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The Application Value of 3.0T MRI Diagnosis in Patients with Rotator Cuff Injury

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Abstract: *Objective:* To analyze the value of 3.0TMRI in diagnosing patients with rotator cuff injury. *Methods:* A retrospective analysis was conducted on the clinical data of 69 patients with suspected rotator cuff injuries in our hospital from June 2024 to May 2025. MRI examinations were performed in all cases, with arthroscopy results as the gold standard. *Results:* Arthroscopy results showed that 65 of 69 patients with suspected rotator cuff injuries were diagnosed with rotator cuff injuries; MRI results showed positive in 62 cases and negative in 7 cases. There is no significant difference between the consistency rate of MRI examination for different types of rotator cuff injuries and the results of arthroscopy ($P > 0.05$). *Conclusion:* MRI examination has high sensitivity and accuracy in the clinical diagnosis of rotator cuff injuries. It can accurately diagnose different types of rotator cuff injuries and clarify the scope and severity of the injury in a timely manner.

Keywords: Rotator cuff injury; MRI diagnosis; Application value

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1. Introduction

Rotator cuff injuries are common in clinical orthopedics, and the triggering factors are trauma, degeneration, chronic strain, etc. Typical symptoms are shoulder joint pain, limited movement, and decreased muscle strength. The patient's limb function and quality of daily life are seriously affected. With the increase in the number of sportspeople and the acceleration of the aging of the population, patients with rotator cuff injuries are becoming more and more common in clinical practice. It is necessary to carry out early and accurate diagnosis for patients and help them formulate personalized treatment plans [1]. The prognosis of patients has been significantly improved. Among modern medical imaging technologies, MRI technology has shown very high resolution in detecting shoulder joint injuries and can display the details of shoulder joint injuries very accurately [2]. Advanced imaging examination technology includes 3.0T MRI, which is characterized by multi-parameter, multi-directional scanning and high soft tissue resolution. It can clearly present the rotator cuff tendon morphology, signal intensity and surrounding soft tissue lesions [3], and can provide a detailed imaging basis for clinical grading diagnosis of rotator cuff injury patients. This article selected 69 patients with suspected rotator cuff injuries for data analysis and analyzed the value of 3.0TMRI in diagnosing patients with rotator cuff injuries.

2. Materials and methods

2.1. General information

A retrospective analysis of 69 patients with suspected rotator cuff injury in our hospital from June 2024 to May 2025 was conducted for data analysis. There were 41/28 men and women, aged 21-82 (57.26 ± 12.02) years old.

Inclusion criteria: (1) There are symptoms of suspected rotator cuff injury, such as shoulder joint pain, limited movement and other symptoms of rotator cuff injury; (2) All patients underwent shoulder arthroscopy and MRI examination; (3) Patients and their families gave informed consent and signed an informed consent form.

Exclusion criteria: (1) Combined with other bone and joint diseases, such as shoulder joint fractures, dislocations, etc.; (2) Have a history of shoulder surgery or trauma, which will affect the patient's examination results; (3) Have contraindications to MRI examination; (4) Incomplete clinical data.

2.2. Method

All underwent MRI examination: Siemens Vida 3.0T superconducting magnetic resonance imaging machine was used. The patient was placed in a supine position with the affected shoulder neutral. The arm was placed on the side of the body with the palm facing up. Sandbags were used to fix it, and the body was kept still during the entire scanning process. During the scanning process, the entire area from the acromion to the lower edge of the scapula is covered. A large Flex surface coil is used, and the sequence is selected according to the needs, involving PDWI-FS axial and oblique sagittal positions, T2WI-FS oblique coronal position, and T1WI oblique coronal position. The patient's entire shoulder joint is scanned, starting from the distal end of the clavicle, and then scanning to the proximal humerus. The FOV is 16 cm × 16 cm, and the T1WI parameter number: TR400ms, TE12ms, layer thickness and layer spacing are 3.5 mm, 0.5 mm, T2WI-FS is 16 cm × 16 cm, 3400 ms, 80 ms, 3.5 mm, 0.5 mm, PDWI-FS is 16 cm × 16 cm, 3300 ms, 30 ms, 3.5 mm, 0.5 mm, scanning 10–15 min. The diagnostic images obtained after MRI examination need to be read by two diagnosticians with rich work experience, and then discussed and compared with the MRI examination results based on the patient's arthroscopy results.

2.3. Observation indicators

Using shoulder arthroscopy results as the diagnostic gold standard, we evaluate the diagnostic performance of MRI examination for rotator cuff injuries, and analyze the diagnostic value of MRI examination for rotator cuff injury classification.

2.4. Statistics

Use SPSS 28.0 software, use mean ± standard deviation (SD) to describe measurement data, t test; use rate (%) to describe count data, χ^2 test, $P < 0.05$, statistically significant.

