

## Diode Laser Induced Selective Photothermolysis for the Hair Reduction

**S.S.Arsad**

Dept. of Physics, Shri Shivaji Science College, Amravati-444606, Maharashtra, India

### Abstract

We used the pulsed diode laser emitting 20 msec pulses at 800nm wavelength having peak power of 1600 W for removing the hairs from frontal human face

The energy density of the pulse used for removing the hairs is about  $30 \text{ J/cm}^2$ . The size of the laser beam utilised is  $9\text{mm}^2$ . At least six and maximum nine treatment sessions are needed (In an average about six to eight sessions are essential) for permanent hair reduction<sup>1</sup>. In an average 750 pulses are used per patient per laser treatment corresponding to 20.8 KJ energy. The number of hairs exponentially reduced as a function of session (A gap of 1 month is essential between two consecutive sessions for allowing the possible erythema to heal) We utilised the diode laser for removing hairs of 30 patients. In majority cases the hairs are either completely reduced or became thinner and rarer. This method has found very less side effects.<sup>7</sup>

**KEYWORDS:** treatment sessions, erythema

**Introduction:** The hairs on the human body play a significant role in deciding the personality and general appearance. On some spots the hairs add to the beauty and some places they make humans look ugly or cruel. Many times it becomes essential to remove and reduce the hairs to check the ugliness. Laser induced photothermolysis is one of the effective ways to remove and reduce the hairs from the human body surface<sup>2,3</sup>

In the present work we succeeded in removing hairs from the facial portion specifically from the chin and upper lip of 30 female and third gender patients. Average six months duration was required to remove hairs significantly. It was also observed that all the patients show long term hair reduction<sup>4,5</sup>

**Experimental Description:** It has been observed from several cases that the anaesthesia is not required. The head piece of the laser is covered with sapphire window chill tip<sup>6</sup>

Before the use sapphire tip of laser was thoroughly cleaned with chemicals and sanitised completely. While removing hairs headpiece was kept in close contact normally with the skin as the chill tip keeps the skin cold and protects it from damage and brings out the hair follicles (hair shaft) for efficient treatment over the skin. The diode laser pulse was made incident on the hairs and the intermittently pressed then laser pulse were effectively delivered.

The energy density of fluence of about  $30\text{J/cm}^2$  corresponding to 20 msec corresponding to laser pulse energy of 3.2 J. When focussed on the face and irradiated on the target area of the beam is about  $9\text{mm}^2$ . After the laser treatments hairs were significantly reduced. Average 650 to 1000 pulses were used per patient per laser session corresponding to 20.8KJ to 32KJ energy. The lowest fluence was used as  $16\text{J/cm}^2$  and the maximum fluence was  $36\text{J/cm}^2$

**Result and Discussion:** When the laser beam was incident on the skin of patients, few of them showed a kind of swelling (which proved to be purely temporarily) In case of few patients after few days of consecutive sessions, few hairs reappeared. After careful observations it is found that the hairs whose hair follicles are removed do not reappeared. After careful observations it is found that the hairs whose follicles are removed, didn't reappear but the hairs whose shaft or upper part i.e. hairs entering from telogen to anagen phase (hair growth phase) is removed by laser may reappear. For removal of the remaining hairs few more sessions are essential. We used maximum eight sessions for some of the 30 patients. The number of hairs were measured with computerised scanning method and compared with the manual method. The digital photograph clearly shows that after each session the number of hairs were reduced exponentially.

**Conclusion:** The irradiation of 800nm diode laser pulse remove the hairs and numbers of hairs were reduced considerably. After the exposures to the laser the skin of patients does not show degradation. The skin of few patients shows temporarily recoverable swelling. The hair reduction shows exponential behaviour.

