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Incidental Flexor Carpi Radialis Tendinopathy on Magnetic Resonance Imaging

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Abstract

Background: Wrist pain is often nonspecific. Magnetic resonance imaging (MRI) is regularly obtained to evaluate wrist pain. Variations and pathophysiology identified on MRI may not account for patient's clinical symptoms. This study aims to quantify the prevalence of flexor carpi radialis (FCR) tendinopathy on MRI and the coexistence of trapeziometacarpal (TMC) or scaphotrapeziotrapezoid (STT) osteoarthritis. **Methods:** Using an institutional research database, we identified 3631 adult patients who obtained an MRI of the wrist during a 15-year period. Text search in the radiology reports identified 302 patients with possible FCR signal abnormalities. After reviewing the medical records, 98 patients were identified with FCR tendinopathy. Furthermore, medical records were used to identify pain located on the volar radial part of the wrist. In the absence of a documented examination consistent with FCR tendinopathy, we considered any signal change in the FCR incidental. **Results:** We identified 55 patients (55%) with incidental FCR tendinopathy. In a bivariate analysis, we found FCR signal changes on the MRI were associated with older age, white race, clinically suspected FCR tendinopathy, volar-radial sided wrist pain, and TMC and STT arthritis. Using multivariable logistic regression to account for confounding, older age and volar-radial sided wrist pain were independently associated with FCR signal changes on MRI. **Conclusions:** Signal changes in the FCR are infrequent and often incidental (asymptomatic) or associated with peritrapezial osteoarthritis.

Keywords: flexor carpi radialis tendon, magnetic resonance imaging, wrist pain, tendinopathy

Introduction

Wrist pain is common, and it can be difficult to identify discrete, objective pathophysiology that accounts for the symptoms.[6] Magnetic resonance imaging (MRI) is often obtained to evaluate wrist pain. However, it is difficult to interpret incidental findings, which may lead to overtreatment.[2] Many signal changes on MRI (eg, triangular fibrocartilage complex are highly prevalent in asymptomatic individuals such as signal changes in the triangular fibrocartilage complex or wrist ganglia.[3-5,7]

Flexor carpi radialis (FCR) tendinopathy is an MRI finding that may be variably symptomatic. Some surgeons suggest an association between scaphotrapeziotrapezoid (STT) osteoarthritis and FCR tendinopathy.[1,10] It is not clear whether FCR signal changes are incidental and age related, secondary to the arthritis, or an important independent contributor to symptoms.[8] This study aims to quantify the prevalence of FCR tendinopathy on MRI and the coexistence of trapeziometacarpal (TMC) or STT osteoarthritis.

We hypothesized that the overall prevalence of FCR tendinopathy on magnetic resonance does not vary between patients undergoing upper extremity MRI for volar sided wrist pain and those undergoing MRI for other wrist indications (eg, fracture or suspected fracture, arthritis, scapholunate ligament insufficiency, ganglion, tumor, de Quervain, intersection syndrome) accounting for associated TMC and STT osteoarthritis, age, and sex.

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Methods

Study Design and Patients

After institutional review board approval, 3631 adult patients were identified who had MRI of the hand or wrist between January 2000 and December 2014 using an institutional research database. If a person had multiple MRIs during the study period, only his or her first MRI was included. The median age was 45 years (interquartile range, 33-56; range, 18-94), and 49% (n = 1787) were men. In total, 2327 patients had more than 1 indication for MRI noted.

Tendinopathy

Signal changes in the FCR tendon were identified using a text search of the radiology reports. The initial search was conducted on the following words: "fcr," "flexor," "radialis," and "carpi/carpus." This cohort was further searched for "tendinopathy" or synonyms like "synovitis" as well as terms for abnormalities and signal changes (Supplement 1). We reviewed the MRIs of the 302 patients identified with possible FCR signal abnormalities by text search; a total of 98 patients were identified with FCR tendinopathy. Medical records were reviewed to identify if wrists were painful on the volar radial side (or if FCR tendinopathy was a working diagnosis). In the absence of such findings on examination, any signal changes in the FCR were considered incidental.

