>
<td>3</td>
<td>18</td>
<td>VS</td>
</tr>
<tr>
<td>3</td>
<td>38</td>
<td>II</td>
<td>DBr</td>
<td>M</td>
<td>W</td>
<td>1/month</td>
<td>20</td>
<td>4</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>4</td>
<td>38</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>W</td>
<td>1/month</td>
<td>6</td>
<td>5</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>5</td>
<td>54</td>
<td>IV</td>
<td>LBr</td>
<td>C</td>
<td>P</td>
<td>3/week</td>
<td>1</td>
<td>3</td>
<td>14</td>
<td>VS</td>
</tr>
<tr>
<td>6</td>
<td>35</td>
<td>II</td>
<td>DBr</td>
<td>M</td>
<td>S</td>
<td>1/week</td>
<td>7</td>
<td>3</td>
<td>24</td>
<td>VS</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
<td>II</td>
<td>DBr</td>
<td>M</td>
<td>S</td>
<td>1/week</td>
<td>5</td>
<td>4</td>
<td>27</td>
<td>VS</td>
</tr>
<tr>
<td>8</td>
<td>42</td>
<td>III</td>
<td>DBr</td>
<td>C</td>
<td>ES</td>
<td>3/week</td>
<td>1</td>
<td>3</td>
<td>22</td>
<td>VS</td>
</tr>
<tr>
<td>9</td>
<td>48</td>
<td>II</td>
<td>DBr</td>
<td>M</td>
<td>W</td>
<td>1/month</td>
<td>16</td>
<td>2</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>10</td>
<td>40</td>
<td>III</td>
<td>DBr</td>
<td>M</td>
<td>S</td>
<td>1/week</td>
<td>7</td>
<td>3</td>
<td>28</td>
<td>VS</td>
</tr>
<tr>
<td>11</td>
<td>50</td>
<td>II</td>
<td>B</td>
<td>M</td>
<td>ES</td>
<td>1-2/week</td>
<td>3</td>
<td>3</td>
<td>26</td>
<td>VS</td>
</tr>
<tr>
<td>12</td>
<td>43</td>
<td>II</td>
<td>LBr</td>
<td>M</td>
<td>S/W</td>
<td>1/week</td>
<td>5</td>
<td>4</td>
<td>22</td>
<td>VS</td>
</tr>
</tbody>
</table>

Key to hair attributes

- **Hair colour:** Bl = Blonde; LBr = Light brown; DBr = Dark brown; B = Black
- **Hair calibre:** F = Fine; M = Medium; C = Coarse
- **Prior treatment(s) used:** W = Wax; B = Bleaching; P = Plucking; S = Shaving; Et = Electrolysis; ES = Electric shaver; Cr = Depilating cream
Table 4: Patient assessment of side effects after the first and final treatment session (n=52)

<table>
<thead>
<tr>
<th>Item</th>
<th>Severe</th>
<th>Moderate</th>
<th>Mild</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First</td>
<td>Final</td>
<td>First</td>
<td>Final</td>
</tr>
<tr>
<td>Pain</td>
<td>7</td>
<td>1</td>
<td>32</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Itching</td>
<td>1</td>
<td>0</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>7</td>
<td>28</td>
<td>43</td>
</tr>
<tr>
<td>PIH</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>2</td>
<td>41</td>
<td>50</td>
</tr>
</tbody>
</table>

PIH: postinflammatory hyperpigmentation
Figure 1: a) The number of treatments required broken down by patient numbers. b) Satisfaction rates for patients who had only 1 treatment and satisfaction rates for all others who had 2 or more treatments comparing the rates after the first session with those after the final session. VS = very satisfied; S = somewhat satisfied; NS = dissatisfied.
Figure 2: Comparison among patient assessments of pain, itching and postinflammatory hyperpigmentation (PIH) between the first and final treatment sessions.
Figure 3: Photospectrogram of white light transmission through a human hand (in vivo) illustrating relative wavelength penetration. Based on Reference (6).
Figure 4: Schematic illustration of the difference in the spatial and temporal characteristics of a free discharge and partial discharge pulse.
Figure 5: Patient A - Untreated axilla serving as conventional treatment control, one month after shaving at initiation of the study to observe extent of hair regrowth.
Figure 6: Patient A - Photoepilation results using the iPulse i200 (35 ms pulse, 16 J/cm², 8.9 cm² treatment area per pulse, three passes per session) one month after a single treatment.
Figure 7: Patient B - Hair regrowth at second assessment (Italian Centre), non treated axilla.
Figure 8: Patient B - Hair regrowth at second assessment (Italian Centre), treated axilla.
Figure 9: Patient C - Hair growth Final assessment (Italian centre), non treated axilla.
Figure 10: Patient C - Hair growth Final assessment (Italian centre), treated axilla.