Hypothesizing Patho-Mechanism of De Quervian Syndrome: A Case Series

MS Pawan Kumar PT\textsuperscript{1}, TS Veergoudhaman PT\textsuperscript{2}, SF Mariyam Farzana\textsuperscript{3}, V Vijayananth PT\textsuperscript{4}, TN Suresh PT\textsuperscript{5}, A Anandh Raj PT\textsuperscript{6}

1. Physiotherapist, RAA Physiotherapy Clinic,  
2. Dean In Charge, SRM College of Physiotherapy, SRM IST.  
3. Assistant Professor, SRM College of Physiotherapy, SRM IST.  
4. HOD, The Royal office Medical center, Muscat, Sultanate of Oman.  
5. Vice Principal, SRM College of Physiotherapy, SRM IST.  
6. Physiotherapist, RAA Physiotherapy Clinic,  

Abstract: The De Quervian syndrome has varied range of causative factors, the mechanical causative factor is common, which causes stenosing tenosynovitis by friction of Abductor Pollicis Longus and Extensor Pollicis Brevis tendons at first compartment of extensor retinaculum.Till date the patho-mechanism causing the friction of Abductor Pollicis Longus and Extensor Pollicis Brevis not explained. This case series with 4 samples, in which 4 subjects underwent manual physiotherapy for De Quervian syndrome, hypothesizes the patho-mechanism of De Quervian syndrome from mechanical origin, with the kinematic relationship of superior and inferior radio-ulnar joints, carpal joints and CMC joint.  

Keywords: De Quervian syndrome, stenosing tenosynovitis, patho-mechanism, kinematic relationship  


Introduction  

The De Quervian Syndrome (DQS) is a common musculoskeletal problem on radial aspect of wrist. Although it has multiple etiologies, the mechanical causative factor is more common, in which tendon friction takes places, the biomechanical cause of tendon friction had not been much explored till the date. The De Quervian syndrome is a stenosing tenosynovitis, pain on the radial aspect of wrist and tenderness at distal aspect of radial styloid process, exaggerated during wrist and thumb movements especially on ulnar deviations and gripping activities\textsuperscript{(1)(2)}. The pain will be insidious in onset, with the presence of tenderness in Abductor Pollicis Longus (APL) and Extensor Pollicis Brevis (EPB) and positive Finkelstein's test confirms the diagnosis of De Quervian syndrome\textsuperscript{(2)}.  

Anatomy
The muscles which causes the action of extension movements of wrist, thumb and fingers, originates from lateral condylar region of humerus and dorsal aspect of forearm and inserts respectively on wrist, fingers and thumb. Before insertion of the muscles, the tendons are wrapped by synovial covering to prevent friction, these tendons passes through the ligamentous structure extensor retinaculam. In extensor retinaculam there are nearly 6 distinctive compartments for Extensor muscles tendon, the first compartment contains APL & EPB muscles, radial artery and branch of radial sensory nerve passes close to first dorsal compartment(2,3).

Patho Physiology

In De quervian syndrome, there will be thickening of tendon and narrowing of the first compartment, it results in reduction of geometrical space in the canal, so the movements causes friction of the tendons, irritation, inflammation and swelling(1).

Etiology

Repetitive motions
Sports activities (racquet sports, rowers)
Rheumatoid Arthritis
Pregnancy
Endocrinological problem(2, 4, 5)

Case Series

From the year 2016 to 2019, 3 male patients & 1 female patient between the age group of 20 to 72, referred by a GP, came with an excruciating pain on radial aspect of right wrist, clinical laboratory findings in these patients for RA, urea creatinine & TSH are normal. The radiological findings revealed periosteal changes and mild soft tissue swelling in x-ray. On Subjective Examination these patients reported pain, restriction in ADL due to the pain, they reported about their strenuous repetitive activities like carrying, screwing, twisting and past job nature in their history. On Physical Examination there was tenderness in forearm extensor muscles, APL & EPB tendon and thenar muscles . Restriction in movements of thumb and wrist particularly wrist flexion, ulnar deviation and forearm supination, muscle power of APL & EPB was grade <3 and 3, loss of joint play in – proximal carpal row restriction for dorsal glide & dorsal carpal rows restriction for volar glide, first CMC joint restriction for palmar glide of 1st metacarpal, superiorradio ulnar joints restriction of radial head to anterior glide& inferior radio-ulnar joint restriction of distal radius to posterior glide (arthrokinematic restriction for supination). Finkelstein's test was
positive, Neurodynamic test was positive for sensory branch of radial nerve. With the subjective and objective examination, the provisional diagnosis is made as De Quervain syndrome. These 4 patients had a similar kind of physical findings soft tissue tenderness, arthro-kinematic & osteo-kinematic restrictions and neurodynamic restriction of radial sensory nerve. These 4 patients were addressed with soft tissue manipulation to forearm extensor muscles, specifically to APL & EPB. restored the lost joint play of superior & inferior radio-ulnar joints, proximal & dorsal carpal rows and first CMC Joint with kaltemborn technique, Neural mobilisation for sensory branch of radial nerve had been administered. With the above mentioned treatment protocol these 4 patients had an significant improvement from the stenosing tenosynovitis of APL & EPB (De Quervian syndrome) and their disabilities in ADL had improved.

