Original Article

Assessment of the Relationship Between Pisotriquetral Joint Effusion on Magnetic Resonance Imaging and Wrist Disorders

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Abstract

Background: The pisiform is a bone that is sometimes considered a sesamoid bone. Pain and tenderness can be due to tendinopathy at the attachment site of the flexor ulnaris tendon, carpal fractures, or osteoarthritis of the pisotriquetral joint. There are limited studies on the association between wrist disorders and pisotriquetral joint effusion; therefore, this study aimed to investigate this association on magnetic resonance imaging (MRI).

Materials and Methods: In this cross-sectional study, which investigated the relationship between wrist disorders and pisotriquetral joint effusion on MRI, all patients referred to the radiology department of Besat Hospital in 2024 for wrist disorders underwent MRI. MRI findings included osteoarthritis of the wrist joints, ganglion cysts, dislocations, subluxations, and osteonecrosis. If there were no positive findings, the MRI was considered normal. The significance level was considered less than 0.05.

Results: Ninety-three patients were assessed. Fifty-seven patients (61.3%) had pisotriquetral joint effusion, and 36 (38.7%) patients did not have pisotriquetral joint effusion. Joint effusion was not associated with age or gender (P-values > 0.05). Also, there was no association between pisotriquetral joint effusion and the occurrence of osteonecrosis, osteoarthritis, subluxation, dislocation, and ganglion cyst (all P-values > 0.05).

Conclusion: There was no association between wrist disorders and pisotriquetral joint effusion.

Keywords: Magnetic resonance imaging, wrist, pisotriquetral joint

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Introduction

The pisiform is a small, pea-shaped bone, and its function remains debated. The pisotriquetral joint defines the ulnar boundary of the carpal tunnel and is associated with the tendons of the fifth digit. Disorders of this joint should be considered in cases of ulnar wrist pain, particularly if exacerbated by flexion, ulnar deviation, or opposition of the little finger and thumb[1-3].

The pisotriquetral joint is the second most common site of wrist osteoarthritis, after the scaphotrapezial joint, excluding the first carpometacarpal joint[4]. Primary osteoarthritis is identified as the predominant cause of pisotriquetral osteoarthritis, which primarily affects women over the age of 50 who typically lack a history of prior trauma. The arthropathy is commonly bilateral, characterized by a gradual onset of pain, and is

frequently associated with ulnar neuropathy in approximately one-third of affected individuals[5,6].

Computed tomography (CT) scanning is particularly beneficial when there is suspicion of a fracture or dislocation based on radiographic evaluation. Injection of contrast material into the radiocarpal joint successfully opacifies the pisotriquetral joint in 82-88% of cases. Additionally, magnetic resonance imaging (MRI) provides an extensive examination of the ulnar anatomic structures and associated painful disorders on the ulnar side of the wrist, notably pisotriquetral osteoarthritis and occult fractures of the pisiform bone[7-10].

Currently, there is no data evaluating the relationship between the piezotriquetral joint effusion and wrist disorders in Iran. This study aims to investigate the relationship between wrist disorders and pisotriquetral joint effusion on MRI.

Methods

This cross-sectional study was conducted in 2024 on non-traumatic patients who had undergone MRI of the wrist for any reason and reported effusion of the pisotriquetral joint in the MRI.

The inclusion criteria were the presence of effusion of the pizotriquetral joint on MRI, absence of previous or current trauma, absence of prior surgical history, and age 18-80 years. Exclusion criteria included the absence of MRI findings or incomplete data in the patient's file.

All patient information was recorded in a checklist as codes without names, including demographic variables (age and sex). All MRIs were interpreted and evaluated by an experienced radiologist. MRIs included two Axial images: T1 and PD fat-sat. Based on these views, radiologists reported findings. The MRI findings, including normal MRI, wrist joint osteoarthritis, ganglion cyst, wrist joint dislocation or subluxation, and osteonecrosis, were recorded. If no positive findings were noted, it was recorded as a routine MRI.

Statistical analysis: In this study, the collected data were analysed using SPSS version 26 software. The statistical indicators of mean and standard deviation for continuous variables, as well as frequency (number and percentage) for categorical variables, were used to describe the data. An independent t-test was used to examine differences between groups for continuous variables. For categorical variables, Fisher's exact test was used to assess group differences. The statistical significance level in this study was considered less than 0.05.