The incidence of FCR tendinopathy on MRI was 2.7% (98 of 3631). Forty-four of these 98 patients (45%) had suspected FCR tendinopathy. In the remaining patients (55%), the changes in the FCR were considered incidental (Table 1).

Statistical Analysis

Explanatory variables were age, sex, race, and the indications for MRI. The Research Patient Data Registry (RPDR) database was used to identify demographic and radiology reports were used for information about the MRI indication. Data were extracted with the use of Stata 13 (StataCorp LP, Texas) searching for "clinical suspected FCR," "volar sided wrist pain," "tear or dislocation," "nonspecific pain," "trauma or fractures," "inflammation," "avascular necrosis," "hand or wrist pain," "nerve compression or numbness," "mass or swelling," "arthritis," "other tendinopathies or stiffness," and "other,"

The baseline characteristics were summarized with frequencies and percentages for categorical variables and the median and interquartile range was used for continuous variables.

In bivariate analysis, the incidence rate of FCR tendinopathy per indication, sex, and race were examined with the Fisher exact test for normal distributed data and the Wilcoxon rank sum test for the variable age. Variables in bivariate analysis with a P value below .05 were inserted in a multivariable logistic regression analysis. The odds ratio (OR) with 95% confidence intervals (CIs) is provided to quantify the association of explanatory variables with the outcome variable (FCR tendinopathy). A 2-sided P value of less than .05 is considered significant.

Results

In bivariate analysis, we found that older age ($P < .001$), white race ($P = .02$), clinically suspected FCR tendinopathy ($P < .05$), volar-radial sided wrist pain ($P < .001$), and TMC and STT arthritis ($P = .004$) were significantly associated with FCR signal changes on MRI (Table 1).

In multivariable analysis, both older age (OR: 1.04, 95% CI: 1.02-1.05, $P < .001$) and volar-radial sided wrist pain (OR: 5.8, 95% CI: 3.2-11, $P < .001$) were independently associated with FCR signal changes on MRI (Table 2). The covariance of age and STT arthritis was 1.56 and the covariance of wrist pain and STT arthritis was 0.01.

Discussion

A large proportion of wrist pain is nonspecific, meaning that there is no discrete, objectively verifiable pathophysiology. When symptoms and examination are nonspecific, diagnostic tests can be misleading and lead to treatment of pathology that is not related to the patient's symptoms and exposure to risks of treatment. In our study, older age and location of pain were independent risk factors for FCR signal changes. Scaphotrapeziotrapezoid osteoarthritis covaried with age and did not covary with wrist pain.

Our study had several limitations. First, we relied on radiology reports rather than review of the MRI. Second, we assumed that the incidental signal changes in the FCR were asymptomatic if there was no specific evidence of volar-radial sided wrist pain in the medical record. Finally, we studied signal changes in the FCR among patients having a wrist MRI, and these results may not be generalizable to the larger population.

In this study, signal changes were identified in about 1 in 30 wrist MRIs; they were often incidental (55%), and they were collinear with peritrapezial osteoarthritis. Given that tendon changes may not return to normal signal intensity, they may be an incidental finding in patients with pain from osteoarthritis. This is consistent with a prior study of 20 bilateral MRIs in patients with no previous wrist injury or symptoms; there were 3.15 positive MRI findings per wrist. There were 126 positive findings (range: 1-6 per wrist), 68 ganglia, 11 ligament "tears" or perforations; and nonspecific increased joint fluids were seen.[4] The authors concluded that positive MRI findings are common and may be coincidental in patients with wrist pain. Given that symptomatic FCR tendinopathy is uncommon, osteoarthritis is common, and signal changes are often incidental to symptoms

Table 1. Bivariate Analysis of Factors Associated With FCR Tendinopathy on MRI (n = 3631).

