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## Role of preoperative ultrasonography in De Quervain's disease

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### Abstract

**Background:** Fritz De Quervain first described the tenosynovitis of first extensor compartment tendons of abductor pollicis longus and extensor pollicis brevis and hence the affection bears his name. Clinically characterized by pain and swelling over the Radial styloid process, a positive finkelstein test and accompanied by a palpable thickening of the tendon sheaths and painful wrist and thumb movements. The diagnosis is usually clinical and the treatment varies from conservative to surgical decompression of the first extensor compartment.

**Materials and Methods:** This is a prospective study of 28 patients of de Quervain's tenosynovitis involving 30 wrists treated in Father Muller Medical College and Hospital, Mangalore between 1 July 2015 and 30 September 2016

**Results:** Total 28 patients and 30 wrists were examined in this study. The disease was found to be more common in fourth and fifth decade of life. In our study there were 23 females out of total 28 patients. Right wrist was more commonly affected than the left. Out of 28 patients 18 underwent surgery. Total 20 wrists out of 30 were surgically decompressed. Ultra sound showed the presence of single tendon of APL in 16 wrists (53.3%) and more than 1 tendon in 14 cases (46.7%). Out of 20 wrists which were operated 12 had 2 slips of APL and 8 had one slip of APL. Ultra sound correctly identified the number of tendons in all except one case, in which it under diagnosed the number of tendons.

**Conclusion:** Though ultrasound could not pick up a sub compartment it can still prevent the complication of incomplete surgical release as it correctly identifies the number of tendons. We strongly recommend looking for a sub compartment when the number of tendons seen on ultrasound is more than that found on table.

**Keywords:** Dequervain, tendons, ultrasound, wrists

### Introduction

Fritz De Quervain first described the tenosynovitis of first extensor compartment tendons of abductor pollicis longus and extensor pollicis brevis and hence the affection bears his name. Clinically characterized by pain and swelling over the Radial styloid process, a positive finkelstein test and accompanied by a palpable thickening of the tendon sheaths and painful wrist and thumb movements.

The diagnosis is usually clinical and the treatment varies from conservative to surgical decompression of the first extensor compartment.

This study was done to analyze the ultrasonographic features of De Quervain's tenosynovitis, to study its usefulness in the diagnosis and management of de Quervain's disease and most importantly to study its ability to pick up anatomical variations of first extensor compartment and thereby preventing the complication of incomplete release.

### Aims of the Study

To study the epidemiology of De Quervain's disease and to study the incidence and pattern of anatomical variations in the first extensor compartment

- To study the ultra-sonographic features of De Quervain's disease.
- To study the role of ultrasound in diagnosis, management and most importantly in preventing the complication of incomplete surgical release in patients of de Quervain's disease.
- To correlate ultrasound findings in patients of De quervain disease with per operative findings.

**Materials and Methods**

This is a prospective study of 28 patients of de Quervain’s tenosynovitis involving 30 wrists treated in Father Muller Medical College and Hospital, Mangalore between 1 July 2015 and 30 September 2016. The criteria for diagnosis were a history of pain over radial aspect of wrist, aggravated by the use of the thumb, tenderness over the radial styloid process and a positive finkelstein test. The exclusion criteria were systemic diseases like rheumatoid arthritis and gout or a history of trauma/surgery at the site.

Once the diagnosis was confirmed ultrasound examination was done using a 12 MHZ linear array transducer. Both the unaffected and affected wrists in a patient of De quervain’s disease were examined by ultrasound for dimensions of the first extensor compartment and its cross sectional area, number and size of individual tendons, presence of anatomical variations like multiple slips or a separate compartment and synovial thickening and fluid within the sheath.

