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Correlation between Clinical Tests and Magnetic Resonance Imaging Finding in Diagnosis of Chronic Ulnar-sided Wrist Pain

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Background: Ulnar-sided wrist pain is a common cause of upper- extremity disability. Presentation can vary from acute traumatic injuries to chronic degenerative conditions. Carful clinical examination should be done, there are some provocative tests for some pathologies which induce pain when the patient has the specific pathology for the test. MRI of the wrist is often challenging because the components of the wrist have complex anatomy of bone and soft tissues, with ligaments and cartilage which are small sized structures measuring millimeters. MRI is a one of advanced imaging techniques that play an important role in evaluating the wrist and is a useful examination modality because of its multiplanar, multisequence capability and its excellent resolution of soft tissue structures. MRI is particularly advantageous for assessing occult bone lesions and soft tissue structures around the wrist such as cartilages, tendons, ligaments and nerves.

Aim: The aim of this study is to assess the role and accuracy of clinical tests and MRI in diagnosis of chronic ulnar-sided wrist pain causes.

Patients and Methods: This is a prospective study and was conducted on a 50 adult patients complaining from chronic ulnar side wrist pain. They were attended to Orthopedic Department of Tanta University Hospitals over a period of 6 months starting from November 2019 till May 2020.

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Results: MRI gave positive finding in most of patients (92%), while negative in about (8%) of cases, this means that there are some pathologies need more investigations to be diagnosed. Most of Clinical tests also gave a help in diagnosis of the cause of the pain especially ulnocarpal stress test, fovea sign test, ECU synergy test and piano key test which by statistics showed significant results but LT ballottement test had insignificant results so LTL pathology can't be diagnosed by clinical tests only but needs more investigations as MRI. So some pathologies can be diagnosed clinically as ECU tenosynovitis, but other pathologies need more investigations like MRI like LTL tear, also some pathologies need more investigations.

Conclusion: Most of clinical tests give significant results in diagnosis of chronic ulnar-sided wrist pain except for some pathologies like LTL tear needs more investigations, also MRI has important role and gives significant results in diagnosis.

Keywords: Clinical tests; magnetic resonance imaging; chronic ulnar-sided wrist pain.

1. INTRODUCTION

Ulnar-sided wrist pain is a common but challenging cause of chronic wrist pain.

It is a common cause of upper-extremity disability. Presentation can vary from acute traumatic injuries to chronic degenerative conditions. Because of its overlapping anatomy, complex differential diagnosis, and varied treatment outcomes, the ulnar side of the wrist has been referred to as the "black box" of the wrist, and its pathology has been compared with that of low back pain [1,2].

To treat the ulnar-sided wrist pain, it is important to reach the accurate cause of such symptom to treat it correctly.

There are many causes of ulnar-sided wrist pain including osseous, ligamentous, tendinous, nervous and other causes [3].

Osseous causes like old fractures, Kienbock's disease and distal radio-ulnar joint pathology. Ligamentous causes like triangular fibrocartilage complex (TFCC) tear and lunotriquetral ligament tear, tendinous like extensor and flexor carpi ulnaris (ECU and FCU) tenosynovitis [3].

To reach the diagnosis accurate clinical examination should be done, there are some provocative tests for some pathologies which induce pain when the patient has the specific pathology for the test, then x-rays may be asked which help to diagnose some pathologies like advanced Kienbock's disease, old fractures and some impaction syndromes [3,4].

There are other different radiological modalities that may be used to reach the diagnosis like ultrasound, Computerized tomography (CT) and Magnetic Resonance Imaging (MRI) [3].

MRI is widely used in diagnosis as it plays an important role in the assessment of the internal derangement of joints and is reported to be an excellent modality for diagnosing hand and wrist disorders. MR imaging has greater sensitivity for soft tissue contrast and subtle bone marrow changes such as bone edema and is, therefore, particularly useful for evaluating occult fractures and stress fractures [3,5,6].

All previous modality is non-invasive, there are other invasive techniques like arthrography and wrist arthroscope [3].

In this study clinical tests and MRI were used to reach the diagnosis of ulnar-sided wrist pain.

