PROGRAMME OF EVENTS / BOOK OF ABSTRACT

Nigerian Association of Medical Physicists

NAMP 2017

THE CONFERENCE AND WORKSHOP OF THE
NIGERIAN ASSOCIATION OF MEDICAL PHYSICISTS
(CWNAMP 2017)

BOOK OF ABSTRACTS
58 & 59 ON CV

INNOVATIONS AND DEVELOPMENTS IN MEDICAL PHYSICS

Main Conference: 6th - 8th November, 2017

INTERNATIONAL DAY OF MEDICAL PHYSICS

Medical Physics: Providing a Holistic Approach to Women Patients and Women Staff Safety in Radiation Medicine

7TH NOVEMBER, 2017

NATIONAL WORKSHOP ON QUALITY CONTROL OF CT MACHINES
9TH -10TH NOVEMBER, 2017

Venue: National Hospital Abuja, Trauma Building, Hall A

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Computational Magnetic Resonance Spectroscopy using Microsoft Excel Macros

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Magnetic resonance spectroscopy (MRS) is a technique that can be used in preclinical and clinical applications to study cancer metabolism. The improvement of spatial and temporal resolution of spectral data due to advancements in pulse sequence and hardware design has made MRS an interesting modality to be used side by side with clinical magnetic resonance imaging. In recent times, clinical MR scanners now come with routine imaging sequences for 1H-MRS measurements with direct applications in metabolic and functional information combined with contemporary MRI localization. MRS has the ability to detect N-acetylaspartate (NAA) in the normal brain tissue and citrate in the normal prostate, and their levels decrease once the tumor cells start replacing normal cells. MRS detection of total choline signal has been impressive in the diagnosis and monitoring of brain, breast and prostate cancers. It has also been useful in monitoring of patient's response to anticancer therapy. However, MRS has lower sensitivities and requires much longer acquisition times and more complex data processing. In addition to this clinicians are not very much familiar with this technique and thus, limiting the application of MRS in the clinical setting. In order to overcome this problem, we attempt developing a computational program (macros) with Microsoft excel for MRS of tissues with fast data processing.

In this study, we have demonstrated that clinical scientists do not necessarily require the knowledge of advanced mathematics and rigorous signal analysis in order to perform MRS of tissues towards the diagnosis of diseases of the brain. With the computational model presented in this study and the computer program developed, MRS is simply achieved by entering the measured values of T_1 and T_2 relaxation times.

The interesting part of this study is that all that is needed to perform tissue diagnosis is the availability of relaxometric data and Microsoft excel proficiency. This program is easy to use, highly interactive and the data processing is fast and unambiguous. The advantage of this study is that laboratories that are unable to acquire or maintain magnetic resonance equipments can now perform magnetic resonance diagnosis with straightforward computer programs as long as they find ways of obtaining the required relaxation data (T_1 and T_2). MR relaxometers are cheaper and easier to maintain, they could be used to generate these data.

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Keywords: Phantom, Treatment Planning System (TPS), Area Integration, ... Clarkson Integration, Computed Tomography.

Computational MRI Analysis of Liver Cancer Based ... Bloch NMR Flow Equations and Bessel Functions

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Gastrointestinal neoplasms, including those in the pancreas, always involve the liver before metastasizing to other organs. In addition, breast, lung, renal, and ovarian and other common malignancies spread hematogenously, lymphatically or transperitoneally to the liver.

Magnetic resonance imaging (MRI) has proved to be very important in the detection and imaging of liver lesions. However, a standardized MRI imaging method which accommodates most of the observed processes at cellular and sub-cellular level has been very rare. The purpose of this study is to present analytical solutions to the time-independent Bloch NMR flow equation in terms of readily available Bessel algorithm and their properties.

The order of the Bessel functions is found in terms of the relaxation times and the duration of the gradient pulse. The NMR signal obtained in terms of these functions are very easy to control and they act like systems that can be switched on and off with changes in the relaxation times.

We may therefore be able to detect and image processes in liver cancer even with rapidly changing tissue properties and at sub-millimetre formations.

Keywords: Liver lesions, Bloch NMR flow equation, sub-millimetre formations, Bessel functions.