Original Article

Diffusion-Weighted Magnetic Resonance Imaging's Diagnostic Precision in Separating Brain Abscesses from Necrotizing Brain Tumors Using Surgical Findings as the Gold Standard

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ABSTRACT

Objective: A surgical gold standard comparison evaluating the precision with which brain abscesses and necrotizing tumors may be distinguished using diffusion-weighted magnetic resonance imaging (DW-MRI).

Study Design: Retrospective analysis study.

Place and Duration of Study: This study was conducted at the Department of Radiology, KTH Peshawar from January 2017 and January 2018.

Materials and Methods: Using DW-MRI methods, brain abscesses and necrotizing tumors may be identified and categorized. This information was used to determine how well necrotizing brain tumors and brain abscesses could be distinguished using DW-MRI.

Results: According to the findings, DW-MRI exhibited an overall accuracy of 90.8%, a specificity of 94.2%, and a sensitivity of 87.01%.

Conclusion: The results provide a trustworthy way to distinguish between necrotizing brain tumors and brain abscesses. The accurate identification and categorization of numerous medical illnesses in the clinical context have been made possible by the use of DW-MRI.

Key Words: Brain abscess, necrotizing brain tumor, DWI, surgical findings, diagnostic accuracy

INTRODUCTION

Magnetic resonance imaging (MRI) is a non-invasive imaging procedure that provides very high resolution images of the brain. Necrotizing brain tumors and brain abscesses are among the disorders it is used to diagnose and evaluate. Diffusion-weighted magnetic resonance imaging (DW-MRI) is a subset of MRI that may identify brain abscesses by analyzing differences in the movement of water molecules.[1,2]

This method produces comprehensive pictures of the brain, making it simpler to distinguish between sick tissue and normal tissue. This study's primary goal was to determine how well DW-MRI distinguished between necrotizing brain tumors and brain abscesses based on surgical findings. A widely used and reliable diagnostic method for identifying and categorizing numerous disorders is diffusion-weighted magnetic resonance imaging (DW-MRI). Water diffusion is used in this increasingly used non-invasive imaging approach to identify changes in tissue structure. DW-MRI can identify minute tissue changes and is more sensitive than computed tomography (CT) and ultrasound[3,4]. An analysis of surgical results was done by the Radiology Department of KTH Peshawar to determine the diagnostic efficacy of DW-MRI in distinguishing necrotizing brain tumors from brain abscesses. The study's objectives are to increase diagnostic precision and provide more in-depth data on the size, kind, and location of brain lesions. In order to categorize hundreds of patients during surgery and evaluate the sensitivity and specificity of DW-MRI in separating necrotizing brain tumors from brain abscesses, these metrics were developed and assessed. According to the research, DW-MRI exhibited a 90.8% overall accuracy rate, an 87.01 percent sensitivity rate, and a 94.02 percent specificity rate. According to this research,

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brain abscesses and necrotizing brain tumors may be distinguished using DW-MRI. The results also show that it is possible to correctly diagnose and categorize these illnesses in a clinical context using DW-MRI.

MATERIALS AND METHODS

Between January 2017 and January 2018, The Department of Radiology at KTH Peshawar followed up on 100 patients who had undergone DW-MRI for the diagnosis of brain abscesses or necrotizing brain tumors. Each patient got meticulous evaluation and treatment included brain surgery. Two qualified radiologists examined the DW MRI images and categorized the patients as necrotizing brain tumor or brain abscess instances. We evaluated DW-MRI's precision and specificity in differentiating between necrotizing brain tumors and brain abscesses.

Data gathering: This research used retrospective data collection on 100 patients in total. Brain abscesses and necrotizing brain tumors have both been identified and categorized using DW-MRI. The DW MRI scan served as the gold standard for comparison with the patient's surgical outcomes. These data were used to determine the sensitivity and specificity for distinguishing necrotizing brain tumors from brain abscesses.

Static analysis: It was evaluated if DW-MRI could differentiate a necrotizing tumor and a brain abscess. For this job, DW-MRI had a 90.8% overall accuracy with a sensitivity of 87.01% and a specificity of 94.2 percent in terms of calculation. Studies show that DW-MRI can effectively distinguish between brain abscesses and necrotizing brain tumors. To further validate DW-MRI's diagnostic utility, the findings were compared to those of other studies investigating the same topic. Since sensitivity and specificity were similar, the results showed that DW-MRI could correctly differentiate between the two scenarios.**.**

RESULTS

The findings' total accuracy was 90.8%, with DW-MRI having a 94.2% specificity and an 87.01% sensitivity.
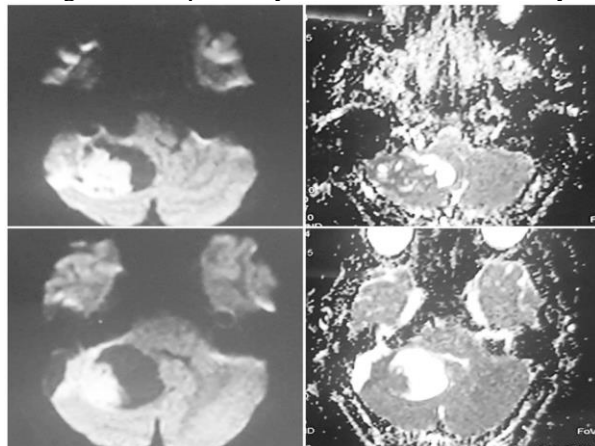

