

# FREQUENCY OF CLINICAL AND RADIOLOGICAL FEATURES IN REPETITIVE STRESS DISEASES

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## ABSTRACT

**OBJECTIVES:** To determine the frequency of different clinical and radiological features occurring in patients with repetitive stress injuries (RSI) that included de Quervain disease, tennis elbow and plantar fasciitis.

**METHODOLOGY:** This cross sectional observational study using convenient sampling technique at Orthopedic Department in collaboration of Radiology Department was carried out for 06 months. After ethical approval, patients of either gender, between 20 to 60 years, diagnosed clinically and radio logically as either of RSI diseases were included while patients below 20 or above 60 years, having infection associated with osteomyelitis and cellulitis were excluded. Clinical features like pain, swelling, site were reported. Radiological imaging and details included ultrasonography, X-ray findings and Magnetic Resonance Imaging (MRI) findings for data analysis, SPSS version 23 was used. Quantitative data was represented as frequency and percentages. **RESULTS:** In a total of 82 patients with repetitive stress diseases, the mean age of the patients was noted to be 42.63–8.53 years, there were 40 (48.8%) male patients whereas 42 (51.2%) were females. A majority 62 (75.6%) patients had no co morbidities, while others had hypertension 10 (12.2%), diabetes mellitus 8 (9.8%) and only a very small population 2 (2.4%) had hypertension with diabetes mellitus. 34 (41.4%) patients had a diagnosis of De-Quervain disease, 28 (34.1%) had Tennis elbow while 20 (24.4%) had planter fasciitis. Ultrasound findings were observed in 30 patients, X-ray findings in 56 patients and MRI findings in 24 patients. 18 patients reported positive Cozens test while in 22 patients, Finkelstein test was positive. **CONCLUSION:** Most commonly observed RSI was de Quervain disease followed by tennis elbow and plantar fasciitis. Most common ultrasound, X-ray and MRI finding was increased fluid within first extensor tendon compartment, cortical erosion and a positive Finkelstein test respectively.

**Keywords:** Repetitive Stress Injury, de Quervain disease, tennis elbow, plantar fasciitis

## Introduction

Repetitive stress injuries (RSI) of the forearm are commonly observed amongst individuals that are employed in occupations in which a high level of exposure to physical activities persists in comparison to other occupations in which there is lesser exposure to physical work.<sup>1</sup> RSI are associated with pain, injury, loss of work and disability. Some researchers think that a strong biological or genetic plausibility also exists in the relationship of prevalence among muscu-

loskeletal diseases of the forearm to the causative exposure to factors in high exposure occupational environments.<sup>2</sup> Researchers have also reported that specific interventions ought to help in reducing the rates of such musculoskeletal disorders among workers performing high risk, physical tasks. It is seen that no single intervention appears to be universally effective. A successful intervention requires attention towards the individual along with organi-

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zational and working characteristics and to tailor them according to corrective actions for improving disease status.<sup>3</sup>

Three main disorders constitute RSI. These include tennis elbow, de Quervain s disease and plantar fasciitis. De Quervain s disease also known as gamer s thumb or mother s thumb is a commonly observed pathology of wrist.<sup>4</sup>

Even though the precise pathway of this pathology hasn t been full determined, the reason behind this disease is thought to be because of synovial sheath thickening which contains the tendons of abductor pollicis longus (APL) and extensor pollicis brevis (EPB). This thickening causes muscles irritation, leading to pain and swelling on radial side of wrist in addition to raised difficulties in gripping movements.<sup>5</sup> Researchers have indicated that de Quervain s tendon sheath gets thick and starts to fibrosis with nodules, however no inflammatory changes are observed. De Quervain s disorder is frequently seen among peri-menopausal and in pregnant mothers, associated with overuse, even though there is no clear evidence that has suggested this change.<sup>6</sup>

De Quervain s tenosynovitis can be as painful as any other stenosing tenosynovitis of the thumb abductors around radial styloid processes. The incidence of this disorder is on the rise, with the rising physical occupational and professional demand. Frequent wrist movement and continuous thumb pinching can lead to this painful condition.<sup>7</sup> Other synonyms of this condition include, texting tenosynovitis, first dorsal compartment tenosynovitis, washer woman s sprain and blackberry thumb. This condition can be triggered by an inflamed tendon sheath in the wrist s first dorsal compartment. Such individuals might experience in addition to pain, numbness, burning, tingling and cramping. Standard testing in de Quervain s is a positive Finkelstein test.<sup>8</sup>

Lateral elbow tendinopathy, also known as lateral epicondylalgia, lateral epicondylitis, lateral epicondylolysis and / or tennis elbow is another most commonly observed lesion of arm. Although tennis elbow is the term usually used, lateral elbow tendinopathy is the most appropriately terminology to be used clinically since other terms might refer to inappropriate causes, patho-physiological or anatomical term.<sup>9</sup> Tennis elbow is defined as a painful syndrome in and around the lateral epicondyle.