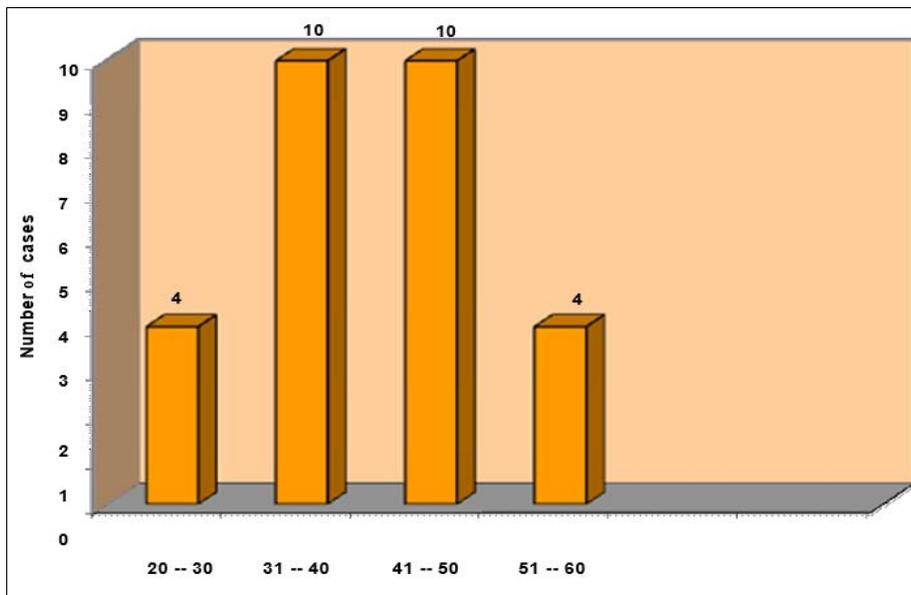
Surgical decompression was done using either a longitudinal or transverse incision after sterile skin preparation and draping. Surgery was done under either brachial block or local anaesthesia under tourniquet control. In this study 20 out of 30 wrists underwent surgical decompression of the first dorsal compartment of the wrist.

**Analysis and Results**

A total of 30 wrists in 28 patients were analyzed in this study. The youngest patient was 20 years and the oldest was 60 years old.

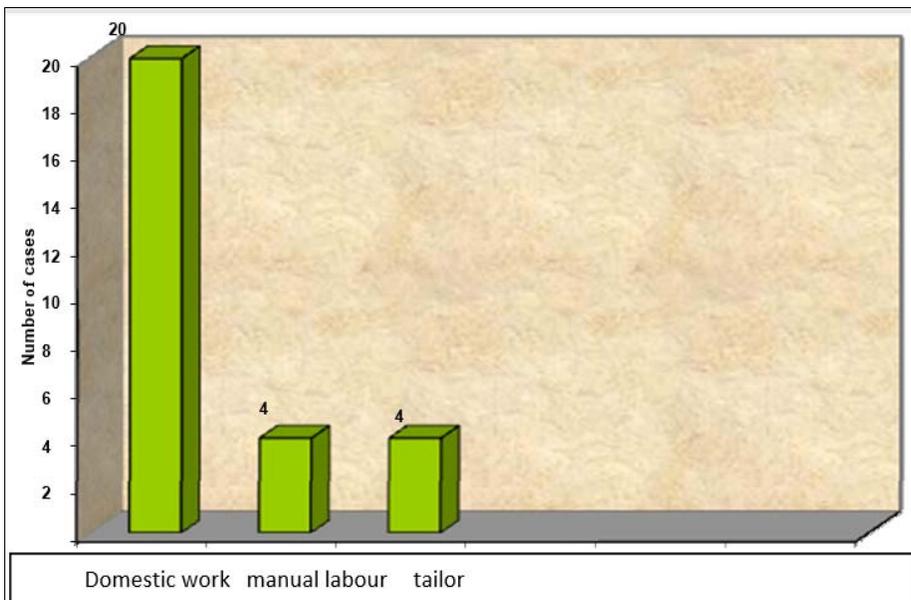
**Age and Sex Incidence**

Majority of the patient were in 30-50 years of age. The maximum incidence was noticed between 30-50 years of age in both males and females. In our series out of 28 patients, 5 were males and 23 were females. Of the 28 patients in our study the age distribution was as follows



**Occupation**

The highest incidence was seen in housewives involved in domestic work.



From this bar chart it can be inferred that occupation involving strenuous activity with hand like domestic work, tailoring, and cooking etc. constitute a large chunk of the total patients.

### Duration of symptoms

Out of 28 patients, majority had pain of less than 1 month duration. The longest duration of symptom was seen in a patient who complained of on and off pain since last 11 months.

### Hand Involvement

Out of 28 patients, involvement of right hand was seen in 18 patients. The left hand was involved in 8 patients whereas 2 patients had bilateral involvement.

### Operative Findings

Out of 20 operated wrists multiple slips of APL was seen in 12 patients. In 8 patients APL was represented by a single slip.