Ethical considerations: All patient information remained confidential, and the research adhered to the ethical principles. This study has received the Code of Ethics from the Army University of Medical Sciences (IR.AJAUMS.REC.1404.019).

Results

In this study, 57 patients (61.3%) exhibited pisotriquetral joint effusion, whereas 36 patients (38.7%) did not. Table 1 provides a comparative analysis of the patients based on their effusion status. The analysis indicated no statistically significant differences in age and gender between the patient group and the control participants (P-values > 0.05) (Table 1).

In Table 2, a comparison was conducted across three medical conditions—osteoarthritis, osteonecrosis, and dislocation—between two groups: those with effusion and those without.

The results revealed no significant relationships

Table 1. Comparison of demographic characteristics (age and gender) based on the presence or absence of effusion.

		Effusion								
		No				Yes				
		Mean	SD	N	%	Mean	SD	N	%	P-Value
Age		51.94	5.37	--	--	56.51	4.97	--	--	0.173**
Gender	Male	--	--	7	19.4	--	--	14	24.6	0.62*
	Female			29	80.6			43	75.4	

*P-value based on Chi-square, **P-value based on T-test

Table 2. Comparison of osteoarthritis, bone necrosis, and dislocation status based on the presence or absence of effusion.

		Effusion				
		No		Yes		
		Count	N %	Count	N %	P-value
Osteoarthritis	No	26	72.2	0	0.0	0.477
	Yes	10	27.8	57	100.0	
Osteonecrosis	No	36	100.0	55	96.5	0.52
	Yes	0	0.0	2	3.5	
Dislocation	No	36	100.0	56	98.2	>0.999
	Yes	0	0.0	1	1.8	

*P-value based on Chi-square

between pisotriquetral joint effusion and the aforementioned conditions, as indicated by P-values exceeding 0.05 in all cases.

In Table 3, the variables of subluxation and ganglion cyst were analyzed with respect to the presence of effusion across groups. The findings indicated that neither subluxation nor ganglion cyst demonstrated a statistically significant association with the occurrence of effusion (P-values > 0.05).

significant relationship was established between pisotriquetral joint effusion and other wrist disorders overall.

The pisiform bone, recognized as the smallest bone in the carpal region, articulates with the palmar surface of the triquetrum. The pisiform joint possesses a synovial covering and shows communication with the radiocarpal joint in 82% of cases. This indicates that effusion or joint abnormalities in the radiocarpal joint may extend to the pisotriquetral joint, and conversely.

Table 3. Comparison of subluxation and ganglion cyst in patients with and without effusion.

		Effusion				
		No		Yes		
		Count	N %	Count	N %	P-value
Sublaxation	No	35	97.2	55	96.5	0.281
	Yes	1	2.8	2	3.5	
Ganglion. cyst	No	33	91.7	45	78.9	0.568
	Yes	3	8.3	12	21.1	

*P-value based on Chi-square

Discussion

This study aimed to investigate the relationship between pisotriquetral joint effusion observed via MRI and various wrist disorders. A total of 93 participants referred to Besat Hospital were enrolled in the study; 57 (61.3%) demonstrated pisotriquetral joint effusion, while 36 (38.7%) did not. The analysis revealed that joint effusion was not associated with the patients' age or gender. Furthermore, there was no correlation between pisotriquetral joint effusion and the occurrence of osteonecrosis, osteoarthritis, subluxation, dislocation, or ganglion cysts. In fact, no

It is essential to recognize that proximal depression is generally considered non-pathological. The primary stabilizers of the pisotriquetral joint include the flexor carpi ulnaris, the pisohamate ligament, the pisometacarpal ligament, and the inferior ulnar ligament (PISO), while the flexor and extensor retinaculum serve as secondary stabilizers. The anatomical boundaries of the pisotriquetral joint are situated medially to the Guyon canal and the carpal tunnel, in proximity to the flexors of the fifth finger[11]. To the best of our knowledge, no prior study has explored the association between pisotriquetral joint effusion and wrist disorders, which constitutes a significant contribution of the current research.

