

Selective Photo thermolysis Induced by Solid State Diode Laser for Permanent Hair Reduction

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ABSTRACT

We used pulsed laser emitting 20 msec pulses at 800 nm wavelength having peak power 1600 W (Frequency=2Hz) for removing the hairs from the human face. The energy density of the pulse used for removing hair is about 30 J/cm². The size of the laser beam utilized was about 9mm². About six or more sessions are essential for reducing the number of hairs. ¹ In an average 650 to 950 pulses were used per patient per laser treatment session corresponding to 20.8 to 30.4 kJ energy. The number of hairs exponentially decreased as a function of sessions. (A gap of about 1-month is essential between two consecutive sessions for allowing the possible wounds to heal.) We utilize the diode laser for removing the hairs of about 300 patients. It is observed in many cases that the hair are either completely reduced or the hair become thinner. The method has very less side effect. ¹⁰

I. INTRODUCTION

The hair of the human body plays very important role in deciding the personality and appearance. At some places presence of hair adds the beauty and at some places the presence of hair is unwanted. It may cause human face to look ugly or cruel. It is essential to remove the hairs from the human body where they add to cruelty and ugliness. Particularly the hairs for example on the chin of a female are cosmetically disfiguring the face value. Laser induced photothermolysis is one of the effective way to remove and reduce the hair from the body surface. ^{3,4}

In the present work we remove the hair from the different portions of face specifically over chin and upper lip of the 200 female patients. Average six sessions was required for the removal of hairs⁵ and it is

observed that all patients show long term hairs reduction. ^{2,8}

II. EXPERIMENTAL SETUP

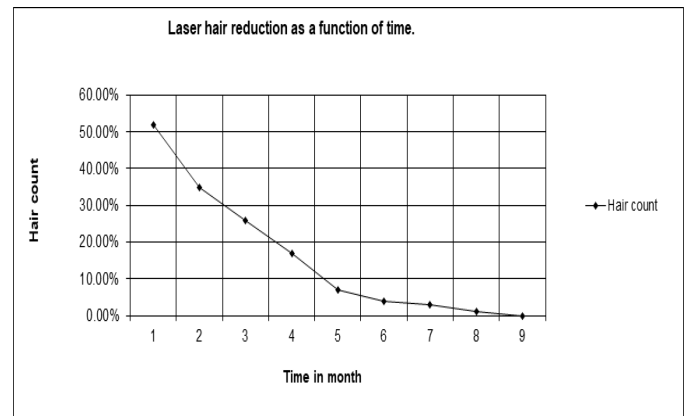
It has been observed from several cases that the anesthesia is not required in this type of hair reduction. ⁶ the headpiece of the laser is covered with sapphire window chill tip. Before use the sapphire tip of laser was perfectly cleaned with alcohol. While removing hairs headpiece was kept in close contact perpendicular with the skin as the chill tip keeps the skin cold and protects it from damage and brings out the hair follicles or shafts for efficient treatment above the skin. The diode laser pulse was made incident on the hairs and the hairs were removed by evaporation. The foot switch was continuously and intermittently pressed and laser pulses were delivered. The laser pulse peak

power is of the order of 1600 W and pulse width is about 20 msec corresponding to pulse energy of each pulse was 3.2 J and average energy density or fluence of about 30 J/cm². When focused and irradiated on the target the size of the laser beam was about 9 mm². After the laser treatment the hairs were completely reduced. In an average 650 to 950 pulses were used per patient per laser session corresponding to 20.8 kJ to 30.4 kJ energy. The lowest fluence used was 16 J/cm² and the maximum fluence used was 36 J/cm².

III. RESULTS AND DISCUSSION

When the laser beam is made incident on the skin, the skin of few patients shows a kind of swelling (which was purely temporary). In case of few patients after few days of laser sessions some hairs reappeared. After careful observation it is found that the hairs whose follicles are removed do not reappear but the hairs whose shaft or upper part i.e. hair entering from telogen to anagen phase is removed by laser may reappear. For removal of the remaining hairs few more sessions are essential.

We used about six sessions for all patients. It was observed that in case of all the patients almost all the hairs were reduced after six sessions. The number of reappearing hairs were measured with manual method and with digital photographs after each session and it is found that the number of hairs reduced exponentially. Depending upon the type of hairs, sex, age of patient (hirsutism in case of female patient), hair density, portion or site of body part and hair treatment session number hair reduction vary from patient to patient.



IV. CONCLUSION

The irradiation of 800 nm diode laser pulses removes the hairs and number of hairs were reduced considerably.⁷ After the exposures to the laser the skin of patients does not show degradation. The skin of few patients showed temporary recoverable swelling. The hair reduction using pulsed diode laser exhibits the exponential behavior. The absorption spectra of the melanin and the competing chromophores water and oxyhemoglobin shows that the ruby laser wavelength would be more effective having relatively less side effects in hairs removal.⁸ But the ruby laser setup is relatively costly and system is bulky also the ruby laser is not well suited for treating dark skin types due to epidermal melanin interference. If the pulse width of the diode laser is reduced further, the effectiveness of the hair removal may be improved. If the hair detector was used along with the control system the hair would be reduced in one or two sessions.^{9,11}

V. REFERENCES

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