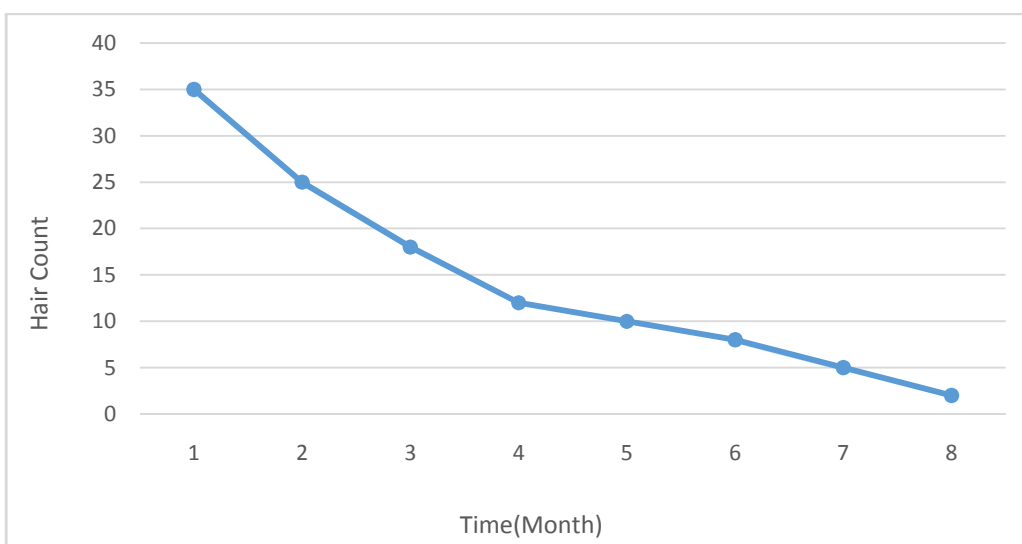


Fig : Time vs Hair Count

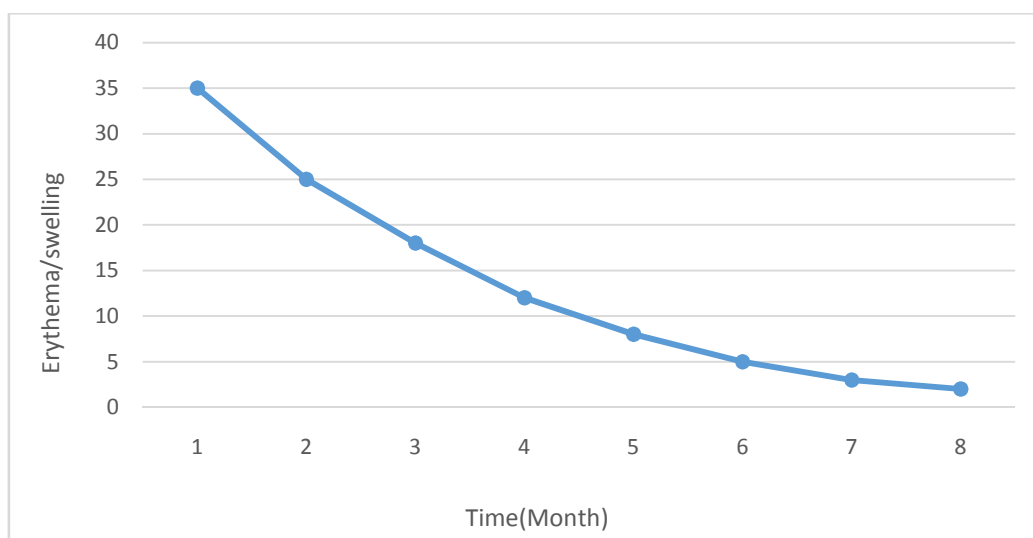


Fig : Time vs erythema/swelling

The absorption spectra of the melanin and the competing chromosphere water and oxyhaemoglobin shows that the ruby laser wavelength would be more effective having relatively lesser side effects. The ruby laser set up is comparatively costly and the system becomes bulky also the ruby laser is not suitable to treat the dark skin due to epidermal- melanin interference. If the pulsed width of the diode laser is reduced further, the effectiveness of the hair removal may be improved. If the hair detector is used along with the control system then hair may be found reduced in less sessions<sup>6,7</sup>.

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