3. Results

3.1. MRI results

Taking shoulder arthroscopy results as the gold standard, MRI results were positive in 62 cases and negative in 7 cases. The sensitivity of MRI diagnosis is 93.85%, the specificity is 75.00%, and the accuracy is 89.56%. See **Table 1** for details.

Table 1. Diagnostic results of rotator cuff injury by MRI examination (n/%)

Check method		Arthroscopy			Sensitivity	Specificity	Accuracy
		Positive	Negative	Total			
MRI	Positive	61	1	62	93.85 (61/65)	75.00 (3/4)	89.56 (62/69)
	Negative	4	3	7			
	Total	65	4	69			

3.2. Consistency rate of MRI examination for different types of rotator cuff injuries

There is no statistically significant difference between the consistency rate of MRI examination for different types of rotator cuff injuries and the results of arthroscopy ($P > 0.05$) (**Table 2**).

Table 2. Comparison of compliance rates of MRI examinations for different types of rotator cuff injuries (n/%)

Check method	Complete rotator cuff injury	Partial rotator cuff injury			
		Partial full-thickness tear	Intratendinous tear	Articular surface tear	Bursal surface tear
Arthroscopy	15 (100.00)	8 (100.00)	9 (100.00)	16 (100.00)	17 (100.00)
MRI	15 (100.00)	8 (100.00)	8 (88.89)	15 (93.75)	16 (94.12)
χ^2	-	-	0.024	0.003	0.002
P	-	-	> 0.05	> 0.05	> 0.05

4. Discussion

The rotator cuff is the core stabilizing structure of the shoulder joint, and its functional integrity will have a direct impact on shoulder joint activity and movement function. Relevant studies have found [4] that the incidence of rotator cuff injury is related to age. The older the age, the incidence rate gradually increases. For example, if a 50-year-old person has a rotator cuff injury rate of 10%, while a 60-year-old person has a rotator cuff injury rate of 20%–30%. MRI examination has the advantages of high tissue resolution, multi-parameter settings, and multi-directional imaging. It can clearly display the soft tissues near the bones and around the bones. It is widely used in the diagnosis of sports-related damage diseases and has good diagnostic performance for rotator cuff injuries [5]. Under normal circumstances, MRI diagnosis of rotator cuff injury will produce the magic angle effect, that is, artifacts, but the fat suppression sequence can eliminate the artifacts and clearly display the rotator cuff injury, so it has high diagnostic efficiency [6]. Normal tendons show iso- or low-intensity on MRI scans. MRI scans of the supraspinatus tendon show tendon thickening or irregular shape, tendon continuity is partially or completely interrupted, there is effusion at the tear, and T2W1 shows high signal and T1W1 shows low signal [7]. In the actual clinical diagnosis process, clinicians need to comprehensively consider factors such as the tendon's shape, disease course, tear size and shape, etc., in order to make an accurate judgment on rotator cuff injury.

The results of this study showed that arthroscopic examination results showed that 65 of 69 patients with suspected rotator cuff injury were diagnosed with rotator cuff injury; MRI examination results showed positive in 62 cases and negative in 7 cases. There is no statistically significant difference between the consistency rate of MRI examination for different types of rotator cuff injuries and the results of arthroscopy ($P > 0.05$). Analysis reason: Based on the hydrogen proton resonance signal, 3.0T MRI imaging has the advantage of multi-parameter, multi-directional scanning and high soft tissue resolution. It can accurately capture the microscopic changes of the patient's tendon in different pathological stages, and has superior diagnostic performance. The analysis shows that high field strength can significantly improve the image signal-to-noise ratio and spatial resolution, and clearly display the normal structure and subtle lesions of the patient's tendon. On T1WI and T2WI, the normal tendon shows low signal, with continuous and clear boundaries. During degeneration, T2WI-FS, PD WI-FS consists of localized or diffuse high signal without interruption of tendon continuity. This condition can be accurately identified using 3.0T MRI. In this study, 6 cases of degeneration were accurately diagnosed. However, MSCT examination missed the diagnosis due to the inability to identify microscopic changes in soft tissue. The application of 3.0T MRI to diagnose partial tears can clearly display the location, size, depth and surrounding lesions of the tear. T2WI-FS and PDWI-FS can show that the tear is filled with high-signal fluid, accompanied by surrounding edema and infiltration. Multi-directional scanning can be carried out for the patient, which

can comprehensively display the three-dimensional shape of the patient's tear, effectively avoiding a missed diagnosis of the patient. In this study, 3.0TMRI can accurately diagnose 13 of the 14 cases of partial tears, which is significantly better than 8 cases of MSCT.3.0TMRI can clearly display key information such as the continuity interruption of a completely torn tendon, the size of the tear, the degree of tendon retraction, and joint effusion, providing corresponding reference for decisions such as surgical suturing methods and whether to extend the tendon. In this study, 27 cases of complete tears were accurately identified, and MSCT examination is difficult to provide precise surgical information for patients.