Discussion

The altered mechanics of superior and inferior radio-ulnar joint acts as a pre-cursor in causing stenosing tenosynovitis. Anatomically superior radio-ulnar joint is confined to elbow joint and the inferior radio-ulnar joint not confined to wrist joint, the mechanical link of these two joints causes pronation and supination in forearm through long axis\(^6\).

The axis for the pronation and supination passes through head of the radius and between the radius and ulna in interosseous membrane, it is collinear in nature\(^6\). On pronation the radial head at superior radio-ulnar joint spins on the capitulum and annular ligament (fibro-osseous ring), radius shaft swings on the ulna. On inferior radio-ulnar joint, ulna moves into extension, abduction and migrates posteriorly and radius swings medially over the ulnar styloid process and on pronation the shaft of the radius will moves proximally for few millimeters and causes positive ulnar variance. For supination reverse of these motion is occurs\(^7\).

The extensors retinaculum prevents the bowstringing of tendons of the muscles which crossing wrist joint dorsally and dorso-laterally and anchors it. This extensor retinaculum radially attached to radial styloid process and radial collateral ligament, medially it is attached to ulnar styloid process, pisiform and flexor carpi ulnaris. The extensor retinaculum consist 6 distinct compartment with synovial covering for the extensor muscles tendon, the Extensor Pollicis Brevis (EPB) and Abductor Pollicis Longus (APL) tendons is confined to 1\(^{st}\) compartment and adjacent to it radial artery and sensory branch of radial nerve courses\(^2,3,8\).

During pronation of forearm, the extensor retinaculum with its attachments to radial and ulnar styloid process elongates and stretches, while elongating and stretching the extensor reticulum is prone to compress the 6 fibro-osseous compartments, in this the 1\(^{st}\) compartment which is in close proximity to radial styloid process are more vulnerable to compression. Repetitive or sustained pronation activity for long period of time causes the inferior radius at inferior radio-ulnar joint to get stuck medial to ulna, it stretches the extensor retinaculum and causes compression of the 1\(^{st}\) compartment, reduction in cross-sectional geometry of the 1\(^{st}\) compartment, further any motions in thumb abduction & extension and wrist ulnar deviation causes friction of the EPB & APL tendons and it
causes inflammation of EPB & APL tendons and synovial sheaths, and as a consequence stenosing tenosynovitis De Quervian Syndrome.

The dysfunctional superior and inferior radio-ulnar joint which stuck in pronation arthro-kinematically with restriction to supination is prone to stretch extensor retinaculum and compression of the 1st compartment in it and causes stenosingteno-synovitis of EPB and APL. The four patient sample in this study had dysfunction in superior and inferior radio-ulnar joint, it was stuck in pronation and there was restriction to supination both actively and passively. With the above biomechanical clinic findings, through this study hypothesizing the patho-mechanism causing pathology of stenosingteno-synovitis De Quervain Syndrome. In De Quervian Syndrome pathology involvement of EPB & APL tendons and synovial sheaths are common, involvement of sensory branch of radial nerve is uncommon, but the sensory branch of radial nerve transversing to the hand is adjacent to 1st compartment of fibro-osseous compartment of extensor retinaculum, so either the inflammatory process of teno-synovium can be tethered sensory branch of radial nerve, medial swing of the radius in distal radio-ulnar joint may be interfered with the course of sensory branch of radial nerve and caused neuro-dynamic restrictions.

The arthro-kinematic restriction of carpal joints proximal row & distal row, and in 1st CMC joint which prevailed in these 4 patients are product of superior and inferior radio-ulnar joint dysfunction which stucked in pronation, with restriction to supination. The forearm pronation and supination commonly occurs on radius and carpal bone on the fixed humerus and ulna. During pronation, carpal bones concomitantly pronates, on the extreme range of pronation, the wrist joint extends and deviates radially, during this wrist extension and radial deviation proximal row of carpals slides volarly and distal row slides dorsally and concomitantly the proximal row of carpals will pronates. The chronicity of the superior and inferior radio-ulna joints which stuck in pronation due to repetitive or sustained pronation motion of forearm had caused arthro-kinematic motion restriction in carpal joints and 1st CMC joint, restriction of proximal carpal row to slide dorsally and distal carpal row to slide volarly. The 1st CMC joint, 1st metacarpal articulates with trapezium which belongs to distal carpal row, during abduction of thumb 1st metacarpal rolls volarly and slides dorsally on the trapezium, in these patients the trapezium was stuck dorsally, hence it restricted the 1st metacarpal to roll volarly and slide dorsally, arthro-kinematics which is necessary for thumb abduction.

**Conclusion**

Till date, though patho-physiology regarding De quervian syndrome had been explained by various researchers. But not much about patho mechanism which causes patho-physiology from mechanical origin. Through this case series with patients with similar physical finding of different genders and age groups between 20 to 70, the patho-mechanism which causing the patho physiology of stenosing tenosynovitis from the mechanical origins due to kinematic relationship between elbow and wrist and its arthro-kinematic restrictions. This patho-mechanism is a
hypothesis still more studies needed to validate this patho-mechanism. This case series reveals the biomechanical cause of De quervain syndrome a stenosing tenosynovitis.

**Conflicts of interest**

No conflicts of interest

**Source of funding**

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**Ethical approval**

There is no any ethical approve since this study was not conducted under any organization or institution

**Consent**

Informed consent had obtained from the subjects

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