Trends in Oncology Vol 6 Issue 1 2024

Original Research Article

Open Access

Omniscient Pte.Ltd.

Analysis of the Application Value of Magnetic Resonance Imaging in the Diagnosis of Intracranial Tumors

Ling Li, Yan-Zhi Kang, Yu-Xin Zhao, Sheng-Hong Cui, Ming-Jiong Wei*

***Correspondence to:** Ming-Jiong Wei,The Second People's Hospital of Shaanxi Province, Xi'an, Shaanxi 710005, China,E-mail:183072703@qq.com

Abstract:Objective: To analyze the application effectiveness of magnetic resonance imaging (MRI) in the diagnosis of intracranial tumors. **Methods:** A study was conducted on 60 patients with intracranial tumors in our hospital from January 2023 to January 2024. All patients underwent both CT scans (included in the control group) and MRI scans (included in the observation group), and the diagnostic efficacy of the two groups was compared. **Results:** The pathological diagnosis results showed that 63.33% of the tumors were supratentorial and 36.67% were infratentorial. Among them, there were 9 cases of mixed glioblastoma, 4 cases of ependymoma, 7 cases of pleomorphic glioblastoma, 8 cases of astrocytoma, 9 cases of meningioma, 12 cases of pineal gland tumor, and 11 cases of medulloblastoma. The diagnostic accuracy rates of the observation group for supratentorial, infratentorial, and total tumors were significantly higher than those of the control group ($P < 0.05$). **Conclusion:** The application of MRI technology in clinical examination can significantly improve the diagnostic efficacy, detect supratentorial and infratentorial tumors, and has promotional value.

Keywords: Magnetic resonance imaging; Intracranial tumor; Diagnosis; Supratentorial; Infratentorial

Intracranial tumors have a high incidence rate, and the location of lesions varies, leading to differences in patient signs and symptoms, commonly including nausea, vomiting visual impairment, dizziness, and headaches, with some experiencing cognitive changes, often non-specific, accompanied by personality changes. After patients become ill, they may experience nerve and vascular compression, affecting multiple functional aspects, including emotions, language, and movement, which should be detected early. Imaging examinations, including MRI and CT scans, are commonly used, with CT having a wide range of applications and effective disease detection capabilities, although it is affected by many factors. MRI has a higher soft tissue resolution, does not involve ionizing radiation, can provide multi-directional imaging, and has a higher signal-to-noise ratio. This study focuses on patients with intracranial tumors to analyze the application effectiveness of MRI scans.

1. Materials and Methods

1.1 General Information

A study was conducted on 60 patients with intracranial tumors in our hospital from January 2023 to January 2024. Among the 60 patients, there were 33 males and

27 females, with ages ranging from 18 to 68 years old and an average age of (40.74±4.23) years. The main symptoms included headaches[3], nausea, and vomiting. All 60 patients were confirmed by surgical pathology; patients with severe organ diseases, communication disorders, cognitive disorders, and secondary intracranial tumors were excluded.

1.2 Methods

1.2.1 Control Group

CT Examination: Spiral CT scanner (GELOGIQE9, from Shanghai Qiwei Industrial) was used. Iohexol was selected as the contrast agent at a dose of 300 mg/mL. The head was examined by first performing plain scans in the transverse plane, followed by enhanced scanning.

1.2.2 Observation Group

MRI Examination: MRI scanner (MAGNETOM Symphony, from Siemens) was used. Gadopentetate dimeglumine injection was selected as the contrast agent at a dose of 469.01 mg/mL. The patient's head was scanned to obtain coronal, sagittal, and transverse images. Layer thickness parameters were adjusted within the range of 5-10 mm, matrix parameters were set at 256mm×256mm, and spin echo (SE) sequences were used to localize and examine intracranial tumors.

1.3 Observation Items and Indicators

Analysis of pathological diagnosis results: Classified as supratentorial and infratentorial, including mixed glioblastoma, ependymoma, pleomorphic glioblastoma, astrocytoma, meningioma, pineal gland tumor, and medulloblastoma. Evaluation of diagnostic efficacy: Observation of the number of accurate diagnoses in supratentorial, infratentorial, and total cases, with accuracy rates calculated accordingly.[6]

1.4 Statistical Methods

Data were processed using SPSS 27.0. Percentages (%) were used for count data. Chi-square test was applied, with $P < 0.05$ indicating statistical significance.

2. Results

2.1 Analysis of Pathological Diagnosis Results

The pathological diagnosis results showed that 63.33% of the tumors were.supratentorial, and 36.67% were infratentorial. Among them, there were 9 cases of mixed glioblastoma, 4 cases of ependymoma, 7 cases of pleomorphic glioblastoma, 8 cases of astrocytoma, 9 cases of meningioma, 12 cases of pineal gland tumor, and 11 cases of medulloblastoma. See **Table 1** for details.

Table 1: Analysis of Pathological Diagnosis Results [*n*(%)]

Tumor Type	Supratentorial	Infratentorial	Total
Mixed Glioblastoma	5(8.33)	4(6.67)	9(15.00)
Ependymoma	2(3.33)	2(3.33)	4(6.67)
Pleomorphic Glioblastoma	5(8.33)	2(3.33)	7(11.67)
Astrocytoma	6(10.00)	2(3.33)	8(13.33)
Meningioma	7(11.67)	2(3.33)	9(15.00)
Pineal Gland Tumor	12(20.00)	0(0.00)	12(20.00)
Medulloblastoma	1(1.67)	10(16.67)	11(18.33)
Total	38(63.33)	22(36.67)	60(100.00)

2.2 Comparison of Diagnostic Efficacy between Two Groups

The observation group exhibited significantly higher accuracy rates in supratentorial, infratentorial, and overall diagnoses compared to the control group, with statistically significant differences ($P < 0.05$). See **Table 2** for details.

