SUMMARY AND CONCLUSION

Proton Magnetic Resonance Spectroscopy (^{1}H-MRS) is a non invasive technique that measures the biochemical contents of living tissues.

MRS is based on the phenomenon that the nuclei of certain atoms have a magnetic moment and that they interact with magnetic field. These alterations in the magnetic field cause small changes in the resonance frequency which are known as chemical shifts, and these allow distinction to be made between the same nuclei in different chemical environment.

While MR Imaging (MRI) produces a visual image, MRS obtains chemical information that may be expressed as numerical values.

Although the distinction between MRI and MRS has now been blurred by the development of MRS imaging (MRSI), the main drawback of ^{1}H-MRS is difficult interpretation as it provides MR spectra and not images to which radiologists are unfamiliar.

With much technical development and more automated procedures MRSI has the ability to overly spectroscopic data on the conventional MR image and provides metabolic information in an imaging format which can be displayed as a grey-scale or color-coded maps superimposed on the diagnostic image causing easier studies and better results.

^{1}H-MRS is potentially sensitive to metabolic changes that occur before anatomical changes during disease progression and treatment, and it represent a bridge between

imaging and metabolism. It offers methods for early detection of new disease and can evaluate success or failure of therapeutic intervention.

MRS may be obtained with most clinical 1.5-T MR imaging units fitted with commercially available automated software. Adequate MR spectra may be obtained in periods of time as short as 10 minutes. Therefore, MRS studies may be added on to routine MRI without significant time penalties.

^{1}H-MRS is helpful in distinguishing brain abscesses from cystic tumors with similar neuro-imaging appearance, which is very important for determining the treatment strategy. Also it helps in differentiation of radiation necrosis from tumor progression.

^{1}H-MRS is useful in differentiating cystic or necrotic brain tumors from inflammatory cystic masses because various metabolites, including acetate, succinate and/or amino acids other than lactate, are frequently observed in brain abscess and cysticercosis.

Discrimination between amino acid (at 0.9 ppm) and Lipid (at 0.8 to 1.2 ppm) is important, because Lipid signals may exist in both brain tumors and abscesses, whereas amino acids are not seen in vivo ^{1}H-MR spectra of brain tumors, suggesting that amino acids may be considered as markers for brain abscesses.

Typical spectra of brain tumors are characterized by a high choline peak and depressed or non-existent NAA peak.

Lactate may be seen in highly malignant tumors such as glioblastoma multiforms and metastases.

Although lactate is the most common metabolite observed in various intracranial cystic masses, yet elevation of lactate alone and its peak height are of limited value in diagnosis of cystic tumors or in predicting the pathologic grading of a malignant lesion.

The Choline/Creatine ratio was the best MR spectroscopic parameter to demonstrate the grade of malignancy.

^{1}H-MRS may be able to differentiate between recurrent tumor and radiation necrosis, as in recurrent tumors reappearance of high peak of choline is characteristic.

In most cases of radiation necrosis this choline peak is absent or depressed. NAA is depressed as well.

Radiation necrosis shows a broad peak "Death Peak" located between 0 and 2 ppm. This peak is probably a combination of mobile lipids and amino acids from tissue destruction and cellular breakdown.

^{1}H-MRS can help in delineating tumor margins and identifying areas with highest malignancy. ^{1}H-MRS is a method of choice for diagnosis of early proliferative changes in the peritumoral zone which is the most often starting point for post operative recurrence. It is the site where the risk of recurrence is greatest because of the presence of undetectable neoplastic cells by conventional MRI.

^{1}H-MRS may serve as a potential tool to provide useful information of differentiation of ring-like enhanced cystic lesions that can not be diagnosed correctly using enhanced MR image alone.

3D ^{1}H-MRS has proved to be a worthy method in the post therapeutic monitoring, discriminating among recurrent and residual tumors from post treatment changes.

So, ^{1}H-MRS is very useful in diagnosis and follow up of brain tumors, as it can detect early minor changes with great accuracy and has proposed to have unique feature like fingerprint in certain brain tumors.

In conclusion, ^{1}H-MRS plays diagnostic and prognostic role in characterization of cystic lesions of the brain and it will be, in the near future, the modality of choice in complement with MRI.