2. PATIENTS AND METHODS

2.1 Study Population

Prospective study was conducted on a 50 adult patients complaining from chronic ulnar side wrist pain. They were attended to orthopedic department of Tanta University Hospitals over a period of 6 months starting from November 2019 till May 2020.

2.2 Inclusion Criteria

- Patient complaining of chronic ulnar-sided wrist pain.
- Both sexes were included.

2.3 Exclusion Criteria

- Patient with acute wrist trauma

- Patients with any contraindication for MRI examination as having metal implants as pacemaker, aneurysm clips, joint replacement or any other electronic or magnetically activated implant as well as claustrophobic subjects.
- Patients with a past history of wrist joint inflammatory disorders like tuberculosis, supportive arthritis and rheumatoid arthritis.

All patients were subjected to the following:

1. **History and Clinical examination:**

- Personal history: name, age, sex, special habits such as alcoholism.
- Present history of the current illness including onset, course and duration of the wrist pain, unilateral or bilateral, history of trauma or medication and history of illness.
- History of previous medical wrist problems, any malignancies all-over the body, any systemic illness or organ failure.
- Review of all previous investigations or radiological examination.
- Clinical examination was done including the provocative tests.

2. **Laboratory investigation**

- Recent renal function test (urea and creatinine).
- Erythrocyte sedimentation rate (ESR).
- C-reactive protein (CRP).
- Rheumatoid factor (RF).

3. **Wrist imaging**

Plain X-ray of Wrist Joint

- Postero-Anterior radiograph of wrist
- Lateral radiograph of wrist

MRI

- All MRI scans were performed by a GE 1.5 Tesla (SIGNA explorer) machine at MRI unit, Radiodiagnosis department, Tanta University Hospital.
- The MRI scans were reported by musculoskeletal radiologist who was blinded to the patient symptoms and clinical history.
- The MRI findings were compared with the findings of clinical examination.

2.4 Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation. Significance of the obtained results was judged at the 5% level.

3. RESULTS

MRI gave positive findings in 46 patients about 92% of cases.

Ulnar fovea sign: Among the 50 patients of the study, 12 patients were positive ulnar fovea sign and had MRI findings (TFCC tear) correlated with the clinical sign, 4 cases were positive ulnar fovea sign while no MRI findings for TFCC tear, one case was negative for the test and had MRI findings of TFCC tear and 33 cases were negative for the test and MRI (Table 1).

Ulno carpal stress test: Among the 50 patients of the study, 43 patients were positive ulnocarpal stress test and had MRI findings (ulnar side pathology) correlated with the clinical sign, 2 cases were positive ulnocarpal stress test while no MRI findings, 3 cases were negative for the test and had MRI findings and 4 cases were negative for the test and MRI (Table 2).

Lunotriquetral ballottement test: Among the 50 patients of the study, 2 patients were positive Lunotriquetral ballottement test and had MRI findings (LTL tear) correlated with the clinical sign, 15 cases were positive Lunotriquetral ballottement test while no MRI findings,2 cases were negative for the test and had MRI findings and 31 cases were negative for the test and MRI (Table 3).

ECU synergy test: Among the 50 patients of the study, 3 patients were positive ECU synergy test and had MRI findings (ulnar side pathology) correlated with the clinical sign, 2 cases were positive ECU synergy test while no MRI findings, one cases were negative for the test and had MRI findings and 44 cases were negative for the test and MRI (Table 4).

Table 1. Shows sensitivity, specificity. PPV, NPV and accuracy of ulnar fovea sign

	MRI positive	MRI negative	χ^2	p	Sensitivity	Specificity	PPV	NPV	Accuracy
Ulnar fovea sign positive	12 (92.3%)	4 (10.8%)	29.363*	<0.001*	92.3%	89.1%	75%	97%	90%
Ulnar fovea sign negative	1 (7.7%)	33 (89.2%)							

χ^2: Chi square test
p: p value for Fisher Exact
**: Statistically significant at p ≤ 0.05*

Table 2. Shows sensitivity, specificity. PPV, NPV and accuracy of ulnocarpal stress test

