Comparison between MRI And CT-Scan In Diagnosis The Brain Tumor Images

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Abstract

This paper was devoted to study the work and diagnosis of two medical systems, i.e. (MRI &CT-scan). We study about 8 cases to diagnose the brain tumor, some strange kinds of tumors were detected by both the systems. The comparison between the two kinds of images taken by the two systems shows that images taken by MRI are more clear and favorable than CT-scan.

Keywords

MRI, CT-scan, tumor diagnosis

I. INTRODUCTION

After the discovery of x-ray by Roentgen in 1895,it was employed then in designing the first prototype CT-scan (computed tomography) device by the year 1979 and it was referred to be used in the clinical diagnosis by the medical community with most important invention in the radiographic diagnosis [1]. Patients who set pacemakers or other metal devices or have a serious condition preferred CT-scan, thereforeCT-scan still the best way for the patients suffered from Cerebral hemorrhage or calcification or have an assessment of change related with tumor [2]. The other important device for the diagnosis purpose is (MRI) Magnetic Resonance Imaging is a modern method of scan and it is preferred to assess patients who have symptoms refer to any change in the brain or the other parts of the body.The presence of bleeding or calcification and even fat are responsible for the heterogeneous appearance of certain tumors in which the normal brain Gadolinium cannot transmit from the inner blood vessels into the tumor but it accumulates in the outer space of the tumor cell because of the shortness of relaxation time (TI) and that the acceptable equivalent dose of Gadolinium is o.1mmol/kg.Studies indicate that giving a high doses of Gadolinium has improved most tumors inside the skull and this has the effect in treating the tumor area [3-7].The best identification of malignant secondary tumors is determined in the brain by using double or triple doses of gadolinium (Gd) [8].

A study comparing brain tumors with MRI and CT-scan with a biopsy from April 2004 to April 2010 collected the data and analyzed them as follows: (7.2%) benign tumors (92.4%) malignant tumors and found that MRI imaging method easier to access brain cancer Of CT[9].

Computed Tomography is scanning faster than Magnetic Resonance Imaging with a high accuracy of 3D [10].

A further study comparing MRI and CT for the diagnosis of primary glaucoma and lymphoma of the central nervous system (CNS) was performed. Visual imaging was enhanced in MRI and the CT values were quantified. The study concluded that MRI was more accurate in diagnosis than CT-scan for patients with these tumors [11].

II. THEORY

MRI system differs from CT-scan system in which some countries use CT-scan more than MRI, but doctors do not advice with it because the recurrent use of it cause cancer . MRI also has its side effects in which some scientists afraid of mutations causes by MRI and its effect on nuclear acids (DNA) in the human body, and this system cannot be dispensed because of its benefit in diagnosing nervous system. However, with unsafe members or emergency referrals, it is preferable to use CT-scan for its fast [12,13].

In magnetic resonance ,we use Bloch Equations to account nuclear magnetism as a function of time when relaxation time T1, T2 are unknown

$$M= (M_x, M_y, M_z)(1)$$

Bloch presented in 1946 these equations which are usually named as movement equations of the nuclear magnetization, and they are similar for Maxwell-Bloch Equations.

$$\frac{dm\ x\ (t)}{dt} = \gamma\ (M(t)x\ B(t))\text{x-}\ \frac{Mx\ (t)}{T2} \quad (2)$$

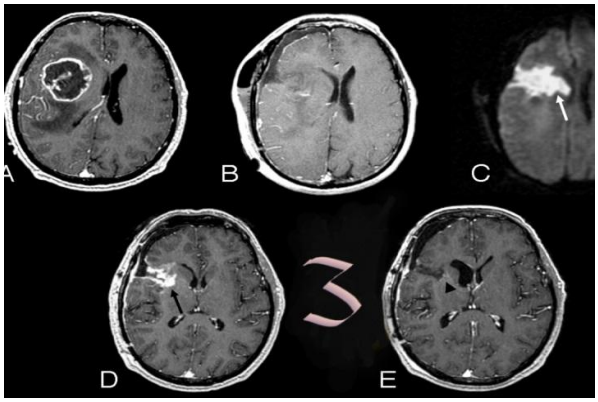
$$\frac{d\ My(t)}{dt} = \gamma\ \left(M(t)x\ B\ (t)\right)y - \frac{My(t)}{T2} (3)$$