It can be a degenerative or due to failure of tendon s healing as compared to inflammation. Therefore, a higher ratio of fibroblasts, proteoglycans, vascular hyperplasia and glycosaminoglycans coupled to disorganized and immature collagen might occur in absence of prostaglandins and inflammatory cells. The most affected muscle in this condition is the extensor carpi radialisbrevis.<sup>10</sup> Usually, tennis elbow is work or a sport related painful condition. Dominant arm is frequently affected, with peak incidence being around 30 to 60 years while with increased duration of the conditions, both severity and pain starts to decline.<sup>11</sup>

Pain, immobility and reduced functioning of the affected arm are main complains of patients with tennis elbow. Even though sign and symptoms of tennis elbow are clear, with a simple diagnosis yet to date the ideal treatment of this condition hasn t yet been observed. Most clinician use a more conservative approach for treating tennis elbow. Most commonly, physiotherapy is advised. However a wide range of physiotherapeutic treatments are used. The main objective of any treatment is to decrease pain along with improvement in function and mobility.<sup>12</sup>

A painful medial prominence of the calcaneum tends to impact millions of humans around the globe, predicting around 07 % of over 65 year old individuals. Diagnosis of plantar heel pain is frequently observed in both developed and developing worlds.<sup>13</sup> Plantar fasciitis patients mostly complain of pain at antero-medialcalcaneum prominence. Exacerbation of pain is observed in dorsiflexion of toes. At time of presentation, symptoms may have persisted for weeks to months.<sup>14</sup> Worsening of pain is seen when a person stands after resting, especially in the morning. Once patients start to walk, a decrease in pain threshold is observed. Even though pain is reduced, however it doesn t resolve completely, being exacerbation via activities like continuous walking and exercising, especially on hard surface. Patients when presenting to a clinicians, might have previously used over the counter medicated shoes or heel inserts.<sup>15</sup>

A decreased dorsiflexion of ankle along with obesity are well-known risk factors for plantar fasciitis. It is also related to bio-mechanical abnormalities like tight Achilles tendon, pesplanus and pescavus.<sup>16</sup> An increased frequency is observed among sero-negative spondyarthropathy and gout individuals. Although

majority of individuals with plantar fasciitis show adequate response to conservative treatment and improve with passage of time, however approximately 01 % individuals might need for undergoing surgical intervention.<sup>17</sup>

The objective of this study was to determine the frequency of different clinical and radiological features occurring in patients with repetitive stress injuries (RSI) that included de Quervain disease, tennis elbow and plantar fasciitis.

## Methodology

This cross sectional observational study using convenient sampling technique was carried out at the Orthopedic Department in collaboration of Radiology Department of Sir Syed Hospital, Karachi for a period of 06 months from August 2019 to January 2020. The study was done after attaining ethical approval from the Institutional Review Board of the hospital and written and informed consent from the patients. Patients of either gender, between 20 to 60 years of age, diagnosed clinically as well as radiologically as a case of either of the RSI diseases such as de Quervain, tennis elbow or plantar fasciitis were included in the study. Patients below 20 years or above 60 years of age, having an infection which was associated with osteomyelitis and cellulitis were excluded from the study. A total of 82 patients were included in the study.

Clinical features such as pain, swelling, site were reported. Radiological imaging and details included ultrasonography which was used to reported thickness of fascia >4.5 mm, hypo echoic fascia, increase in fluid within the first extensor tendon compartment and presence of sub-cutaneous edema. In addition, X-ray findings included a calcaneal spur, healing, and cortical erosion, and periosteal reaction, sclerosis in soft tissues and calcification in soft tissues. MRI findings were done for confirming diagnosis using Cozens Test and Finkelstein Test. For data analysis, SPSS version 23 was used. Quantitative data was represented as frequency and percentages.

## Results

In a total of 82 patients with repetitive stress diseases,

the mean age of the patients was noted to be 42.63 – 8.53 years, there were 40 (48.8%) male patients whereas 42 (51.2%) were females. A majority 62 (75.6%) patients had no co morbidities, while others had hypertension 10 (12.2%), diabetes mellitus 8 (9.8%) and only a very small population 2 (2.4%) had hypertension with diabetes mellitus. 34 (41.4%) patients had a diagnosis of De-Quervain disease, 28 (34.1%) had tennis elbow while 20(24.4%) had planter fasciitis.

