

INTRODUCTION

Intense Pulsed Light (IPL) is a conventional technology for hair reduction. Effective permanent hair reduction treatments with IPL necessitates working with high energies. Applying high energies activates pain receptors in the skin and sharp and acute pain sensation follows.

For over 5 years we have applied analgesic creams (EMLA) to reduce the pain associated with permanent hair removal. However, we have applied the cream only over small areas, due to the risks associated with analgesic creams when applied to large areas. Patients suffered and treatment speed was considerably reduced.

The current article presents a 10 month summary of the utilization of a novel Pneumatic Skin Flattening (PSF) chamber (Serenity, Inolase/Candela) which naturally reduces the transmission of pain to the brain during otherwise painful skin procedures. So far we have treated 148 patients with the PSF.

PNEUMATIC SKIN FLATTENING OPERATING PRINCIPLES

Pneumatic skin flattening utilizes an evacuation chamber located at the distal end of the treatment IPL (see figure 1). The evacuation chamber is covered by a flat Sapphire window through which the IPL treatment light is delivered (see figure 2). High vacuum which is automatically generated on the surface of the skin once the handpiece contacts the skin, elevates the skin and generates a very tight flattening of the skin against the window. The skin flattening induces sensation of suction on tactile and pressure receptors in the skin, resulting in afferent inhibition of pain transmission in the dorsal horn (figure 3 - the "gate control theory of pain transmission"). According to the gate control theory of pain transmission (3, 4, 5), nerve impulses from pain receptors and their sensory fibers (slower and thinner A-delta or C fibers) arrive to synapses in the spinal cord in their way to the brain. Larger diameter and faster myelinated sensory neurons (A-beta fibers) carrying vacuum sensation and tactile information from the surrounding skin site activate secondary neurons which secrete endogenous opioids into the pain synapse, thus suppressing the flow of pain information up to the brain.

The pneumatic skin flattening also expulses blood from the IPL treatment beam pathway inside the skin. Skin becomes more transparent which may enhance treatment efficacy. Blood expulsion also reduces skin heating and post treatment erythema which are produced by absorption of light by hemoglobin which is an unwanted competing chromophore.

MATERIAL AND METHODS

Patients: 148 patients were treated with two IPL hair removal devices (First 100 patients with the Quantum IPL (Lumenis, Israel) and the last 48 patients with the LumenisOne IPL (Lumenis, Israel). Total study period was one year, and a total of 276 treatment sessions. Most patients had skin types II or III. Axillas, legs, arms, bikini lines and backs were treated.

IPL Devices: Both Quantum (Lumenis) and Lumenis IPL Devices were used. The Quantum IPL head size was 8 x 35mm, and the LumenisOne IPL head size was 16 x 35mm. Energy density levels were averaged at 36 J/cm² (double pulse 2 x 5 millisecond) with the Quantum IPL and 20 J/cm² (triple pulse, 3 x 3, 5 millisecond) with the LumenisOne (without PSF). Energy density was increased by 5% in most patients with the application of PSF (energy densities of 38 J/cm² with the Quantum IPL and 21 J/cm² with the LumenisOne IPL).

PSF Operation: The PSF handpiece used had a Sapphire window, 29 x 57mm size. A vacuum of 600 torrs (500mBar) was applied for 1.6 sec per IPL Pulse. A thin layer of standard lubricating fluid was applied on the skin before treatment. The gel enables for better sealing and fast gliding on the skin with the vacuum chamber.

We have utilized both a two-handed and a single-handed operation configurations. Following a short learning curve, treatment rates with both configurations were faster than normal non PSF treatments (No need to stop because of pain).

Measured Parameters: Intra-subject treatment pain rating was performed by comparing PSF to Non-PSF treated areas pain rating. In addition, patient satisfaction, treatment speed, comfort of patients as well as comfort of operation were evaluated.

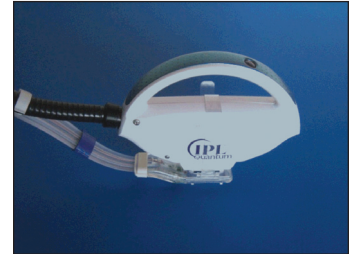


Figure 1: A PSF assembly for a single hand operation of a "Quantum" IPL.

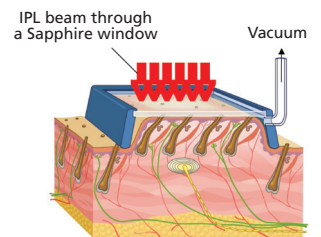


Figure 2: Schematic presentation of a Pneumatic Skin Flattening chamber. The IPL is placed above the sapphire window. Vacuum expels blood from the beam pathway and blocks pain transmission to the brain.



Figure 3: PSF renders skin more transparent.

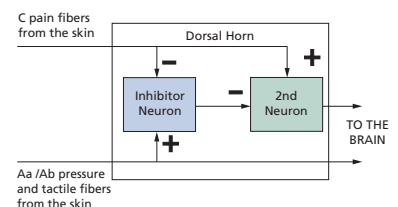


Figure 4: Operating principles of the "gate control theory of pain transmission".

HAIR REMOVAL WITH PNEUMATIC SKIN FLATTENING (PSF) AND IPL: 148 PATIENTS EXPERIENCE

RESULTS AND CONCLUSIONS

The conclusions and observations, based on 1 year experience and 148 patients are:

- a) All patients currently insist to be treated with PSF – patients do not agree to be treated without PSF because of the PSF pain alleviation properties
- b) Treatment speed is increased due to reduced pain
- c) Treatment efficacy is either preserved (85%) or improved (15%)
- d) Side effects such as erythema and scabs are reduced
- e) The PSF enhanced our hair removal capabilities. We are able to better utilize our IPL systems (+5% energy).

REFERENCES

1. Sadick NS; Weiss RA; Shea CR; Nagel H; Nicholson J; Prieto VG. "Long-term photoepilation using a broad-spectrum Intense Pulsed Light source". Arch Dermatol 2000 Nov; 136(11): 1336-40.
2. Lask G, Friedman D, Elman M, Fournier N, Shavit R, Slatkine M. "Pneumatic skin flattening (PSF): a novel technology for marked pain reduction in hair removal with high energy density lasers and IPLs". J Cosmet Laser Ther. 2006 June; 8(2):76-81.
3. Wall PD, Melzack R, "On nature of cutaneous sensory mechanisms", Brain, 85:331, 1962.
4. Melzack R, Wall PD, "Pain mechanisms: A new theory", Science, 150:171-9, 1965.
5. Kapit, W., Macey, R.I., Meisami, I., "The physiology coloring book", Harper Collins, Publishers, 1987, p. 88.

Candela Corporation
530 Boston Post Road
Wayland, MA 01778 USA
Phone: (508) 358-7637
Fax: (508) 358-5569
Toll Free: (800) 821-2013
www.candelalaser.com

