AbstractID: 11945 Title: Quantitative Estimate of in-vivo Metabolites in Breast and Prostate Tissues by MR Spectroscopy

Diagnosis of cancer is challenging despite the availability of large number of biochemical and imaging investigations. Magnetic resonance imaging (MRI) provides morphological details while *in vivo* magnetic resonance spectroscopy (MRS) provides metabolic information at the molecular level thus enabling to study tissue physiology and metabolism. *In vivo* localization can be achieved either using single voxel spectroscopy (SVS) or multi-voxel spectroscopy (known as MR spectroscopic imaging, MRSI or chemical shift imaging, CSI), to detect metabolites that are present in millimolar concentration or less in normal and pathological tissues *in vivo.*

Breast cancer is the most common cancer in women and is a leading cause of death worldwide. MRS of normal breast tissues showed high amount of lipid with little contribution from water while malignant breast tissues contain high water content. The parameters obtained from *in vivo* MRS of breast tissues are water-to-fat (W-F) ratio and the concentration of choline containing compounds (tCho). Recently, *in vivo* quantitative measurement of the concentration of tCho has been reported for differentiation of normal, benign and malignant breast tissues. Two methods are used for quantification of tCho: (a) semi-quantitative way by calculating the signal-to-noise ratio (SNR), and (b) absolute quantitation of tCho concentration using water as an internal and external referencing. Further, both W-F ratio and tCho concentration have been evaluated as markers for assessment of tumor response to therapy.

Prostate cancer is the most common cancer and is the second common cause of cancer related deaths in males. Various MR techniques have been evaluated in prostate cancer diagnosis. MRS of prostate tissues provides relative concentrations of metabolites like citrate (Cit), creatine (Cr), choline (Cho), and polyamines. High levels of Cit are observed in normal prostate tissue and are higher in the peripheral zone (PZ) than in the central gland (CG) and transition zone (TZ). The Cit level is reduced or not detectable in prostate cancer because of a conversion from citrate-producing to citrate-oxidating metabolism. Cho is elevated due to a high phospholipid cell membrane turnover in the proliferating malignant tissue. These changes in Cit and Cho are quantified by using ratios of metabolites like Cit/Cho, [Cit/(Cho+Cr)] or [(Cho+Cr)/Cit]. Few studies have also reported the determination of the absolute concentration of Cit in normal and pathological prostate tissues. This talk would provide details of the various *in vivo* MRS methods used for diagnosis and for monitoring tumor response to therapy in breast and prostate cancer patients including details of the absolute and relative of concentration of *in vivo* metabolites.

Educational Objectives:

1. Understand the basics of *in vivo* MR spectroscopy.
2. Understand the various biochemical parameters obtained from *in vivo* MRS on breast and prostate tissues and their significance.
3. Understand the methods used for quantitation of *in vivo* MRS metabolites.