	MRI positive	MRI negative	χ^2	p	Sensitivity	Specificity	PPV	NPV	Accuracy
Ulnocarpal stress test (positive)	43 (93.5%)	1 (25.0%)	16.341*	0.004*	93.4%	75%	87%	50%	92%
Ulnocarpal stress test (negative)	3 (6.5%)	3 (75.0%)							

χ^2: Chi square test
p: p value for Fisher Exact
**: Statistically significant at p ≤ 0.05*

Table 3. Shows sensitivity, specificity. PPV, NPV and accuracy of Lunotriquetral test

	MRI positive	MRI negative	χ^2	p	Sensitivity	Specificity	PPV	NPV	Accuracy
Lunotriquetral ballottement test (positive)	2 (50.0%)	15 (32.6%)	0.496	0.597	50%	67.3%	11.6%	93.9%	66%
Lunotriquetral ballottement test (negative)	2 (50.0%)	31 (67.4%)							

χ^2: Chi square test
p: p value for Fisher Exact

Table 4. Shows sensitivity, specificity. PPV, NPV and accuracy of ECU synergy test

	MRI positive	MRI Negative	χ^2	p	Sensitivity	Specificity	PPV	NPPV	Accuracy
ECU synergy test (positive)	3 (75.0%)	2 (4.3%)	20.411*	0.002*	75%	95.6%	60%	97.8%	94%
ECU synergy test (negative)	1 (25.0%)	44 (95.7%)							

χ^2: Chi square test
p: p value for Fisher Exact
**: Statistically significant at p ≤ 0.05*

4. DISCUSSION

In our study, all patients complain of chronic ulnar sided wrist pain (100%) and other symptoms such as limitation of movement swellings, and tingling and numbness, paresthesia.

By comparing the data obtained from clinical examination and MRIs findings and by some statistics we tried to evaluate sensitivity, specificity of each clinical test according to the available results.

This study reveals that MRI play an important role in diagnosis of chronic ulnar-sided wrist pain causes as it gave positive findings in 46 patients about 92% of cases, this agrees with many studies like study of Marco Zanetti et al., 2006 [7].

The ulnocarpal stress test was done as screening test for all patients for detection of ulnar sided wrist pathology, the test was positive in 46 patients (92%) and negative in 4 patients (8%), with sensitivity about 93%, specificity about 75% and accuracy 94%. These results mean that ulnocarpal stress test is useful as a screening test to detect ulnar-sided wrist pathology this agrees with the study of Nakamura et al., 1997 [8].

In this study ulnar fovea sign was done to all patients and was positive in 16 patients and negative in 34 patients, with sensitivity 92% specificity 89 % and accuracy 90%. This results mean that ulnar fovea sign has a role in diagnosis of foveal disruption of TFCC, this agree with the study of Tay et al., 2007 [9].

In this study LT ballottement test, which is specific for LTL tear was done for all patients and was positive in 17 patients and negative in 33 patients with sensitivity about 50, specificity about 67 % and accuracy about 66%. These results show low sensitivity and specificity of that test, but used in diagnosis of LT ligament tear this agree with the study of Andersson et al., 2015 [10].

In this study ECU synergy test was done for all patients of the study and was positive in 5 patients and negative in 45 patients with sensitivity about 75%, specificity about 95% and accuracy about 94%. These results mean that ECU synergy test help in diagnosis of ECU tendonitis, this agrees with the study of Ruland and Hogan, 2008 [11].

Another research conducted by Sato and colleagues in 2016 [12] revealed that the sensitivity, specificity, positive predictive value, and negative predictive value were 73.7%, 85.7%, 82.4%, and 78.3%, respectively. Thery discovered significant variation in the ECU synergy test findings among the groups which have and also lack ECU abnormalities ($P < .01$).

5. CONCLUSION

Most of clinical tests give significant results in diagnosis of chronic ulnar-sided wrist pain except for some pathologies like LTL tear needs more investigations, also MRI has important role and gives significant results in diagnosis.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

CONSENT

- Informed consent was obtained from all subjects after full explanation of benefits and risk.
- Privacy of all patient's data was granted and there is code number for every patient file that includes all investigations.
- The data would be confidential and used only for scientific research purposes.

ETHICAL APPROVAL

- Approval for the study was taken from the ethical committee of faculty of medicine, Tanta University.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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