EPB was represented by 2 slips in 1 out of 20 wrists. In the remaining 19 it had 1 slip.

In 6 out of 20 wrists the EPB tendon was found to be in a separate compartment while in the remaining 14 wrists it occupied the same compartment as the APL.

### Ultrasound Findings And Comparison With Intraoperative Findings

#### First Compartment

The size and cross sectional area of the first compartment was found to be increased in all the affected wrists as compared to the unaffected side. The mean cross sectional area on the affected side was 0.460cm<sup>2</sup> whereas that of unaffected side was 0.246cm<sup>2</sup>. This increase in cross sectional area was found to be significant

#### EPB

Out of 30 wrists which underwent ultrasound examination, 25 showed 1 slip of EPB at the radial styloid process whereas 1 showed 2 slips of EPB. In 4 wrists the tendon of APL and EPB could not be separately identified at radial styloid process and sonologically they appeared fused. Out of these 4 wrists distal ultrasound showed 1 slip of EPB in 3 wrists and 2 slips of EPB in 1 wrist. Out of 20 operated wrists we found 1 slip of EPB in 19 wrists and 2 slips in 1 wrist on table. Ultrasonography of these wrists correctly identified the number of tendons at radial styloid process in 18 out of 20 wrists. In 2 cases the tendons of APL and EPB could not be separately identified and they appeared sonologically fused to each other. However, a more distal scan correctly revealed the number of tendons in both the cases.

In 28 out of 30 wrists which underwent ultrasound examination the EPB was represented by a single slip. In 2 cases there were 2 slips of EPB. Thus EPB in most of the cases is represented by a single tendon.

#### APL

Out of 30 wrists which were ultrasonographically examined 14 wrists showed 1 slip of APL at the radial styloid process. Distal scan also showed the same number of tendons.

In 6 wrists, more than 1 slip of APL were found sonologically at the radial styloid process. Distal scan also showed the same number of tendons.

In 6 wrists, the ultrasound at radial styloid process showed 1 slip but a more distal scan showed the presence of extra slips.

In 4 wrists the EPB and APL tendon could not be identified separately at the radial styloid process as sonologically they appeared fused. However a distal scan in these cases revealed 2 slips of APL in 2 cases and 1 slip in remaining two.

Out of 20 wrists which were operated 12 had 2 slips of APL and 8 had 1 slip of APL. Ultrasound in these correctly identified the number of tendons in all except 1 wrist in which ultrasound showed 1 slip at radial styloid process, however peroperatively 2 slips of APL were found.

Out of 30 wrists which were examined sonologically 16 had 1 slip of APL and 14 were represented by 2 slips. Thus significantly in 47% of wrists APL was represented by 2 slips in our study.

### Synovial Sheath Thickening/Fluid

One of the most characteristic features seen in the ultrasonography of affected wrists was the presence of synovial sheath thickening and fluid within the sheath. In 29 out of 30 wrists there was synovial thickening and fluid present whereas in only one case of de Quervain's tenosynovitis there was no synovial sheath thickening and fluid. In contrast none of the unaffected wrist had any noticeable synovial thickening and fluid presence.

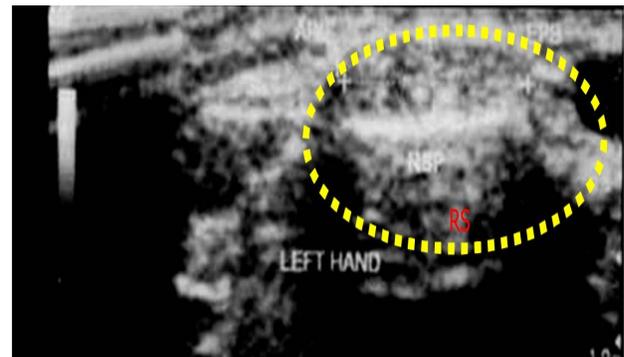
### Separate Compartment

We could not sonologically locate a septum dividing the first extensor compartment into two in any of our subjects. In 6 out of 20 operated wrists we found the EPB to lie in a separate compartment. On retrospective analysis of these 6 sonograms we found the EPB tendon to have a more localized synovial thickening. Also the tendons of APL and EPB were comparatively far from each other. Whether it is of any significance in identifying a separate compartment needs further study and verification.

