Bangladesh Med Res Counc Bull 2020; 46:64-65 DOI: https://doi.org/10.3329/bmrcb.v46i1.47472

Letter to the Editor

Technological Advancements to Reduce the Influence of Absorption and Scattering on the Optical Imaging

Zahra AT

Laser Physics-College of Science for Women, Babylon University, Iraq

Dear Editor,

Especially with the status of the technological advancements, it endures impossible to detach all absorbers and scatter sequence events within a diffuse, inhomogeneous environment. However, calculation methods have been sophisticated that try to appreciate the perturbation give rise to optical tissue properties and develop the image by partly correcting for these properties.[1,2]

An fluorescence imaging system has been advanced that implements such a correction scheme for light intensity variation in tissues.[3-4] Improved precision was shown within phantoms and post-mortem tissues, independently of the optical property variation in tissues.[5] At a 5-fold alteration of absorption variation within the fluorescent lesions, quantification errors were miniature from 25.0% in uncorrected images to 8.0% using the correction scheme.[6]

A latter new technology being investigated in this field is Fluorescence Differential Path-Length Spectroscopy (FDPS), which determines the fluorophore concentration based on the fluorescence intensity corrected for absorption that has the potential to furnish the real-time information on the photosensitiser pharmacokinetics, vascular physiology, and photosensitizer photobleaching.etc based on the dosimetry of tumours that is receiving Photodynamic Therapy (PDT).[7-8]

FDPS facilitates quantitative concentration measurements can harmonize large variations in background absorption utilizing a simple correction algorithm. This makes it especially valuable for photosensitizer fluorescence spectroscopy in-vivo, during PDT, when the background of the absorption may change dramatically.[9-10]

Another feature of FDPS is that the collection volume may be regulate to match the relevant dimensions of the implementation.[11-12].

**Correspondence: AL-Timimi Zahra, Laser Physics-College of Science for Women, Babylon University, Iraq; e-mail: dr.altimimizahra@gmail.com, zahraja2007@yahoo.com*

For fluorescence measurements of photosensitizers, it is stringent to selectively interrogate a relevant tissue volume to avert averaging photosensitiser concentrations over a volume that is either deeper or shallower than the purposed sampling volume.[2-13]

It is remarkable that while FDPS remains dependant on the scattering coefficient of tissue, that is predictable to have a relatively small influence on the signals collected particularly in tissues of the same type.[14-15]

However, presently this method can only be conducted using fibres optics measurements at a single point. An imaging version and following intraoperative applications have not been developed yet.

References

1. Zahra Al Timimi, Jaafar M, Zubir Mat Jafri M. Photodynamic therapy and Green Laser blood Therapy. Glob J Med Res. 2011;11:22–8. url:www.isla-laser.org/wp-content/uploads/5-Photodynamic-therapy-and-Green-Laser-blood-Therapy.pdf.
2. Zahra A-T. A Comparative Study of Determination the Spectral Characteristics of Serum Total Protein Among Laser System and Spectrophotometric: Advantage and Limitation of Suggested Methods. Curr Anal Chem. 2018; 14:1–8. DOI:10.2174/1573411014666180531092053.
3. Zahara AT. Letter to the editor clinical evaluation of scalpel Er: YAG laser 2940 nm and conventional surgery incisions wound after oral soft tissue biopsy. Bangladesh Med Res Counc Bull. 2017;43:149. DOI:10.3329/bmrcb.v43i3.36429.
4. Li C, Yang Y, Mitchell GS, Cherry SR. Simultaneous PET and Multispectral 3-Dimensional Fluorescence Optical Tomography Imaging System. J Nucl Med. 2011;52:1268–75. DOI:10.2967/jnumed.110.082859.
5. Waters JC. Accuracy and precision in quantitative fluorescence microscopy. J Cell Biol. 2009;185:1135–48. doi:10.1083/jcb.200903097.
6. Al Timimi Z, Saleem Ismail Alhabeel M. Laser Dental Treatment Techniques. In: Dr. Sivapatham Sundaresan, editor. Oral Cancer. IntechOpen; 2019. p. 1–16. DOI:10.5772/intechopen.80029.

7. Zahra A-TT. Exploration of Additional Mechanical Phenomena of Laser-Tissue Interaction Contributes to the Damage and Elimination of the Small Blood Vessels. Int J Sci Eng Res. 2014;5:672–75. url:www.ijser.org/onlineResearchPaperViewer.aspx?Exploration-of-Additional-Mechanical-Phenomena-of-Laser-Tissue.pdf.

8. Zahra'a A-T, Zahra ' A-T. Assessment of the impacts of 830 nm Low Power Laser on Triiodothyronine (T3), Thyroxine (T4) and the Thyroid Stimulating Hormone (TSH) in the Rabbits. J Med Sci Clin Res. 2014;2:2902–10. url:jmscr.igmpublication.org/home/index.php/archive/133-volume-02-issue-11-november-2014-in-process#13-2-abstract.

9. Renaud R, Martin C, Gurden H, Pain F. Multispectral reflectance imaging of brain activation in rodents: methodological study of the differential path length estimations and first in vivo recordings in the rat olfactory bulb. J Biomed Opt. 2012;17:016012. DOI:10.1117/1.JBO.17.1.016012.

10. Amelink A, Kruijt B, Robinson DJ, Sterenborg HJCM. Quantitative fluorescence spectroscopy in turbid media using fluorescence differential path length spectroscopy. J Biomed Opt. 2010;13:054051. DOI:10.1117/1.2992132.

11. AL-TimimiZahra a. Biological Effects of Yellow Laser-Induced of Cell Survival: Structural DNA Damage Comparison is Undergoing Ultraviolet Radiation Photocoagulation. Int J Eng Res Gen Sci. 2014;2:544–48. DOI:10.1.1.650.4677.

12. Amelink A, Sterenborg HJCM, Bard MPL, Burgers S a. In vivo measurement of the local optical properties of tissue by use of differential path-length spectroscopy. Opt Lett. 2004;29:1087–89.

13. Houssein HAA, Jaafar MS, Ali Z, Baharum A. Correlations between lymphocytes, mid-cell fractions and granulocytes with human blood characteristics using lowpower carbon dioxide laser radiation. Mod Appl Sci. 2012;6:27–33.

14. Talukdar T, Moore JH, Diamond SG. Continuous correction of differential path length factor in near-infrared spectroscopy. J Biomed Opt. 2013;18:56001. DOI:10.1117/1.JBO.18.5.056001.

15. Zahra'a A-T. Assessment of the impacts of 830 nm Low Power Laser on Triiodothyronine (T3), Thyroxine (T4) and the Thyroid Stimulating Hormone (TSH) in the Rabbits. J Med Sci Clin Res. 2014; 2: 2902–10. url:jmscr.igmpublication.org/ home/ index.php/ archive/133-volume-02-issue-11-november-2014-in-process#13-2-abstract.