Surgical Treatment of Tenosynovitis of Extensor Tendons of Fourth Compartment of Wrist in Nonrheumatoid Patients—A Case Series of 10 Patients in India

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Abstract

Purpose Proliferative tenosynovitis of the extensor tendons is a very common painful wrist condition that can occur both in presence and absence of rheumatoid arthritis (RA). This study aims to evaluate a series of patients without RA, having extensor tendon tenosynovitis, its pathology, and results of surgical treatment.

Materials and Methods A consecutive series of 10 patients without RA, having tenosynovitis of fourth extensor compartment were treated surgically and evaluated in the study. All patients were operated upon by a single surgeon, and intraoperative specimens were sent for histopathologic evaluation by a single pathologist. The functional outcome of the patients was evaluated by comparing the post- and preoperative wrist extension.

Results All patients presented with painful mass over dorsum of the wrist, overlying the fourth extensor compartment. On clinical examination, there was severe limitation of active wrist extension with extended fingers and improvement in wrist extension on flexing the fingers. All patients had significant improvement in wrist extension after surgery. The histopathologic examination of the intraoperative samples revealed similar findings of tenosynovitis in all cases, which was different than that seen in RA.

Conclusion This study reveals a distinct tenosynovitis in a group of patients without RA resembling traumatic tenosynovitis on histopathologic examination. Radiologic and intraoperative findings reveal presence of nodular mass in the affected tendon due to proliferative tenosynovitis, which blocks effective proximal excursion of the tendon, leading to decreased wrist extension. This study shows that surgical treatment in the form of tenosynovectomy gives excellent relief to these patients.

Type of Study This is a Level IV, therapeutic study.

Keywords

- extensor tendons
- fourth compartment
- rheumatoid arthritis
- tenosynovitis

Introduction

The fourth compartment consists of the tendons of extensor digitorum and extensor indicis. Extensor tendon tenosynovitis is an important cause of wrist pain and significant morbidity. The condition is well described in rheumatoid arthritis (RA), and most patients respond well to synovectomy.^{1,2}

However, many times, nonrheumatoid patients may present with similar complaints and are overlooked leading to considerable dissatisfaction and unresolved pain in these patients. This study aims to evaluate this second group of patients in terms of clinical features, pathology, and response to surgical management.

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Materials and Methods

This study was performed in the institute from June 2014 to July 2016. A series of 10 consecutive patients were included in the study, after getting approval of the ethical committee. Patients having painful mass over dorsum of the wrist (►Fig. 1), restricted wrist active extension especially with the fingers fully extended, improvement in extension as the fingers were flexed, and absence of any signs of RA were included in the study. The absolute exclusion criterion was presence of RA as proved by the ACR/EULAR (American College of Rheumatology/European League Against Rheumatism) criteria³⁻⁵ (►Table 1).

Fig. 1 A 40-year-old nonrheumatoid female patient with (A, B) painful mass over dorsum of wrist. (C) Normal wrist radiographs.

All patients with complaints of wrist pain with mass over dorsal aspect were screened for the other signs of tenosynovitis and absence of RA. A rheumatologist was consulted in excluding RA and other inflammatory conditions. Patients with nonrheumatoid tenosynovitis were given conservative treatment in the form of immobilization with splint, analgesic, anti-inflammatory medications, local analgesic, and intralesional steroid injection (triamcinolone) for 2 to 3 weeks. Patients not improved with these conservative methods were counseled for surgery and included in the study after obtaining a valid written informed consent. The preoperative wrist extension (with fingers in flexion and extension) was measured and compared with wrist extension in postoperative period. All patients were operated upon under brachial block, with the help of a pneumatic tourniquet by a single surgeon. A longitudinal S-shaped incision (►Fig. 2A) was made over the hypertrophic mass. After dissection of the subcutaneous tissue in the same line (►Fig. 2B), the hypertrophied tenosynovium was separated from the tendons with blunt dissection with artery forceps (►Fig. 2C). The size and extent of the lesion was noted at time of surgery and documented (►Fig. 2D). The excised mass was preserved in sterile bulbs and sent immediately to a senior pathologist for histopathologic examination. All specimens were processed, mounted on a slide, and examined under microscope by this senior pathologist alone to avoid bias. Postoperatively, all patients were given analgesics and advised wrist mobilization immediately after surgery or, in some cases, by the next day. Patients were given occupational therapy for 4 to 6 weeks, and the range of motion was measured at the latest postoperative follow-up visit (►Fig. 3).

