

Delayed rupture of the thumb extensor tendon

A 5-year study of 18 consecutive cases

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18 consecutive cases of delayed rupture of the extensor pollicis longus tendon were recorded during 5 years; 4 were spontaneous, and 14 after distal radius fracture, most of which were undisplaced or only slightly displaced. 15 cases were operated upon with tendon transfers: 13 had extensor indicis proprius transfer, 1 transfer of the extensor carpi radialis longus, and 1 reoperated with the extensor communis to the little finger as a motor unit. Subjectively,

nearly complete satisfaction was reported; all patients were able to elevate the thumb to the level of the palm and full independent index finger movements were noted.

In this 5-year-period 4,400 patients with distal radius fractures were treated, giving an incidence of delayed tendon rupture after distal radius fracture of 0.3 percent

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Several hundred post-traumatic ruptures of the extensor pollicis longus (EPL) tendon have been reported in the literature since Duplay (1876) first described the condition. Most authors and textbooks currently recommend transfer of the extensor indicis proprius (EIP) tendon. Series of other tendon transfers, direct suture, gap suture, and tendon grafts are also reported.

This paper concerns a study of 18 consecutive patients with delayed rupture of the extensor pollicis longus tendon, treated during 5 years.

Patients and methods

From 1985 through 1989, all patients with delayed rupture of the extensor pollicis longus tendon, treated in Bergen, were registered. There were 6 men and 12 women with median age 57 (19–79) years. 4 ruptures were spontaneous, and 14 occurred after distal radius fracture (Table 1). 6 patients with rheumatoid arthritis and 9 with old lacerations were not included in the study.

Among the 4 spontaneous cases, Case 8 had an operation for rupture of the ulnar collateral ligament at the first MCP joint 8 weeks before the tendon rupture; Case 11 had a distortion 2 weeks before; Case 1 complained of tendinitis some weeks before the tendon rupture; Case 9 sustained his rupture after a period of several weeks of weight-lifting.

In the post-fracture group there were 12 Colles and

2 Smith type fractures. The Colles fractures, classified according to Older et al. (1965), were minimally displaced in 8 cases. In this period a special registration of distal radius fractures among adults was performed in this city (Hove et al. 1993), and a total of 4,400 distal radius fractures were treated, giving an incidence of delayed tendon rupture after distal radius fracture of about 0.3 percent (Table 2).

The median interval between the fracture and the tendon rupture was 6 weeks (2 weeks–1 year).

Repair of the tendon rupture

Cases 7 and 14 had minimal disability and were not operated upon, and Case 8 refused operation. Case 3 had the first operation at a hospital elsewhere; the transferred extensor indicis proprius tendon ruptured, and he was given another tendon transfer at our hospital.

15 cases were thus operated upon. With the patients under local or regional anesthesia and with tourniquet control, the operations were performed in the outpatient clinic. 3 incisions were used: transverse over the metacarpal neck of the index finger, transverse at the distal radius (distal to the extensor retinaculum), and curvilinear or S-shaped at the dorsum of the distal part of the first metacarpal. Through the first incision the proprius tendon was transected obliquely proximal to the extensor hood. No sutures were used to secure the distal stump to the adjacent communis tendon. The proprius tendon was mobilized and drawn into the sec-

Table 1. Observations in 18 cases of delayed rupture of the extensor pollicis tendon

	A	B	C	D	E	F	G	H	I	J	K
1	29	F	S		5	a	3	—	—	—	
2	19	F	P	8	1	a	4	0	0	0	E
3	36	M	P		6	b	3	10	5	5	G
4	60	F	P	4	1	a	5	5	5	5	E
5	79	F	P	4	1	a	3	0	0	0	E
6	72	F	P	6	3	a	4	0	0	0	E
7	67	F	P	6	7	—					
8	42	M	S	8	8	—					
9	53	M	S		9	c	5	5	10		G
10	68	F	P	9	2	a	4	0	5	5	E
11	61	F	S	2	10	a	4	0	0	0	E
12	61	F	P	4	1	a	3	5	5	5	E
13	34	M	P	7	4	a	3	0	0	0	E
14	55	M	P	7	7	—					
15	44	F	P	2	1	a	3	0	5	5	E
16	53	F	P	4	1	a	5	0	5	5	E
17	60	F	P	56	1	a	4	5	0	0	E
18	61	M	P	5	3	a	3	0	0	0	E

A	Case	8	rupture of MCP
B	Age		collateral ligament
C	Sex	9	weight-lifting
D	Cause of lesion	10	distorsion
	S spontaneous	G	Tendon transfer
	P post-fracture		a EIP to EPL
E	Weeks after injury		b EDC-5 to EPL
F	Injury		c ECRL to EPL
	Colles fracture, Older	H	Weeks of immobilization
	1-4	I	Loss of IP extension (°)
	5 "tendinitis"	J	Loss of IP flexion (°)
	6 reoperation	K	Subjective result
	(rerupture)		E excellent
	7 Smith fracture		G good