### Tendons

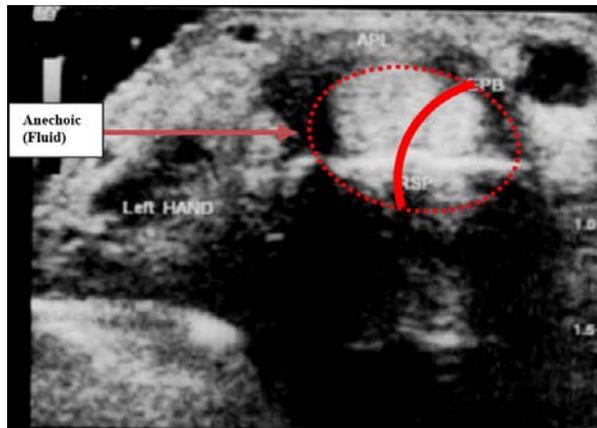
The other characteristic feature seen in de quervain's tenosynovitis is that the echogenic tendons can be easily made out against an anechoic background (usually the case with synovial thickening and fluid which appears black). The tendon outline can be easily made out. In unaffected wrists in most of the cases it is impossible to clearly mark the tendon outline and it is very difficult to separately identify APL and EPB slips at radial styloid process.

### Unaffected Wrist



Difficult to demarcate individual tendons

## Affected Wrist



Tendon outline can be easily made out.

## Discussion

Total 28 patients and 30 wrists were examined in this study. The disease was found to be more common in fourth and fifth decade of life. A similar pattern of age distribution was noted by Muckart (1964), Harvey (1990)<sup>[1]</sup> and LB Lane (2001)<sup>[2]</sup>. According to Lapidus (1972)<sup>[3]</sup>, Harvey (1990)<sup>[1]</sup>, Kay (2000)<sup>[4]</sup>, Lane (2001)<sup>[2]</sup>, the disease was more common in females. In our study there were 23 females out of total 28 patients and is comparable with the above mentioned studies. In our study the Right wrist was more commonly affected than the left, which is in accordance with the findings of Harvey (1990)<sup>[1]</sup> and Christopher Zingas (1998)<sup>[5]</sup>.

The concept that work is related to De Quervain's disease as an etiological factor has long been documented. According to De Quervain (1895), the pathology could be "Because the Thumb is the most used digit".

Finkelstein in 1930 concluded that repeated pinch gripping in ulnar deviation was causative in the "labouring class". However out of his 24 cases 16 were women involved in household duties (66.67%) and only one was a factory worker.

In a study by leao (1958)<sup>[6]</sup> 14 out of 29 (48.27%) cases were involved in domestic duties. In our study 20 patients (71%) were involved in domestic work, 2 patients (7%) were tailors and 6 patients (22%) were manual labourers. Thus in our study also the disease was most commonly seen in patients involved in domestic work which requires frequent ulnar deviation of the wrist.

Out of 28 patients 18 underwent surgery. Total 20 wrists out of 30 were surgically decompressed. In our study longitudinal incision was employed in 9 wrists and transverse incision in 11 wrists.

Variations in anatomy of first dorsal compartment has been known and documented by many authors (Bryan Keon-Cohen, W.T. Jackson, Bruce M Leslie, J. Bahm etc.). It is now known that variations in anatomy of first dorsal compartment are the rule rather than exception.

In our study per operatively we found that in 12 out of 20 wrists APL was represented by more than 1 tendon (60%). A similar incidence was reported by Bryan Keon-Cohen<sup>[7]</sup>, (79%) and J. Bahm (76%)<sup>[8]</sup>.

In 10 out of 30 wrists the correct number of APL tendons could not be ascertained by just doing an ultrasound examination at the radial styloid process. A more distal scan revealed the correct number of tendons.

Ultra sound showed the presence of single tendon of APL in

16 wrists (53.3%) and more than 1 tendon in 14 cases (46.7%). This is in agreement with other anatomical studies and our per operative percentage.

Out of 20 wrists which were operated 12 had 2 slips of APL and 8 had one slip of APL. Ultra sound correctly identified the number of tendons in all except one case, in which it underdiagnosed the number of tendons.

In most of the studies EPB has been found to have 1 tendon in the first extensor compartment (Kean-Cohen 79.5% and J. Bahm (96%)<sup>[8]</sup>). In our study per operatively we found EPB to be represented by a single slip in 19 out of 20 wrists (95%). In 1 wrists (5%) it had 2 tendons.