All data were analyzed using the Epi info 7 software (Centre for Disease Control and Prevention, Atlanta, Georgia, United States) using the paired *t*-test with $p < 0.05$ considered as significant statistical difference.

Table 1 ACR/EULAR criteria for diagnosis of RA

	Criteria	Score
Joint involvement	1 large joint	0
	2–10 large joints	1
	1–3 small joints	3
	> 10 joints (at least 1 small joint)	4
Serology	Negative RF and anti-CCP	0
	Low-positive RF or anti-CCP	2
	High-positive RF or anti-CCP	3
Acute phase reactants	Normal CRP and ESR	0
	Abnormal CRP and ESR	1
Duration of symptoms	< 6 wk	0
	≥ 6 wk	1
Total score of > 6 is classified as RA		

Abbreviations: ACR/EULAR, American College of Rheumatology/European League Against Rheumatism; CCP, cyclic citrullinated peptide; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; RA, rheumatoid arthritis; RF, rheumatoid factor.

Fig. 2 Intraoperative photos of the 40-year-old patient from Fig 1. (A) Skin incision. (B) Subcutaneous dissection and exposure of the hypertrophied tenosynovium. (C) Following excision of the lesion. (D) The excised specimen to be sent for histopathologic examination.

Results

Out of the 10 patients in the study, 4 were males and 6 females. The average age was 48.8 years (range: 35–63). All patients had unilateral involvement. The dominant hand was affected in seven cases (the right hand being dominant in all cases). At the time of presentation, all patients had a painful mass over dorsum of the wrist that moved distally with the movements of the extensor tendons as the fingers were clenched into a fist. Active wrist extension was painful. However, the passive wrist flexion was painful with the increasing flexion. The average extension with fingers in full extension was 17.4 degrees and that with fingers flexed was 45.9 degrees ($p < 0.01$). The finger range of motion was normal in all patients. The range of motion in the opposite wrist was normal, and there were no signs of hyperlaxity in the opposite wrist or elbow as well as metacarpophalangeal (MCP) joints of the hands. The patients were followed up for a period of 6 to 12 months (average: 7.7). At the latest follow-up examination, wrist extension with fingers extended improved significantly ($p < 0.01$), with the average being 47.0 degrees whereas the extension with flexed fingers improved slightly, with the average being 49.9 ($p > 0.05$).

Radiographs were done in all patients, which showed no significant finding. Ultrasonography revealed the thickening of tenosynovium along with the fluid suggestive of tenosynovitis. Magnetic resonance imaging was done in three patients, which showed isolated involvement of the fourth extensor compartment with synovial hypertrophy and fluid surrounding these tendons. In other patients, ultrasonography of the wrist showed hypoechoic lesion surrounding the tendons of fourth extensor compartment. The average size of lesion as found after excision was 18

Fig. 3 Follow-up photographs after 2 months postoperative period showing (A) full extension and (B) full flexion of left wrist after tenosynovectomy in a 40-year-old male typist.

mm, range being 15 to 25 mm. The digital range of motion remained normal following surgery. The excised lesion measured approximately around 2.7 ± 0.7 cm.

Histopathologic examination revealed similar findings in all cases. There was evidence of minimal synovial hyperplasia, synovial tufting, flattening of the tenosynovium, reactive changes, and fibrosis. The slides showed minimal inflammatory reaction (►Tables 1–3).

