

MRI of brain tumors - A surgeons view

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Abstract

Introduction and Objective: There has been a steady increase in the incidence of brain lesions both benign and malignant in the past decade as a result of the advances that have taken place in medical imaging technology.

It is also a known fact that the overall malignancy rate has increased in the past decade as a result of various factors. Unlike other areas in the body it should be remembered that the brain tissue is not directly accessible to the exterior, and localization of the lesion is difficult in the three dimension in the brain making the tissue diagnosis difficult

With the increasing use of technology for detections at times when imaging like Computer tomography done for other conditions like vehicular accidents, headache or even at request of the patient, lesions of brain that were asymptomatic come to light

It is the responsibility of the health personnel to see that the correct diagnosis be done and not leave the patient and the care takers to the dilemma of the disease

MR spectroscopy is useful in establishing the diagnosis of by demonstration of elevated choline, a metabolite that is found in the normal brain and raised in tumors due to high cell turnover. We kept all this in mind aimed at evaluating brain lesions comparing MRS with histopathology.

Materials and Methods: The study was a prospective non randomized analytical study conducted on 40 successive cases who met pre-defined criteria who had come to the radiology department of father muller medical college for MRI brain, with clinical suspicion of brain tumour or MRI detected brain tumour.

Results and Observations: In our study we found that abnormal Magnetic resonance regions had consistently lower NAA than in normal-appearing tissue, which is consistent with the theory that NAA is found primarily in neurons, and that tumour and necrotic and reactive tissues all demonstrate an abnormally low neuronal cell density.

Conclusion: We concluded that Magnetic resonance spectroscopy could recognize regions the location and the type of tumor, also help in distinguishing them from normal tissue thus helping in guiding surgical biopsies and planning focal therapies.

Keywords: Magnetic resonance spectroscopy, Central nervous system, Brain tumor.

Introduction

There has been a steady increase in the incidence of brain lesions both benign and malignant in the past decade as a result of the advances that have taken place in medical imaging technology.

It is also a known fact that the overall malignancy rate has increased in the past decade as a result of various factors. Unlike other areas in the body it should be remembered that the brain tissue is not directly accessible to the exterior, and localization of the lesion is difficult in the three dimension in the brain making the tissue diagnosis difficult.

With the increasing use of technology for detections at times when imaging like CT done for other conditions like vehicular accidents, headache or even at request of the patient, lesions of brain that were asymptomatic come to light.

It is the responsibility of the health personnel to see that the correct diagnosis be done and not leave the patient and the care takers to the dilemma of the disease.

In the recent times brain imaging has seen an uprising with advances which have affected all the aspects of neuroscience traditions in terms of general and the management of brain lesions intra-axial brain tumors in particular.

Magnetic resonance spectroscopy has made it possible to evaluate active compounds in the living tissue and to differentiate from malignancy.

Magnetic resonance spectroscopy allows the non-invasive quantification of certain biological compounds in vivo applications. Proton spectroscopy is acknowledged as a harmless and noninvasive analytical mode that, together with magnetic resonance imaging techniques, allows for the association of anatomical and physiological changes in the metabolic and biochemical processes happening within formerly determined volumes in the brain.^{1,2}

Magnetic resonance spectroscopy is useful in diagnosing brain tumors by expression of elevated choline, a metabolite which is raised in brain tumors due to high cell turnover. We kept all this in mind aimed at evaluating brain lesions and the role of Magnetic resonance spectroscopy.

Materials and Methods

The study was a prospective non randomized analytical study conducted on 40 consecutive patients who met a pre-defined criteria who had come to the radiology department of Father Muller Medical College for Magnetic resonance spectroscopy brain, with clinical suspicion of brain tumor or Magnetic resonance

imaging detected brain tumor during a period of eighteen months from march 2016 to February 2018. The study was initiated after obtaining ethical clearance from the institution's ethical clearance committee. The diverse spectra obtained are interpreted and analyzed with the normal spectrum. The data is then analyzed statistically.

Results and Observations

1. In our study we found that abnormal Magnetic resonance regions had consistently lower NAA due to the fact that any abnormal tissue malignant or necrotic will demonstrate an abnormality in the form of reduced neuronal cell density.
2. In our study we found also found that tumor regions had considerably augmented choline.
3. The distribution of intracranial adult tumors infratentorial was more in number.
4. The untreated second and third grade gliomas had higher choline levels than, both treated patients and patients with glioblastoma multiforme tended to have lower choline levels.
5. The sensitivity of detection of brain lesions with histopathological accuracy was 98%.

Discussion

There has been a steady increase in the incidence of brain lesions both benign and malignant in the past decade as a result of the advances that have taken place in medical imaging technology.¹⁻⁵

It is also a known fact that the overall malignancy rate has increased in the past decade as a result of various factors. Unlike other areas in the body it should be remembered that the brain tissue is not directly accessible to the exterior, and localization of the lesion is difficult in the three dimension in the brain making the tissue diagnosis difficult.⁶

With the increasing use of technology for detections at times when imaging like CT done for other conditions like vehicular accidents, headache or even at request of the patient, lesions of brain that were asymptomatic come to light.

It is the responsibility of the health personnel to see that the correct diagnosis be done and not leave the patient and the care takers to the dilemma of the disease.

The distribution of intracranial adult tumors infratentorial was more in number.

According to Osborn AG et al,⁷ slightly larger percentage of intracranial pediatric neoplasms are infratentorial (52%) compared to supratentorial (48%), while, most intracranial adult tumors are supratentorial. The distribution of intracranial adult tumors in our study correlates with Osborn AG et al.⁷

In our study, choline was increased in 100% of tumors. In the study by Poptani H et al,⁸ the choline was increased in all 100% of tumors. In the study by

Hirsch JA et al,⁹ choline was generally increased with increase in Cho/Cr ratio in 70% cases.

In our study, NAA was decreased in 82% of tumors. According to Ott D et al,¹⁰ NAA was decreased in cases of Glioma, meningioma and metastasis. Any process that destroys neurons displays reduction in NAA.

In our study, lipid was increased in 45.5% cases of tumors. In the study done by Krouwer HG et al,¹¹ lipid peak was elevated in 83% of cases.

Conclusion

We concluded that Magnetic resonance spectroscopy could recognize regions the location and the type of tumor, also help in distinguishing them from normal tissue thus helping in guiding surgical biopsies and planning focal therapies. Increased levels of choline and reduced levels of N- acetyl aspartate help distinguishing regions of active cancer from normal and other non-malignant tissue thus helping in guiding surgical biopsies and planning focal therapies.

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