$$\frac{d\ Mz(t)}{dt} = \gamma\ (M(t)x\ B(t))z - \frac{Mz(t)-M0}{T1} \quad (4)$$

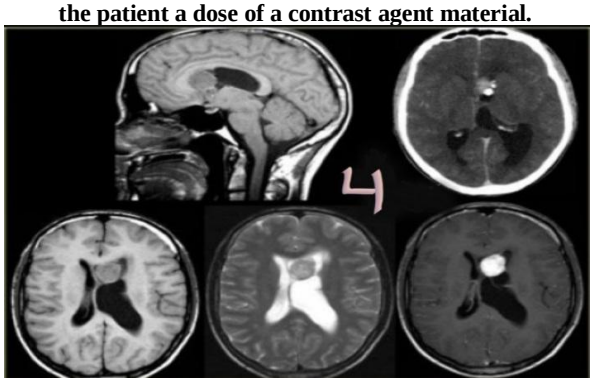
where γ Magnetic Rotation Ration, B(t) the Magnetic Field, M_0 is the steady state nuclear magnetization [14].The MRI technique uses a big magnetic fieldand electromagnetic and radio frequency waves (RF) [15].The first patient was examined after the initial model was installed [EMIL+d] for a CT-scan system at London in Ankiston Morley Hospital in the 1st of October, 1971for a middle-aged woman suffered from a frontal lobe tumor [16]. Iodine contrast factors are divided into ionic contrast factors (high osmolarity) and non-ionic contrast factors (low-osmolarity). The contaminant may cause a sensitivity reaction in the patient and it is divided into early effects and late effects. It is preferred to use the non-ionic contrast factors for it causes few negative effects [17].

III. EXPERIMENTAL

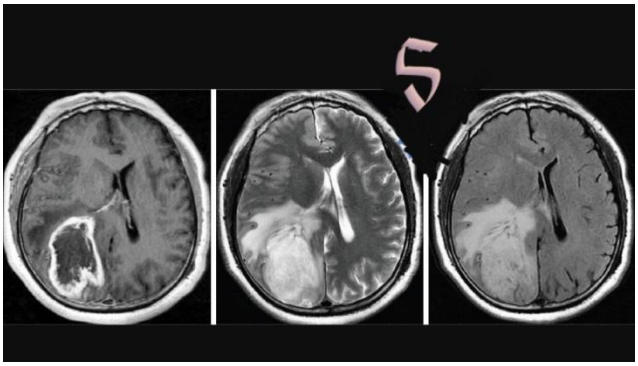
4 samples were taken bythe MRI system to diagnose tumors in different places in the body as it is shown in figures (1,2,3,4)



Fig(1) : Taken from MRI system for the brain after giving the patient a dose of a contrast agent material.



Fig(2) : shows an initial tumor on the left side of the brain.



Fig(3): shows a malignant tumor in the right lobe of the brain surrounded by edema around the tumor.

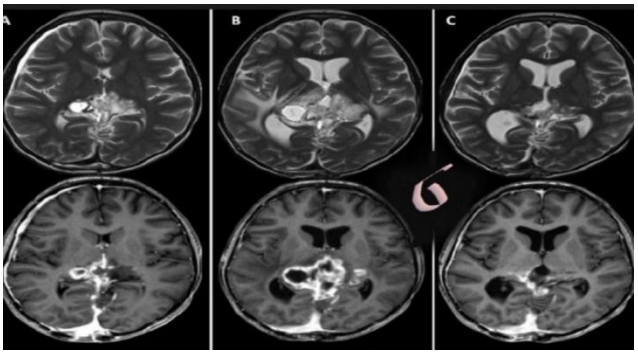
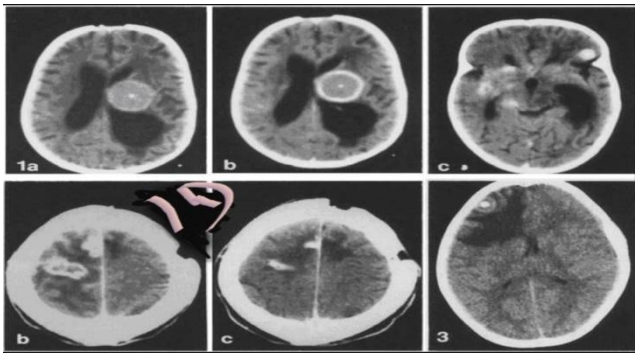


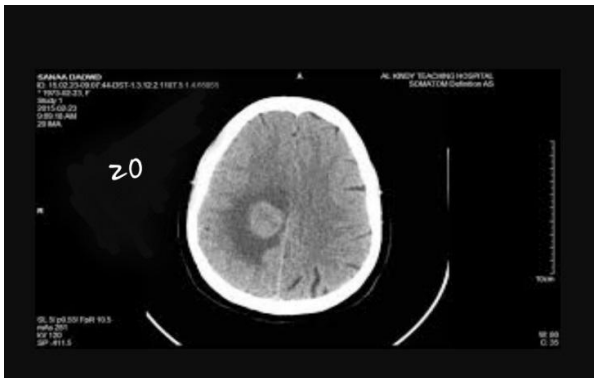
Fig (4): shows the presence of malignant tumor taking the left and right sides of the brain surrounded by edema around the tumor Jessethis type of tumors Glioblastomamultiformi, which is meant Gingival tumor that affects the central nervous system in glial cells in the brain.