Variable	Total cohort (n = 3631)	FCR signal changes (n = 98)	%[a]	*P* value
Age, median (IQR)	45 (33-56)	55 (43-66)		<.001
Sex, n (%)				
Men	1787 (49)	49 (50)	2.7	.92
Women	1844 (51)	49 (50)	2.7	
Race, n (%)				
White	2851 (79)	89 (91)	3.1	**.02**
African American	188 (5.0)	4 (4.0)	2.1	
Hispanic	156 (4.0)	0	0.0	
Asian	141 (4.0)	2 (2.0)	1.4	
Other/unknown	295 (8.0)	3 (3.0)	1.0	
Indication MRI,[b] n (%)				
Clinical suspected FCR tendinopathy	48 (1.3)	44 (45)	92	**.05**
Volar-radial sided wrist pain	123 (3.4)	15 (15)	12	**<.001**
Arthritis	184 (5.1)	12 (12)	6.5	**.004**
Nerve compression or numbness	62 (1.7)	3 (3,0)	4.8	.23
Tear or dislocation	393 (11)	14 (14)	3.6	.25
Non specific pain	743 (20)	24 (25)	3.2	.31
Other tendinopathies or stiffness	1050 (29)	32 (33)	3.0	.43
Hand or wrist pain	1819 (50)	50 (51)	2.7	.92
Mass or swelling	1454 (40)	40 (41)	2.8	.92
Avascular necrosis	78 (2.1)	2 (2.0)	2.6	.99
Inflammation	205 (5.6)	5 (5.0)	2.4	.99
Trauma or fractures	1241 (34)	25 (26)	2.0	.07
Other	120 (3.3)	2 (2.0)	1.7	.77

Note. Bold indicates significant difference (*P* value below .05). FCR = flexor carpi radialis; MRI = magnetic resonance imaging; IQR = interquartile range.
[a]Percentage FCR tendinopathy per variable.
[b]Patients can have multiple indications for MRI: 1304 (36%) had 1 indication, 1208 (33%) had 2 indications, 725 (19%) had 3 indications, and 394 (12%) had >4 indications.

Table 2. Multivariable Logistic Regression Analysis of Factors Independently Associated With FCR Tendinopathy on MRI (n = 98).

Variable	Odds ratio (95% confidence interval)	Standard error	*P* value	C statistic[a]
Age	10.4 (1.02-1.05)	0.01	**<.001**	0.71
Race (reference: white)[b]				
African American	0.72 (0.26-2.0)	0.38	.53	
Asian	0.59 (0.14-2.5)	0.43	.47	
Other/unknown	0.36 (0.11-1.2)	0.22	.09	
Volar-radial sided wrist pain	5.8 (3.2-11)	1.8	**<.001**	
Arthritis	1.9 (0.99-3.6)	0.63	.052	

Note. Bold indicates significant difference (*P* value below .05). FCR = flexor carpi radialis; MRI = magnetic resonance imaging.
[a]The C statistic is a measure of model fit and is the area under the receiver operating characteristics curve.
[b]No Hispanics in FCR tendinopathy group.

(as with other findings on wrist MRI), one should be cautious ascribing symptoms to FCR signal changes on MRI. Overinterpretation of MRI signal changes in the FCR tendon might lead to injections or surgeries with little potential for benefit greater than the placebo effect, and increasing the possibility of harm or disappointment.

FCR tendinosis is uncommon and often asymptomatic. Low prevalence diseases lead to limited diagnostic performance characteristics of even the most sensitive and specific diagnostic tests, even more when signal changes are common without symptoms.[9] Given the observation that symptoms and examination seemed sufficient to diagnose

the unusual patient with symptomatic FCR tendinopathy, we believe that the use of an MRI in patients with suspected FCR pathology is best restricted to confirmation of treatable pathology.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

With the approval of our institutional review board, we used a research database from 3 affiliated urban hospitals in a single city in the United States.

Declaration of Conflicting Interests

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