Intra operative Anatomical variations of the first extensor compartment of the wrist in patients of de Quervain's disease

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ABSTRACT

Objective: To determine the frequency of intra operative anatomical variations in patients undergoing surgical release for de Quervain's disease.

Methods: We conducted this descriptive study in Department of Orthopaedics and spine surgery Khyber Girls Medical College/Hayatabad Medical Complex Peshawar from 21st January 2017 to 24th December 2019.All patients of de Quervain's disease fulfilling the inclusion criteria were surgically released under local anaesthesia. The frequency of intra operative anatomical variations of Abductor Pollicis Longus(APL) and Extensor Pollicis Brevis(EPB) were noted and classified according to the Hiranuma classification.

Results: We enrolled 80 patients (86 wrists) in our study. The mean age was 41years(range 25 to 75 years).Female patients were 71(88.7%) and male patients were only 9(11.2%).Majority(88.7%,n=71) of patients had right sided de Quervain's disease while left sided was involved in 3(3.7%) patients and 6(7.5%) patients had bilateral de Quervain's disease. Hiranuma Type II was the predominant anatomical variation noted in 53(61.6%) wrists followed by type I(26.7%,n=23).Majority(91.8%,n=79) of wrists had 1 APL tendon followed by 2 APL tendons in 4(4.6%) and 3 tendons in 3(3.4%) wrists. The number of EPB was 1 in 82(95.3%) wrists,2 in 1(1.1%) and absent EPB in 03(3.4%) wrists.

Conclusion: Majority of our patients had APL and EPB in separate compartments with complete septation and had single APL and EPB tendon in each compartment. On the contrary the traditional or classical presentation of APL and EPB lying side by side in a single compartment was noted in less number of patients.

Keywords: De Quervain's disease, Tenosynovitis, Abductor Pollicis Longus, Extensor Pollicis Brevis, Fibro-osseous tunnel.

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INTRODUCTION

Stenosing tenosynovitis of the Abductor Pollicis Longus (APL) and Extensor Pollicis Bervis (EPB) tendons of the first extensor compartment of the wrist is known as De Quervain's disease.[1] This disease was first described by Swiss physician Fritz de Quervain in five patients in 1895.[2] Later on Finkelstein presented more detailed description of this disease in his 24 cases in 1930.[3]The pathology of de Quervain's disease is not merely an inflammatory process of the tendons but degenerative and attritional process of the ABL and EPB as they glide under the thickened extensor retinaculum.[4,5] De Quervain's disease is characterized by pain and tenderness at the radial styloid process and exacerbated by ulnar deviation of the wrist.[6] Although it affects 1.3% women and 0.5% men in general population,[7] women are found to have been

suffering from De Quervain's disease six times more often than men in their middle ages and the dominant hand is more frequently affected than the non dominant hand.[8-10]Treatment of de Quervain's disease is usually initiated with a conservative approach and includes physiotherapy, splints, Nonsteroidal Anti-inflammatory drugs and steroid injection.[11] Failure of conservative treatment is a an indication for surgical release of first extensor compartment.[12]The effectiveness of corticosteroid injection in de Quervain's disease is 50%[13] and causes of failure are either injection at the inappropriate site or anatomical variations of ABL and EPB tendons in the first extensor compartment of the wrist.[14]Variations in the anatomical configurations of ABL and EPB are common and knowledge of these variations are important for injecting steroid at the precise location and adequate surgical release.[15] Variations in the anatomical configuration of the first dorsal extensor compartment include two slips of APL and one slip of EPB(57%),[16] absent EPB(9.2%), and septum inside the compartment(34.6% to 72%).[17,18] Failure of corticosteroid injection has been attributed to the presence of septum in the first compartment which prevents the even distribution of corticosteroid in the entire extensor compartment.[6,19]More than one tendon slip of APL when present is mistakenly for EPB tendon resulting in inadequate release of EPB which lies in separate sub compartment.[20] Inability of the operating surgeon to recognize the anatomical variations of APL and EPB per operatively results in inadequate release of the extensor compartment and persistence of symptoms.[21]

To our knowledge no study has been conducted on this topic in Pakistan. The prevalence of anatomical variations of the first extensor compartment in our population is not known so far. The results of our study will be utilized to enhance the knowledge of Orthopaedic surgeons about the anatomical variations of the first extensor compartment so that accurate injection techniques and adequate surgical release practices are established. The objective of our study was to determine the frequency of intra operative anatomical variations in patients undergoing surgical release for de Quervain's disease.