B. 4 samples were taken by using images from CT-scan system to diagnose some cases as shows in the figures (5,6,7,8)

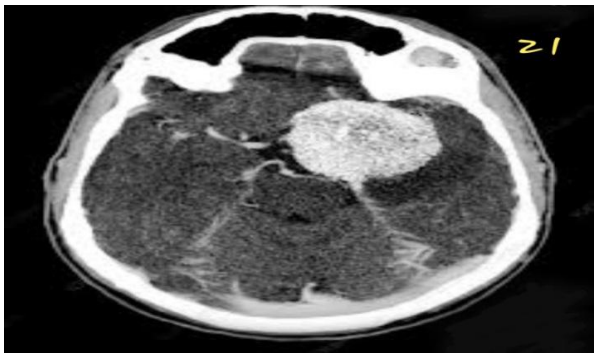


Fig(5) : shows an image taken by CT-scan system after giving the patient a contrast agent.

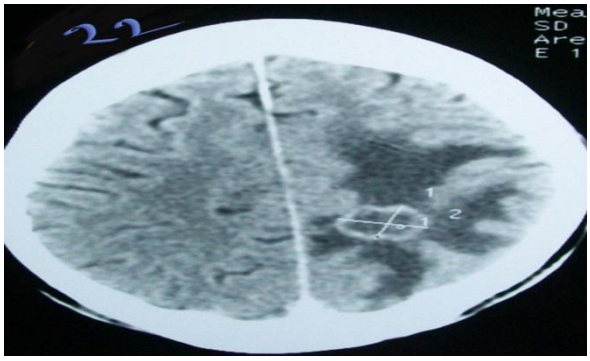
We notice a tumor spread in the right and left side of the brain, causing the clear pressure on the brain and it is considered a kind of the secondary tumors.



Fig(6) :a malignant tumor notice in the right side of the brain surrounded with edema around the tumor.



Fig(7) :a tumor notice in the left side of cerebral membranes of the benign kind called as Meningioma.



Fig(8) :a malignant tumor notice in the left lobe of the brain surrounded with edema.

IV. RESULTS AND DISCUSSION

Doctors prefer magnetic resonance imaging (MRI) for most brain tumors because it shows the more details, behavior and location more
clearly, from the point of view of the size, shape and the kind of the tumor and also if the tumor was surrounded with edema or not.

For the distinguish between examination of MRI and CT-scan system, the late shows the outer bone or the bone, which surroundsthe brain with a light white color whereas MRI does not show it with this clear whiteness.

For a patient with a tumor that is given a contrast agent material, usually in most examining this patient his image will appear Heryclear for the checker or the doctor.

V. CONCLUSIONS

1. We notice that diagnosing with MRI shows the details and the parts of the brain clearly and detecting tumors more accurately hence doctors prefer checking or imagingwith it in all kinds of the brain tumors more than CT-scan as shown in fig (1,2,3,4).
2. Imaging with CT-scan showing the bone clearly with white color and we notice that the external brain wall which is composed of bones appears in the image with white color for the checking as shown in fig (5).
3. MRI is better than CT-scan in clarifying the white material from the gray one in diagnosing the disease,as shown in fig (1,2,3,4).
4. The purpose of giving the patient the contrast agent is to determine the real size of the tumor and to discover if there's a tumor or not in the place need to be checked and to know the behavior the nature of the tumor as shown in fig(1,2,3,4,5,6,7,8).
5. The tumor color after giving the contrast agent is white, so as the blood vessels and mesothelioma as shown in fig (1,2,3,4,5,6,7,8).
6. When imaging tumors with the two systems, the patient should be given the contrast agent because the tumor takes the material more than the other natural tissues, i.e., appears clearly so as the doctor can distinguish the tumor easilyas shown in fig (1,2,3,4,5,6,7,8).
7. After giving the contrast agent, it will appear what is medically called (Edema). Edema is a pool of fluid surrounding the tumor shows us that the tumor is often maligned and the more was the

edema bigger we find the tumor more hostile as shown in fig (3,7,8).

8. In determining the tumor, we consider the brain as a mirror; the right side in front us represents the left side, and the left side of the brain represents the right side, i.e., the image is mirrored to us as shown in fig(1,2,3,4,5,6,7,8).
9. The difference between the primary and secondary tumor is , the primary tumor represent the initial tumor (the mother) whereas the secondary tumor represent forests and propagations of the tumor which stems from the primary tumor as shown in fig(5).
10. Meningioma is variety of tumors that are formed in the meninges layer represent a group of membranes surrounding the central nervous system arises from a spider cells in the spider veins in the meninges layer, sometimes forming benign tumors anda few of them are malignant. We notice that these tumors are often formed in brain membranes, i.e., in the brain sides as shown in fig (7).
11. Glioblastomamultiformi, this tumor is called the mercurial tumor, and it is the most dangerous tumor in the central nervous system inthe brain's glial cells, and it is a general name for atrocities of the cells as shown in fig (4).

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