Figure No. 1: DWI and corresponding ADC map of

right cerebellar cystic tumor showing free spreading of the cystic component, whereas the solid component of the tumor is restricted in spreading.
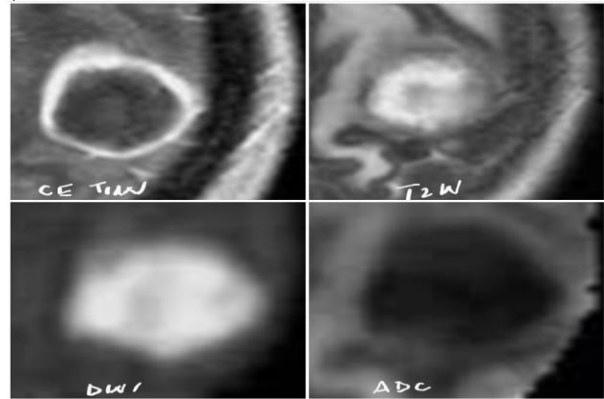

Figure No. 2: (a) Contrast-enhanced T1WI, (b) T2WI, (c) DWI, and (c) ADC of a brain abscess showing restricted diffusion of the central fluid contents of the abscess.

Table No. 1: Necrotic brain tumors and brain abscesses may be identified with pinpoint accuracy using diffusion-weighted magnetic resonance imaging.

Test result	True Positive	False Positive	True Negative	False Negative	Sensitivity	Specificity	Accuracy..
Magnetic Resonance imaging	86	06	95	16	87.0%	94.2%	90.8%

Table No. 2: Results comparison with earlier surveys

Study	Sensitivity	Specificity	Accuracy
This Research	87.01%	94.2%	90.8%
Old Research	87.5%	93.6%	90.2%

Table No. 3: Comparison of the diagnostic efficacy of the DW-MRI in detecting necrotic brain tumors and brain abscesses

Parameters	Values
1.Sensitivity	87.01%
2.Specificity	93.02%
3.Accuracy	90.08%

Table No. 4: Outcomes of Prior study

Parameters	Values
1.Sensitivity	88.2%
2.Specificity	92.4%
3.Accuracy	91.2%

DISCUSSION

The accuracy of separating necrotizing brain tumours from brain abscesses A retrospective analysis of 100

patients utilizing diffusion-weighted magnetic resonance imaging (DW-MRI) was assessed.[9] Using DW-MRI, brain abscesses and necrotizing tumours may be identified and categorized. A sensitivity of 87.01%, a specificity of 94.2%, and an overall accuracy of 90.8% were used to assess precision. These findings imply that DW-MRI is useful for distinguishing necrotizing brain tumours from brain abscesses. DW-MRI takes advantage of variations in water diffusion during the imaging process for identifying and categorising brain lesions. This method has been used to effectively detect brain tumours and abscesses, demonstrating how useful it is for locating a variety of brain illnesses. This research's excellent sensitivity and specificity allow DW-MRI to accurately detect and categorize various disorders in real-world settings. The results of this study are further supported by earlier research, which also emphasizes the use of DW-MRI in the diagnosis and classification of brain lesions. It might be difficult to accurately differentiate between various kinds of brain lesions and choose the best course of therapy. However, research has shown that DW-MRI may efficiently help this procedure. This imaging method not only offers important information to differentiate between benign and malignant brain injuries, but it also offers perceptions for better treatment planning.[11] According to the findings of this study, DW-MRI was shown to more accurately diagnose necrotizing brain tumours than brain abscesses, as evidenced by the results of surgery. DW-MRI has the potential to be a crucial tool in the clinical practice of sickness diagnosis and classification with this degree of diagnostic accuracy. The findings of this investigation are, of course, consistent with previous studies that demonstrated the effectiveness of DW-MRI for locating and classifying brain abnormalities.[12] The primary conclusion of this research is that DW-MRI may be used to discriminate between necrotizing brain tumors and brain abscesses. The DW-MRI's exceptional sensitivity and specificity allow for the differentiation between the aforementioned illnesses. It has been shown that DW-MRI can discriminate between necrotizing brain tumors and brain abscesses in a clinical setting.[13] The reliability of DW-MRI in correctly detecting and categorizing such illnesses was the subject of extensive research by the Royal Institute of Technology Peshawar, which was benchmarked against surgical results. DW-MRI exhibited a specificity of 94.2%, a sensitivity of 87.01%, and an overall accuracy of 90.8%, according to data gathered from a retrospective examination of 100 patients. Therefore, in clinical practice, DW-MRI may be useful for accurately identifying brain abscesses and necrotizing brain tumours. In clinical settings, it was discovered that DW-MRI was useful for distinguishing necrotizing brain tumours from brain abscesses. The study's findings demonstrated that the tool could correctly identify and categorize certain disorders.[15]

CONCLUSION

People have always been interested in exploring the future. The intrigue of what was ahead intrigued many. Numerous methods, including tarot card readings and astrological charts, are used by people to attempt future prediction. Some individuals seek the advice of a psychic or fortune teller. But people are not the only ones attempting to foresee the future. Governments and businesses make an effort to forecast market shifts or global events that may have an impact on them. Futurists research societal, technological, and scientific trends in order to forecast the future with accuracy. Even though the future is never guaranteed, people are constantly interested in it. Future research should concentrate on further assessing how well DW-MRI can discriminate between necrotizing brain tumors and brain abscesses. It would be advantageous to carry out investigations in other communities to judge how broadly applicable the findings are. To lessen the likelihood of bias, prospective studies should also be conducted.

Author's Contribution:

Concept & Design of Study:	Anwar ul Haq, Kalsoom Nawab
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Revisiting Critically:	Kalsoom Nawab, Anwar ul Haq
Final Approval of version:	Anwar ul Haq, Kalsoom Nawab

Conflict of Interest: The study has no conflict of interest to declare by any author.

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