Assessing patients clinically for pain, swelling and site of swelling, following results were found. 42 (51.2%) patients reported a moderate intensity pain, whereas an equal proportion of patients i.e. 24.4% rated the pain as mild and severe. On assessment, swelling was found to be mild in 70 (85.4%) patients and moderate in a small number of 12 (14.6%) patients. Sites commonly targeted in disease process were evaluated in detail for every patient and it was observed that in 18 (22%) patients left radial styloid process was involved, an equal number of 16 (19.5%) patients had right radial styloid process & left lateral epicondyle involvement, 12 (14.6%) patients had right radial epicondyle involvement, whereas involvement of left & right heel planter surface was found in 14 (17.1%) and 6 (7.3%) patients respectively. Cozen's test was performed during examination and 18 (22%) patients were positive while 64 (78%) had negative results. Finkelstein's test was also negative for 60 (73.2%) patients and 22 (26.8%) had a positive result (Tab. 1).

Results for radiological features in the patients with repetitive stress diseases were based on ultrasound, X-ray and MRI findings. Ultrasound findings were found to be negative in 52 (63.4%) patients and 30 (36.6%) had positive findings. 6 (7.3%) patients had increase in fascial thickness > 4.5 mm, while in 76 (92.7%) patients the thickness was less than 4.5 mm. 10 (12.2%) patients had hypoechoic fascia. Only 16 (19.5%) patients had increased fluid within 1st extensor tendon compartment and other 66 (80.5%) had no such increase in fluid. Sub cutaneous edema was not observed in any of the patients.

Majority of patients i.e. 56 (68.3%) patients had positive X-ray findings. Calcaneal spur was found in 14 (17.1%) patients, whereas 68 (82.9%) patients calcaneal spur was absent. Cortical erosions were seen in 24 (29.3%) patients while 58 (70.7%) were

Variable		n	%
Gender	Male	40	48.8
	Female	42	51.2
Co-morbid	Diabetes mellitus with hypertension	2	2.4
	Diabetes Mellitus	8	9.8
	Hypertension	10	12.2
	No Co-morbid	62	75.6
Diagnosis	Tennis Elbow	28	34.1
	De-Quervain's Disease	34	41.5
	Planter Fasciitis	20	24.4
Pain	Mild	20	24.4
	Moderate	42	51.2
	Severe	20	24.4
Swelling	Mild	70	85.4
	Moderate	12	14.6
Site	Left Radial Styloid Process	18	22.0
	Right Radial Styloid Process	16	19.5
	Left Lateral Epicondyle Process	16	19.5
	Right Lateral Epicondyle Process	12	14.6
	Left Heal Planter Surface	14	17.1
	Right Heal Planter Surface	6	7.3

**Table 1:** Baseline demographics and clinical features of patients with RSI.

negative for such erosions. Almost one fourth 18 (22%) of patients had an X ray showing periosteal reaction, whereas 64 (78%) patients had no reaction by periosteum. A majority of patients i.e. 68 (82.9%) did not have any sclerosis in the soft tissues with the exception of 14 (17.1%) patients. Calcification in soft tissues was observed in only 16 (19.5%) patients and 66 (80.5%) had no soft tissue calcification. MRI findings were positive in 24 (29.3%) and negative in 58 (70.7%) patients (Tab. 2).

## Discussion

RSI results from a repeated movement of a specific body part. It is also known as repetitive motion injury, trauma disorder, or musculoskeletal disorder. Most often associated with people working with an awkward posture, poor techniques, bending wrist frequently while performing tasks, using improper equipment, working rapidly without any breaks and not performing

Variable		n	%
Ultrasound Findings	Yes	30	36.6
	No	52	63.4
Increase Thickness of Fascia > 4.5mm	Yes	6	7.3
	No	76	92.7
Hypo echoic Fascia	Yes	10	12.2
	No	72	87.8
Increased Fluid within 1st Extensor Tendon Compartment	Yes	16	19.5
	No	66	80.5
Sub Cutaneous Edema	Yes	0	0.0
	No	82	100.0
X-ray Findings	Yes	56	68.3
	No	26	31.7
Calcaneal spur	Yes	14	17.1
	No	68	82.9
Heal	Yes	0	0.0
	No	82	100.0
Cortical Erosion	Yes	24	29.3
	No	58	70.7
Periosteal Reaction	Yes	18	22.0
	No	64	78.0
Sclerosis in Soft Tissues	Yes	14	17.1
	No	68	82.9
Calcification in Soft Tissues	Yes	16	19.5
	No	66	80.5
MRI Findings	Yes	24	29.3
	No	58	70.7
Cozens Tests	Positive	18	22.0
	Negative	64	78.0
Finkelstein Tests	Positive	22	26.8
	Negative	60	73.2