METHODS

This descriptive study was conducted in Department of Orthopaedics and spine surgery Khyber Girls Medical College/Hayatabad Medical Complex Peshawar from 21st January 2017 to 24th December 2019.Patients of any age and either gender with de Quervain's disease for the last six months and not relieved with physiotherapy, splints, non steroidal anti inflammatory drugs and corticosteroid injections and presented to the Orthopaedic OPD were included in our study. Patients with rheumatoid arthritis, trigger thumb, first carpometacarpal osteoarthritis, wrist bones fracture dislocations, radial styloid fracture, local infection and previous surgical release for de Qurvain's disease were excluded. The research protocols were approved by the Ethical Committee of our hospital. Informed written consent for surgery and research publication was taken from all participants of our study. In the included patients complete history, physical examination and x-ray wrist joint was taken. De Quervain's disease was diagnosed by pain, tenderness, crepitus over the tendons and with or without swelling at the first dorsal compartment or radial styloid and confirmed by positive Finkelstein test. The test was performed by grasping the thumb of the affected side and deviating the wrist and hand to the ulnar side.[11]Pain exacerbation at the first extensor compartment indicated positive test and confirmed de Quervain's disease.

The data was analyzed with SPSS version 20.Frequency and percentages were calculated for numerical variables while qualitative variables were represented as mean and standard deviation. Data was presented in tables where necessary.

Surgical Technique

The operation was performed under local anaesthesia and tourniquet control. A uniform surgical approach as advised by Gundes H and colleagues[22]was adopted in all cases. A longitudinal skin incision of 4 cm beginning from 1 cm proximal to radial styloid along the dorsal and lateral side of proximal forearm was given. The sensory branches of radial nerve were identified, retracted and protected through blunt dissection in transverse fashion. The first extensor compartment was opened through longitudinal dorsolateral incision with a knife and compartment was carefully examined for APL, EPB, septation and extra tendon slips. The EPB tendon was retracted and intra compartmental septum was searched on volar surface. The APL tendon was properly identified by retracting and tensioning it and observing abduction of the first metacarpal. The EPB tendon was identified by retracting and tensioning the tendon and observing the extension of metacarpophalangeal joint of the thumb.[23] A hook was used for pulling the tendons out of their tunnel to confirm their complete decompression. After

decompression the tourniquet was deflated and hemostasis was secured. The skin was closed with polypropylene suture and dressing applied. Early range of motion of wrist and metacarpophalngeal joints of fingers and thumb was encouraged.

Intra operative anatomical variations of APL and EPB were classified and recorded according to the Hiranuma classification[24] as normal type with APL and EPB in the same compartment(Type I),APL and EPB are in separate sheaths with complete septation (Type II),APL and EPB are in a separate sheath but only in distal portion of the compartment as incomplete septation (Type III) or normal tendon sheath but absent EPB (Type IV).

RESULTS

A total of 80 patients (86 wrists) with mean age 41years (range 25 to 75 years) operated for de Quervain's disease during time period extending from January 2008 to December 2019 were included in our study. Majority(88.7%,n=71) of our patients were female while male patients were only 9(11.2%).Right sided de Quervain's disease was present in 71(88.7%) patients , left sided in 3(3.7%) and bilateral in 6(7.5%) had bilateral involvement. The intra operative anatomical variation of 86 wrists are shown in table I. Overall septum was present in 60(69.7%) wrists with majority (61.6%,n=53) had complete septum and 07(8.1% patients had incomplete septum. The number of APL tendon was 1 in 79(91.8%) wrists,2 in 4(4.6%) and 3 tendons in 3(3.4%) wrists. The number of EPB was 1 in 82(95.3%) wrists,2 in 1(1.1%) and absent in 03(3.4%) wrists. No complication was noted per operatively or post operatively. All patients were symptoms free at 2 weeks follow up.

