

The Possible Limitation of the Intra-Operative PDT Dosimetry: On Wounds Healing, Following Tumor Resection

Farouk A H Al Watban*

Laser Medical Applications, and Specialty Photodynamic Therapy (PDT), World Academy for Laser Applications, Saudi Arabia

Keywords: Photo dynamic therapy; Low power laser therapy; Photo-bio modulation; HPD; Wound healing; Tumors; Photo sensitizer; Stimulation; Inhibition

Short Communication

In the past three decades, laser research in Saudi Arabia had provided methodical findings for the advancement of laser application in medicine. At low power emission, lasers incite photochemical effects, which diverge into two inevitable therapeutic phenomena Photo Dynamic Therapy (PDT) and Low Power Laser Therapy (LPLT). The term PDT refers to the combined use of a Photo Sensitizer (PS) (Dye) plus Laser to treat and diagnose malignant cells. In the doses usually used for treatments, the dye alone or the laser alone has no effect. PDT, a laser treatment for cancer, involves light and PS, (i.e. a light-sensitive drug, for instance – Hemato Porphyrin Derivative (HPD), Photofrin, and 5-Aminolevulinic Acid etc.) for the selective destruction of Neoplastic cells. Rigorous PDT studies in our laboratory are ongoing since 1985 aiming to determine the most suitable laser wavelength and PS, in thyroid tumor using nude mice as animal models. Previously we have established the Clonogenic Survival Rates, and tumor growths following PDT as a function of tumor volume for RIF-1 (murine fibro sarcoma) in C3H mice. We were able to completely eradicate small tumors (i.e. tumor volume < 50 mm³), and decrease the growth rates of larger tumors by executing superficial PDT followed by interstitial PDT. Thus, unlike ionizing radiation, PDT may be repeated if necessary without yielding cumulative toxicity [1-4]. The high laser doses required for the presents widely used dye {Photofrin @ I and II (HPD)}, may result, as our recent experiments show, in inhibiting Wound Healing of up to 8%. Where if the PDT laser dose decreased it could stimulate acceleration of wound healing up to 30%. Where the Incident dose for PDT with Photofrin of 80 J/cm² give zero bio activation for wound healing. With regard to LPLT, we study its effects on wounds and burns in Sprague-Dawley rats. We noticed healing acceleration, zero-bio activation, and inhibition that depended on the wavelength, dose and treatment schedule, but not on dose rate and laser-skin transmission. We further observed that LPLT had higher wound healing acceleration than Light Emitting Diode (LED), or pharmaceutical treatments. We found 29% healing acceleration with HeNe (632.8 nm) laser at 5 J/cm² (human dose) 40 J/cm² (animal dose), applied three times a week. 42% of the animals had better cosmesis. When wound healing was impaired by diabetes, LPLT accelerated healing by +8.6% relative to diabetic controls (-42%) [5-8]. This support the suggestion of using other dyes (new PS, developed to overcome some of other problems, like unacceptable prolongation of the procedure if large area treated and poor absorption of light By HPD). Since then several classes of PS were developed. The main classes are: porphyrin derivatives, Chlorins, Phthalocyanines and Porphycenes etc., Must have the properties of high absorption of laser, and deep tissue penetrations. Also these dyes should use a simulative laser dose for the wound healing, as the PDT optimum dose when combined with surgery, beside its efficacy for selectively destroying malignant tissue. The laser incident dose For PDT suggested from our experiments is up to 40 J/cm² to give also wound healing acceleration in the animal, (which should converted

to human), and up to 140 J/cm² for deceleration in the animal. We advocate the Intraoperative Photo Dynamic Therapy (IPDT). Initially, surgical lasers excise/ablate visible tumors sealing the lymph vessels in the process thereby preventing further metastasis. Highly selective PDT follows removing microscopic residual cancer cells that remain after the surgery. Finally, LPLT is applied to accelerate healing of postoperative normal wounds (and /or Diabetic wounds). In time, medical lasers shall supersede some conventional therapies simply because of being overwhelmingly effective in various clinical applications.

References

1. FAH Al Watban, G King, R Brannon, T Altamero (1987) Photodynamic Therapy: Optimal Treatment Parameters in Murine Fibrosarcoma. *Lasers in Medical Science* 2: 55-62.
2. FAH Al Watban (1990) PDT Tumor Volume Limitation and Tumor Response for Murine Fibrosarcoma. *Lasers in Surgery and Medicine* 10: 165-172.
3. FAH Al Watban (1990) Variations in Biological Activities of HPD in Comparison to Other Dosimetric Parameters. *Lasers in Life Science* 3: 155-166.
4. FAH Al Watban (2005) Photodynamic Therapy of Human Undifferentiated Thyroid Carcinoma Bearing Nude Mice Using Topical 5-Aminolevulinic Acid, *Journal of Photomedicine and Laser Surgery* 23: 206-211.
5. FAH Al Watban, BL Andres (2001) Wound Healing Efficacy of HeNe Laser (632.8nm) and Pharmacological Treatments in Normal Rats. *Journal of Lasers in the Life Sciences* 9: 245-254.
6. FAH Al Watban, Zhang X Y (2004) The Comparison of Effects Between Pulsed and CW Lasers on Wound Healing, *Journal of Clinical Laser Medicine & Surgery* 22: 15-18.
7. FAH Al Watban, Xing Yang, Zhang, Bernard L Andres (2007) Low Level Laser Therapy Enhances Wound Healing in Diabetic Rats Comparing Different Lasers. *Journal of Photomedicine and Laser Surgery* 25: 72-77.
8. FAH Al Watban, BL Andres (2013) Laser Biomodulation of Normal and Neoplastic Cells. *Lasers in Medical Science* 27: 1039-1043.

***Corresponding author:** Farouk AH Al Watban, Principal Scientist, Laser Medical Applications, & Specialty Photodynamic Therapy (PDT), World Academy for Laser Applications, P O Box 3354, Riyadh 11211, Saudi Arabia, Tel: 966505229122; E-mail: Watban@hotmail.com

Received January 08, 2015; Accepted July 13, 2015; Published July 20, 2015

Citation: Al Watban FAH (2015) The Possible Limitation of the Intra-Operative PDT Dosimetry: On Wounds Healing, Following Tumor Resection. *Adv Tech Biol Med* 3: 126. doi: [10.4172/2379-1764.1000126](https://doi.org/10.4172/2379-1764.1000126)

Copyright: © 2015 Al Watban FAH. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.