Table 2: Comparison of Diagnostic Efficacy between Two Groups [*n*(%)]

Group	Cases	Supratentorial Accuracy (%)	Infratentorial Accuracy (%)	Total Accuracy (%)
Observation Group	60	97.37(37/38)	95.45(21/22)	96.67(58/60)
Control Group	60	78.95(30/38)	63.64(14/22)	73.33(44/60)
x^2	/	6.176	6.844	12.810
P	/	0.013	0.009	0.000

3. Discussion

Intracranial tumors, also known as cranial or brain tumors, occur within the cranial cavity and are classified as a type of nervous system tumor. They can generally be categorized into three main types: those originating from germ cells, peripheral nerves, and meninges; those arising from granule cells and the skull base; and metastatic tumors originating from other organs or tissues. Based on their origin, intracranial tumors can be classified into primary and secondary tumors. From a biological perspective,[8] tumors can be categorized as benign or malignant. The disease is influenced by various factors, including environmental and host factors. Environmental factors encompass chemical, physical, and biological factors, while host factors include medical history and personal background. Intracranial tumors are chronic diseases characterized by symptoms such as headaches and nausea, which can significantly impact daily life due to compression of intracranial nerves[9]. Surgery is the primary treatment for intracranial tumors, and accurate preoperative assessment using appropriate techniques is crucial for improving prognosis. Imaging examinations, particularly CT and MRI scans[10], play a vital role in detecting and characterizing intracranial tumors. While CT scans are widely used and have advantages in diagnosing intracranial tumors, they may lack clarity in depicting cystic nodules, leading to potential misdiagnosis or missed diagnoses. In contrast, MRI scans provide clear anatomical images and can obtain multi-sequence images, enabling effective detection of intracranial tumors. MRI technology has proven effective in detecting various types of tumors, including mixed glioblastomas, ependymomas, pleomorphic glioblastomas, astrocytomas, meningiomas, pineal gland tumors, and medulloblastomas.Comparing the diagnostic efficacy of MRI and CT scans[11], MRI demonstrates higher accuracy in detecting both supratentorial and infratentorial tumors. MRI can visualize various tumor characteristics, including their size, location, and surrounding structures, aiding in precise diagnosis and treatment planning. Additionally, MRI is capable of distinguishing between different tumor types based on their signal characteristics, providing valuable information for clinical decision-making.

In conclusion, the application of MRI technology in clinical examination significantly improves the diagnostic efficacy of intracranial tumors. MRI scans can effectively detect both supratentorial and infratentorial tumors, providing clear and comprehensive images that are valuable for accurate diagnosis and treatment planning.

References

[1] Bao Z. Clinical application of multi-parameter magnetic resonance imaging in the differential diagnosis of intracranial gliomas. *Intelligent Health*. 2023;9(17):9-12.

[2] Chen ZN, Zhu JY, Zhong LQ, Xiong MR, Yao JY. Application of multi-layer spiral CT, magnetic resonance imaging, and cerebrospinal fluid cytology examination in the diagnosis of primary intracranial tumors. *Chinese Rural Medicine*. 2021;28(8):49-50.

[3] Ji XT, Yang J. Progress in the application of diffusion tensor imaging technology in surgical treatment of intracranial tumors. *Chinese Journal of Neurosurgery*. 2021;37(8):857-860.

[4] Dong SL, Ren YH. Value of 3D-ASL analysis based on magnetic resonance in evaluating blood perfusion of intracranial tumors. *Liaoning Medical Journal*. 2023;37(1):74-76.

[5] Zhao JJ, Bi N, Xiao JP. Application of magnetic resonance-guided adaptive radiotherapy in brain metastases. *Chinese Journal of Radiological Oncology*. 2023;32(1):60-64.

[6] Zhang MZ, Gao XY, Yang ZG, Wang WJ, Zhang Y, Cheng JL. A case of intracranial pseudotumor angioplastic endothelial cells. *Chinese Journal of Radiology*. 2022;56(10):1141-1142.

[7] Chen SX, Wang JC, Chen H, Liu CS, He L. Clinical application value of multimodal magnetic resonance imaging technology in the diagnosis of intracranial tumors. *Great Doctor*. 2022;7(17):13-16.

[8] Wang W, Xu ZY, Yang GY, Li Y, Yang BY, Gao MY. Application of BioMind imaging-assisted diagnostic software in magnetic resonance diagnosis of intracranial tumors. *Journal of Jinan University* (Natural Science & Medicine). 2022;43(4):441-446.

[9] Ba HZ, Li JH, Li JL, Zhao FH. Diagnostic value of

hydrogen proton magnetic resonance spectroscopy imaging in intracranial tumors. *Journal of Yan'an University* (Medical Science). 2021;19(4):85-88.

[10] Wang K. Analysis and discussion on the differential diagnosis value of enhanced multi-voxel proton magnetic resonance spectroscopy after intracranial common tumors. *Medical Theory and Practice*. 2021;34(17):3055-3056.

[11] Li G, Zhang JF, Chen F, Zhang WS. Clinical application analysis of magnetic resonance MRS technology in differential diagnosis of intracranial tumors. *Practical Journal of Cancer*. 2021;36(9):1533-1535.