Table I. Intra operative Anatomical variations of the first dorsal compartment as per Hiranuma classification.

Type I		Type II		Type III		Type IV	
Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
23	26.7%	53	61.6%	07	8.1%	03	3.4%

DISCUSSION

In our study intra compartmental septum in first extensor compartment of the wrist was noted in 60(69.7%) wrists and majority (61.6%,n=53) had complete septum while 07(8.1% patients had incomplete septum. Review of literature indicates variable frequency of intra operative septum ranging from 20 to 91%(table II). Chori SJ[30] performed surgical decompression of 15 patients of de Quervain's disease and noted complete septation in 7(46.6%) and incomplete septation in 4(26.6%) patients. Lee and colleagues[6] conducted a systemic review comprising of 21 article collected from Cochrane database, MDLINE and PubMed published from 1951 to 2015 on de Quervain's disease.

Table I: Literature review of studies showing the frequency of intra operative septum in first dorsal compartment.

S. No	Authors	Year	Number of Wrists	Presence of septum	Percentage
1	Finkelstein H[3]	1930	20	04	20
2	Harvey FJ[9]	1980	11	10	91
3	Jackson WT[25]	1986	40	27	67
4	Visuthikosol V[26]	1988	42	38	90
5	Horiuchi Y[27]	1989	60	50	83
6	MinamikawaY[15]	1990	70	33	47
7	Witt J[19]	1991	30	22	73
8	Weiss AP[10]	1994	45	20	44
9	Bahm J[28]	1995	70	42	60
10	Kulthanan T[20]	2007	38	66	58
11	Gousheh J[29]	2009	50	43	86
12	Chori SJ[30]	2011	15	11	73
13	Lee HJ[31]	2014	33	18	54
14	Pires PR[32]	2016	110	64	62
15	**Our study**	**2020**	**86**	**60**	**69**

He noted that one compartment was present in 191/470(40.6%) and two compartment in 279/470(59.4%) patients with de quervain's disease. The septum was incomplete in 327/559(58.5%) patients. One APL tendon was found in 87/320(27.2%) and two or more tendons in 233/320(72.8%) patients.

We observed that the number of APL tendon was 1 in 79(91.8%) wrists,2 in 4(4.6%) and 3 tendons in 3(3.4%) wrists while the number of EPB was 1 in 82(95.3%) wrists,2 in 1(1.1%) and absent in 03(3.4%) wrists. Kulthanan T[20] treated 66 patients of deQuervain's disease and noted single tendon of APL in 34(51.5%),two in 28(42.4%) and three tendons in 4(6%) patients. Single tendon of EPB was documented in 62(93.9%) and two tendons in 4(6%) patients. Kulthanan was of the opinion that the probability of observing the accessory tendons were higher in cadaver dissections than in de Quervain's patients because in surgical release the incision was limited than in cadaver dissection.

Lee HJ and colleagues[31] operated on 33 patients of de Quervain's disease and pointed out that EPB was dorsally located and the musculotendinous junction was relatively distal than APL tendon. Interestingly these authors noted that 8(24.2%) patients in their series had ganglia in the EPB tendon.

The classical surgical incision for decompression of de Qurvain's disease is transverse and parallel to the skin crease of the wrist as it results in less visible scar.[33]However we used longitudinal incision as it is mandatory for better visualization of septum and accessory tendons with acceptable cosmetic results.[22]Since ultrasound had been shown by Chori[30] to detect anatomical variation accurately. We recommend ultrasonography of the first extensor compartment of the wrist before steroid injection and surgical release.

Our study was based upon patients and not cadavers and this was the main strength of our study as literature has more studies on cadavers than patients. The descriptive design and limited number of patients were the probable limitations of our study.

CONCLUSION

Majority of our patients had APL and EPB in separate compartments with complete septation and had single APL and EPB tendon in each compartment. On the contrary the traditional or classical presentation of APL and EPB lying side by side in a single compartment was noted in less number of patients.

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