Out of the total 30 wrists which underwent sonological examination EPB had 1 tendon in 93.30%. It had 2 tendons in 6.70% of wrists. These values are in agreement with the above mentioned anatomical studies.

Ultrasound correctly predicted the number of EPB tendons in all the 20 operated wrists. However in 4 wrists (20%) a single scan at Radial styloid process was not sufficient to correctly identify the number of tendons which sonologically appeared to be fused with the APL tendon. In all these a distal scan was required to correctly identify the number of tendons.

In 4 out of 30 wrists (13%) a distal scan was required to correctly identify the number of EPB tendons. In all these 4 wrists the APL and EPB tendons appeared to be sonologically fused at radial styloid process.

Synovial sheath thickening and fluid within the sheath was seen in 29 out of 30 cases of de Quervain's disease (96.60%). More of synovial thickening and fluid was seen in acute cases and this decreased with increase in duration of symptoms. In contrast none of the unaffected wrist had any noticeable synovial thickening and fluid present. Thus presence of synovial sheath thickening and fluid within the sheath in the presence of relevant history and Clinical finding can be considered diagnostic of this condition. A similar finding was reported by Francesco Giovagnerio (1997)<sup>[9]</sup> in his study who noted thickening and edema of the synovial sheath and fluid within the sheath in all his cases.

## Tendons

The other characteristic feature seen in de quervain's tenosynovitis is that the echogenic tendons can be easily made out against an anechoic background (usually the case with synovial thickening and fluid which appears black). In unaffected wrists in most of the cases it is impossible to clearly mark the tendon outline and it is very difficult to separately identify APL and EPB slips at radial styloid process.

## Compartment size

The compartment size and the cross sectional area was found to be increased in all the affected wrists (100% cases) as compared to the unaffected wrists. To our knowledge there is no other study which has compared the compartment size and cross sectional area of affected wrist with that of unaffected wrist. We propose that this increase in compartment Size and cross sectional area can be considered as one of the diagnostic sonological feature of de Quervain's tenosynovitis.

## Separate Compartment

We were not able to sonologically pick up a septum dividing the first compartment into two in any of the wrists which underwent ultrasound examination. In 6 out of 20 wrists which were operated EPB was found to be in a separate compartment (30%). This is in agreement with the study of

Kean Cohen [7] and Bruce Leslie. J. Bahm [8] reported a higher incidence of separate compartment (60%). On retrospective analysis of sonogram of 6 wrists in which we got a separate compartment on table, we found that in 5 the EPB appeared far from the APL slip and there was thickened synovial sheath and fluid present between them. The intertendinous distances between APL and EPB at radial styloid process in these 5 cases were 1.6, 1.3, 1.6, 2.2 and 2.2 mm respectively. The mean intertendinous distance was 1.8mm. Patients in which ultrasound shows an intertendinous distance of 1.8mm or more are more likely to have a separate compartment. However since the sample size is small it needs further study and verification.

Though ultrasound was not able to pick up a separate compartment it correctly picked up the number of tendons. Thus it still remains an effective tool in preventing incomplete surgical decompression and we recommend to search for a separate compartment when the number of tendons in ultrasound does not match with the number of tendons found on table.

### Conclusion

De Quervain's disease commonly affects females and the incidence is highest in 4th & 5th decade of life. The hand more frequently involved is commonly seen in people whose work requires frequent ulnar deviation of the wrist.

Variations in anatomy of first dorsal compartment are the rule rather than exception. The most common anatomical pattern seen was of 2 Abductor pollicis longus tendon and 1 Extensor pollicis brevis tendon in the same compartment.

Increase in the size and cross sectional area of the first dorsal compartment and presence of synovial sheath thickening and fluid within the sheath are diagnostic sonological features of De Quervain's disease.

Ultrasound at the Radial styloid process may not correctly identify the number of tendons. When a more distal scan is done the number of tendons can be easily picked up. Hence we recommend a routine distal scan in all the cases.

Though ultrasound could not pick up a sub compartment it can still prevent the complication of incomplete surgical release as it correctly identifies the number of tendons. We strongly recommend looking for a sub compartment when the number of tendons seen on ultrasound is more than that found on table.

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