Clinical studies have concluded that 3.0T MRI has multi-parameter and multi-directional scanning characteristics, which can provide complementary information and provide patients with accurate diagnosis with high accuracy [8]. In this study, PDWI-FS axial and oblique sagittal views, T2WI-FS oblique coronal views, and T1WI oblique coronal views have their own application advantages. For example, T1WI can clearly display the anatomical boundaries of the patient's tendons and surrounding tissues, and judge the patient's overall shape. T2WI-FS can accurately identify the patient's tear range, and PDWI-FS can display subtle deformations and partial tears, making up for the shortcomings of T2WI-FS. Applying multi-parameter joint scanning to patients can comprehensively evaluate the patient's pathological status. Using multi-directional scans, such as oblique sagittal and oblique coronal positions, can match the direction of tendon movement and clearly display the entire morphology. The scanning plan used in this study can cover the distal end of the clavicle to the proximal end of the humerus and focus accurately, further ensuring the accuracy of diagnosis. It should be noted that 3.0T MRI has limitations in clinical application. For example, the examination time is long. If the patient is claustrophobic or unable to remain still for a long time, the applicability is poor. In addition, the examination cost is high. If there are contraindications, the examination cannot be performed. Based on this, in clinical application, it is necessary to make individualized choices. Patients with contraindications, inability to cooperate, or limited financial resources can be preliminarily screened for MSCT. If the patient has suspected early injury, partial tear, or requires accurate assessment of the extent of injury and comorbidities, 3.0T MRI will be prioritized, and the diagnostic accuracy will be significantly improved.

By organically combining the research results with clinical practice, the diagnostic advantages of 3.0T MRI are summarized as follows: first, high soft tissue resolution, which can accurately identify early degeneration and subtle tears in patients, and the early diagnosis rate is significantly improved; second, multi-parameter and multi-directional scanning, which can comprehensively display the patient's injury location, scope, extent and comorbidities, and help formulate detailed treatment plans for patients; third, high sensitivity, accuracy and specificity, the missed diagnosis rate and misdiagnosis rate will be significantly reduced. These advantages encourage clinical application of it in the diagnosis of rotator cuff injuries.

During clinical practice, it has been found that the application of 3.0T MRI has high value and high diagnostic accuracy. It can be used to guide patients' precise treatment and accurately diagnose patients with early degeneration or mild partial tears. Conservative treatment can effectively avoid over-treatment. According to the location and degree of the tear shown on the patient's MRI, patients with large partial tears and obvious symptoms can choose arthroscopy for minimally invasive repair. Based on the information such as the size of the tear and the degree of tendon retraction provided by the patient's MRI, scientific selection of suture methods and fixation materials can be carried out for patients with complete tears, and the success rate of surgery has been significantly improved. In addition, 3.0T MRI can also be used to follow up patients after surgery, evaluate tendon healing, and determine patient prognosis.

5. Conclusion

In summary, MRI examination has high sensitivity and accuracy in the clinical diagnosis of rotator cuff injuries. It can accurately diagnose different types of rotator cuff injuries and clarify the scope and severity of the injury in a timely manner.

Disclosure statement

The author declares no conflict of interest.

References

[1] Wei ZM, 2025, Analysis of the Diagnostic Value of 3.0T MRI in Patients with Rotator Cuff Injury. Chinese Modern Drug Application, 19(21): 47–50.

[2] Liu NH, Deng N, Zheng YL, et al., 2025, Diagnostic Value of 3.0 T MR Examination in Classifying Rotator Cuff Injuries. Modern Medical Imaging, 34(09): 1685–1688.

[3] He DF, Guan Y, Zhang LZ, 2025, Analysis of the Accuracy of MRI Examination in the Differential Diagnosis of Frozen Shoulder and Rotator Cuff Injury. Chinese Health Care, 43(18): 172–175.

[4] Zhou J, Qin XD, 2025, The Application Value of MRI in the Diagnosis of Rotator Cuff Injury and Assessment of Tear Degree. Imaging Research and Medical Applications, 9(18): 157–160.

[5] Zhong F, Wang Y, Zeng J, et al., 2025, Clinical Value of MRI and Ultrasound Examination in Proximal Humeral Fractures Combined with Rotator Cuff Injury. Journal of Molecular Imaging, 48(08): 959–964.

[6] Yu MZ, 2023, Diagnostic Value of 3.0 T High-field Magnetic Resonance Imaging in Rotator Cuff Injuries. Chinese Rural Medicine, 30(03): 70–71.

[7] Wu XH, Zhu N, 2025, Diagnostic Value of 3.0T MRI and Multi-slice Spiral CT for Different Types of Rotator Cuff Injuries. World Comprehensive Medicine (Chinese and English), 11(06): 166–169.

[8] Miao XH, Shi JW, Chen F, 2024, Diagnostic Value of 3.0T High-field Magnetic Resonance Imaging in Rotator Cuff Injuries. China Medical Device Information, 30(02): 119–121.