Discussion

Tenosynovitis is an established phenomenon in RA in which it can cause serious complication of tendon rupture if left untreated.⁶ It is also seen in patients without RA, though the natural history in these patients does not seem so aggressive and has not been so deeply studied. Such tenosynovitis is seen most commonly in the first compartment, called as *De Quervain's tenosynovitis*.⁷ It is also seen in the second (intersection syndrome⁸), third (extensor pollicis longus syndrome), fourth (extensor indicis proprius syndrome⁹), and the fifth compartments.^{10,11} In this study, the authors present cases without RA having tenosynovitis of fourth compartment as it has been reported in a few studies.

It presents with a painful mass causing restricted movements of the wrist, especially during extension.

The proposed phenomenon for the condition is repetitive loading of the wrist in hyperextension during vigorous sporting activity among males.¹² It results in micro injury to the tendon, which is responded by healing attempts by the tendon. If these attempts are inadequate and the injury gets on repeated, irreversible changes occur in the tenosynovium in the form of hyperplasia, reactive changes, and fibrosis. This results in a nodular, adherent mass on the tendon that blocks excursion of the tendon during active wrist extension with finger in extension. The wrist extension improves with

Table 2 Wrist ROM in flexed and extended fingers

Sr No.	Age/Sex	Dominant hand	Involved hand	Wrist extension with extended fingers		Wrist extension with flexed fingers	
				Preoperative	Postoperative	Preoperative	Postoperative
1	60/M	Right	Right	15	40	40	45
2	40/F	Right	Right	15	50	38	55
3	35/F	Right	Left	20	55	52	55
4	47/M	Right	Right	18	48	50	50
5	63/M	Right	Left	15	42	35	40
6	50/F	Right	Right	18	50	50	54
7	42/F	Right	Right	25	45	54	50
8	37/F	Right	Left	10	40	35	55
9	55/M	Right	Right	18	45	50	40
10	59/F	Right	Right	20	55	55	55

Abbreviations: F, female; M, male; ROM, range of motion.

Table 3 Statistical analysis of the age, range of motion of wrist extension (in degrees) with fingers extended and flexed

Parameter	Age	Wrist extension with extended fingers		Wrist extension with flexed fingers	
		Preoperative	Postoperative	Preoperative	Postoperative
Mean	48.8	17.4	47.0	45.9	49.9
SD	10.15	4.00	5.55	7.96	6.15
95% CI	42.51–55.09	14.91–19.88	43.55–50.44	40.96–50.84	46.08–53.71
SEM		1.27	1.76	2.52	1.95
p-Value		< 0.001		0.19	

Abbreviations: CI, confidence interval; SD, standard deviation; SEM, standard error of the mean.

Note: Out of the 10 patients, 1 had a recurrence at 6 weeks after surgery (therefore, recurrence rate was 10%).

finger flexion as it leads to the mass being dragged distally. The calcification following degeneration adds to the event of calcific tendinosis that further increases the microtrauma with every excursion of tendons causing nonhealing and persistence of inflammatory response and thereby causing swelling.

However, predicted phenomenon among Indian female is different. The females especially household maids who are involved in cooking, washing of clothes, and even laborers in the farms are continuously engaged in repetitive extreme movements of the wrist joints. These continuous repetitive movements predispose the females to vicious cycle of repetitive microtrauma and again cause for persistence of inflammation around tenosynovium and thereby tenosynovitis.

There was no progression in the pathology in the form of tendon rupture. The pathology was limited to tenosynovitis; hence, there was no suspicion of autoimmune etiology. Neither the authors have seen any rice bodies from the excised synovium that did not make them suspect increased friability of tenosynovium and thereby any infective etiology as whole. The swab from the fluid also did not show growth of any mycobacteria or gram-positive bacteria.

This study revealed that patients improved following tenosynovectomy. The difference between extension of the wrist with fingers in extension was statistically significant,

showing that excision of the lesion benefits the patient in achieving improvement in wrist extension. However, the difference in wrist extension with fingers flexed was not found significant after surgery. Also, the preoperative wrist extension with finger extension improved significantly after full finger flexion. These findings correlate to the study performed by Cooper et al¹² who found similar results in a study of 11 patients. However, this study covers the condition in the Indian population. Cooper et al also compared the histopathologic findings to that of RA. They found that the findings are different from those in RA¹³ and closely resemble to that of traumatic tenosynovitis, which is similar to the findings in this study. VanHeest et al¹⁴ studied a series of seven young athletes and showed the presence of impingement of extensor tendon in these patients.