The pisiform bone serves as a fulcrum, transmitting forces from the forearm muscles across the wrist. During flexion, the flexor carpi ulnaris (FCU) exerts a proximate and palmar pull on the pisiform, thereby widening the joint space between the pisiform and the triquetrum. Conversely, in extension, the pisiform is displaced distally, resulting in a narrowing of the joint space [12]. Pain localized in the pisiform region may arise from a variety of pathologies, including tendonitis at the FCU attachment, arthritis affecting the pisiform joint, subluxation of the pisiform accompanied by synovitis, fractures of the triquetrum or pisiform, rheumatism, or osteonecrosis[1,13-15].

In autopsy studies, erosive arthritic changes were detected in over 80% of pisiform joints. Nevertheless, symptomatic manifestations have been reported in fewer individuals. Primary osteoarthritis typically presents in patients aged over 50 years who do not have a history of trauma. In contrast, secondary osteoarthritis has been observed in younger patients, particularly racquetball players and gymnasts, with symptoms attributed to microtrauma. Research by Berg et al. examined joint space width (JSW) in the pisotriquetral joint of patients with osteoarthritis compared with healthy individuals. The findings revealed a median JSW of 0.1 mm in the patient group versus 0.8 mm in the control group, indicating a statistically significant difference between the two cohorts[16]. It was concluded that the pisotriquetral joint space in wrists afflicted by osteoarthritis is considerably narrower than that of healthy wrists. This suggests that JSW assessment may possess valuable diagnostic potential for evaluating patients suspected of having pisotriquetral osteoarthritis. In our investigation, the relationship between interarticular space width in patients was not explored; however, it was observed that pisotriquetral joint effusion, a contributory factor to joint degradation, is not associated with other wrist disorders in patients with wrist issues. Given the limited research on pisotriquetral joint impairment, more studies focusing on this joint are warranted. Furthermore, it is important to acknowledge that, due to the scarcity of patients with disorders of this joint, multicenter and retrospective studies are advisable to increase sample size.

In the study conducted by Rancy et al., MRI was assessed in a cohort of 24 patients diagnosed with scapholunate advanced collapse (SLAC) and an equal number of control patients. The findings indicated a prevalence of pisotriquetral osteoarthritis of 37.5% in the control group and 41.7% in the SLAC group. Among the control patients, 8 individuals had grade 3 osteoarthritis, and 1 had grade 4. In contrast, within the SLAC cohort, 6 patients presented with grade 3 osteoarthritis, and 4 with grade 4. However, this difference was not statistically significant [17]. In the current investigation, the prevalence of pisotriquetral joint effusion was 61.3%, potentially attributable to injuries to this joint, including pisotriquetral joint osteoarthritis. Our analysis revealed no significant association between osteoarthritis and joint effusion, a result that aligns with findings from Rancy et al. It is crucial to note that the present study focuses on patients with wrist disorders, whereas the analysis by Rancy et al. targeted individuals with advanced scapholunate collapse; this distinction is a fundamental difference between the two studies. Nevertheless, the evidence suggests no association between various wrist disorders and injuries to the pisotriquetral joint. Given the limited availability of research on this topic, further studies are encouraged to substantiate these findings.

In the investigation conducted by Kofman et al., the conditions of pisotriquetral osteoarthritis and flexor carpi ulnaris enthesopathy were analyzed in a cohort of 20 wrists sourced from 10 autopsies. The radiological assessment revealed that 2 cases showed no signs of osteoarthritis, 5 cases exhibited severe osteoarthritis, and 1 case showed no enthesopathy. Macroscopic evaluation indicated that 9 cases demonstrated changes consistent with osteoarthritis, with 5 instances categorized as severe. Furthermore, microscopic examination confirmed osteoarthritis changes in all samples, with 5 cases exhibiting severe alterations. The findings suggested that pisotriquetral osteoarthritis was more prevalent and severe among older individuals[6]. In contrast, the current study found no statistically significant association between pisotriquetral joint effusion and factors such as age and sex, which contributes to the divergence from the results of Kofman et al. They also highlighted the discrepancies observed between radiological and autopsy findings. However, it is essential to note that the present study was conducted on a living population and involved a larger sample size than Kofman et al.'s research, thus

representing a significant advantage of the current study's methodology.

Conclusion

It has been determined that there is no significant association between pisotriquetral joint effusion and various wrist disorders, including osteonecrosis, osteoarthritis, subluxation, dislocation, and ganglion cysts. Furthermore, the presence of effusion in this joint does not exhibit an association with age or gender.

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