**Table 2:** Radiological findings of patients with RSI.

stress releasing exercises for promoting graceful motion and good wrist using techniques. RSI tends to occur not only in workers or adults, but also in keying school assignments, playing video or computer games or surfing internet increases RSI incidence among youngsters.<sup>18</sup>

In a study determining the diagnostic accuracy of different imaging modalities for detecting clinically diagnosed de Quervain disease in twenty two different studies reported that in using ultrasound, magnetic

resonance imaging and scintigraphy studies, patients were found to have sheath effusion, retinaculum thickening, tenosynovitis, subcutaneous edema and increased uptake on scintigraphy.<sup>19</sup> The most commonly observed finding was tendon sheath swelling and ultrasound was the most commonly performed imaging technique used.<sup>20</sup> Similarly in our study as well, in de Quervain disease patients of the study, swelling was observed in all the patients, with mild swelling in 70 (85%) of patients while moderate swelling in 12 (15%) of patients. 10 (12%) patients reported hypoechoic fascia while increase fluid in first extensor tendon compartment was seen in 16 (20%) of patients. None of the patients reported subcutaneous edema.

In another study in which after confirming diagnoses of de Quervain disease on ultrasound, used ultrasound guided steroid injection to treat the disease classified the anatomic variations of de Quervain disease as complete sub-compartmentalization, distal incomplete sub-compartmentalization and no sub-compartmentalization.<sup>21</sup> However in our study, firstly only diagnostically, ultrasound was used. Secondly, classification of de Quervain disease was done on the site on injury, i.e. left or right radial styloid process or right or left lateral epicondyle process.

It is reported that in de Quervain disease patients, a substantially increased proportion of supernumerary tendon slips and compartmentalization of first extensor compartments is observed with greater cross-sectional area of first extensor compartment at styloid process of radius.<sup>22</sup> In our study, 18 (22%) patients reported greater surface area on the left radial styloid process while in 16 (20%) of patients, the right radial styloid process was involved.

A study on ultrasonography of patients with de Quervain disease reported 53 % patients having single tendon of APL and more than one tendon in 47% patients. All the patients in the study were found to have positive Finkelstein test on MRI.<sup>23</sup> In contrast, our study reported 22 (26.8%) of patients having a positive Finkelstein test. Research done on imaging studies in patients of tennis elbow reported that although many tennis elbow cases can be diagnosed on clinical basis, however some clinical symptoms might not be that well-defined, therefore the need for other diagnostic modalities might be needed.<sup>24</sup> Likewise the study found that using X-rays, sclerosis

of tissues, calcification, periosteal reaction, cortical erosion as well as healing patterns can be observed.<sup>25</sup> Ultrasonography has been recommended the diagnostic test of choice; helping in showing structural changes which affects the tendons, i.e. thickening, thinning, tears in tendon and intra-structural degenerative areas can be easily visualized in addition to irregularities in bone or calcified deposits.<sup>26</sup> MRI helps in providing more reproducibility, reducing inter-operative variability and giving more information regarding intra-articular pathologies.<sup>27</sup>

Even diagnosis of plantar fasciitis is observed to be done clinically in some cases, however majority require additional diagnostic work up for confirmation of diagnosis. Ultrasound and MRI findings are known for their ability in depicting changes in plantar fascia. Few studies have compared radiological findings of plantar fasciitis.<sup>28</sup> Sutera and Fazal et al reported in their respective studies that most patients with plantar fasciitis was observed to have calcaneal spur as the most common findings with an increased fascia thickness >4.5 mm (29, 30). Likewise in our study as well, calcaneal spur was seen in 14 (17%) of patients while increased thickness of fascia in 06 (7%) of patients.

## Conclusion

According to the results of the study, the most commonly observed repetitive stress injury was de Quervain disease followed by tennis elbow and plantar fasciitis. Most common ultrasound, X-ray and MRI finding was increased fluid within first extensor tendon compartment, cortical erosion and a positive Finkelstein test respectively.

**Conflict of Interest:** None

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