The aim of surgical treatment in these patients is to decrease pain and improve joint motion, both of which were achieved after surgery, without any complications. One patient had a recurrence of symptoms but is being managed conservatively and did not require surgery. There was no further recurrence noted in this case.

This study has a few limitations. First, the follow-up period of the cases after surgery was short, which was addressed with long-term evaluation of activity levels of the patients. In all these patients, the activity level increased dramatically

after surgery, which either continued or improved further in further follow-up examinations. Also, similar studies with longer follow-up period may be of more use. Second, the number of cohorts in the study was very small as the condition has rare prevalence as compared with rheumatoid synovitis.

Conclusion

Tenosynovitis of the fourth extensor compartment is a well-established condition causing severe limitation of wrist movement as well as pain and difficulty in day-to-day activities in patients without RA. The condition can be initially managed conservatively by activity modification (by use of splint) and analgesics for short course. Recurrences in the tenosynovitis are known. Even recurrences are also managed well by above conservative means. If this fails or is not feasible, surgery is performed; that is, tenosynovectomy is effective in relieving pain and restoration of wrist mobility with minimal risk of recurrence after surgery.

Conflict of Interest

None.

References

- 1 Papp SR, Athwal GS, Pichora DR. The rheumatoid wrist. *J Am Acad Orthop Surg* 2006;14(2):65–77
- 2 Brumfield R Jr, Kuschner SH, Gellman H, Liles DN, Van Winckle G. Results of dorsal wrist synovectomies in the rheumatoid hand. *J Hand Surg Am* 1990;15(5):733–735
- 3 Funovits J, Aletaha D, Bykerk V, et al. The 2010 American College of Rheumatology/European League Against Rheumatism classification criteria for rheumatoid arthritis: methodological report phase I. *Ann Rheum Dis* 2010;69:1589–1595
- 4 Neogi T, Aletaha D, Silman AJ, et al. The 2010 American College of Rheumatology/European League Against Rheumatism classification criteria for rheumatoid arthritis: phase 2 methodological report. *Arthritis Rheum* 2010;62:2582–2591
- 5 Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988;31(3):315–324
- 6 Wilson RL, DeVito MC. Extensor tendon problems in rheumatoid arthritis. *Hand Clin* 1996;12(3):551–559
- 7 Ilyas AM, Ast M, Schaffer AA, Thoder J. De quervain tenosynovitis of the wrist. *J Am Acad Orthop Surg* 2007;15(12):757–764
- 8 Hanlon DP, Luellen JR. Intersection syndrome: a case report and review of the literature. *J Emerg Med* 1999;17(6):969–971
- 9 Patel MR, Moradia VJ, Bassini L, Lei B. Extensor indicis proprius syndrome: a case report. *J Hand Surg Am* 1996;21(5):914–915
- 10 Drury BJ. Traumatic tendovaginitis of the fifth dorsal compartment of the wrist. *Arch Surg* 1960;80:554–556
- 11 Hooper G, McMaster MJ. Stenosing tenovaginitis affecting the tendon of extensor digiti minimi at the wrist. *Hand* 1979;11(3):299–301
- 12 Cooper HJ, Shevchuk MM, Li X, Yang SS. Proliferative extensor tenosynovitis of the wrist in the absence of rheumatoid arthritis. *J Hand Surg Am* 2009;34(10):1827–1831
- 13 Shapiro JS. The wrist in rheumatoid arthritis. *Hand Clin* 1996;12(3):477–498
- 14 VanHeest AE, Luger NM, House JH, Vener M. Extensor retinaculum impingement in the athlete: a new diagnosis. *Am J Sports Med* 2007;35(12):2126–2130