Table 2. Incidence of rupture of the extensor pollicis longus tendon after distal radius fracture

Author	Year	No. of fractures	Rupture of EPL	Incidence percent
Oppolzer	1934	800	2	0.25
Moore	1936	500	3	0.60
Nissen-Lie	1939	1,000	4	0.40
Stapelmoehr	1940	1,000	3	0.30
Kwedar and Mitchell	1940	270	1	0.37
Smith	1946	1,341	5	0.37
Lidström	1959	1,383	1	0.07
Witter	1960	4,780	9	0.18
Frykman	1967	430	3	0.69
Freilinger and Zacherl	1970	4,200	10	0.24
Cooney et al.	1980	565	5	0.88
Stewart et al.	1985	209	1	0.48
This study	1993	4,400	14	0.32
Total		20,878	61	0.29

ond incision, and a subcutaneous tunnel was created between the second and the third incisions for passage of the tendon. The transferred tendon was interwoven to the extensor pollicis longus tendon stump just proxi-

mal to the first metacarpophalangeal joint under tension sufficient to keep the thumb extended at all joints, with the wrist in about 50 degrees of extension. Post-operatively the wrist was immobilized in this extended position with the thumb moderately extended for 3-5 weeks. Uninvolved digits, including the index finger, were permitted free active motion immediately postoperatively. After removal of the splint, the patients were followed at the Department of Physiotherapy until full range of motion had been achieved, and they were reviewed 1 and 3 months later.

The extensor indicis proprius tendon was transferred in 13 patients. The extensor communis tendon to the little finger was used as the second transfer in the reoperated case, and in 1 patient the extensor carpi radialis longus tendon was transferred, because the indicis proprius tendon was too thin.

Case 15 had her tendon rupture 2 weeks after a Type 1 Colles fracture. She was operated upon the same day with an indicis proprius tendon transfer, and was given a new plaster cast for another 3 weeks. 4 patients had their tendon ruptures at 4 weeks, just after the removal of the cast. These patients had a few weeks with active exercises and physiotherapy of the wrist joint before the operations.

Case 13 with a comminuted Type 4 fracture was operated upon with open reduction and fixation with a dorsally placed T-plate. The extensor retinaculum was placed under the tendons to avoid attrition from the plate. The extensor pollicis longus tendon ruptured 7 weeks after this operation.

1 patient with a tendon rupture 13 months after the fracture, a 60-year-old woman, had no special activity and no trauma or pain during the weeks before the rupture.

Case 1 moved to another city after the operation, and was lost to follow-up.

Results

7 cases had periods of mild adhesions between the scars and the tendon sutures, but these adhesions disengaged during the second month after the operation.

Subjective evaluation included questions with regard to general satisfaction with the result, pain, strength, motion, or if they had any problems in daily activity. One patient complained of weakness but, compared with the opposite side, no objective difference was found. The subjective results were excellent in 12 patients and good in 2, in spite of some objective loss of extension or flexion.

Measurements of thumb motion were performed according to the system of Riddell (Riddell 1963,

Takami et al. 1992). All patients were able to elevate their thumbs to the level of the palm. The mean loss of interphalangeal joint extension was 3 (0–15) degrees, and of flexion 4 (0–15) degrees.

Full active index extension usually was achieved within the first few days. 3 patients had some extension lag for a few weeks, but at 3 months all the patients had regained full index finger extension when all fingers were extended simultaneously. Full extension was also the result when the remaining fingers were flexed. However, a few patients had to use more force than on the contralateral side when extending the index finger independently. No patients had limitation of flexion of the index finger after extensor indicis proprius transfer.

Discussion

The reported incidence of rupture of the extensor pollicis longus tendon after distal radius fractures varies from 1 rupture among 1,383 fractures or 0.07 percent (Lidström 1959) to 5 among 565 fractures or 0.88 percent (Cooney 1980). Most literature reports are based on small materials with only a few tendon ruptures (Table 2). Larger series often represent patients referred for operation and have no reference to the number of fractures. Our study represents an unselected series where all patients with extensor pollicis longus tendon rupture in our region during the 5-year-period were registered, as also were the number of distal radius fractures. The incidence found in our study, 0.3 percent, is close to the average incidence calculated from the literature.

Various mechanisms have been proposed to account for spontaneous tendon ruptures. Among them are necrosis caused by pressure (McMaster 1932, Trevor 1950), crush injury (Denman 1979), nutritional impairment (Strandell 1955, Engkvist and Lundborg 1979, Manske 1992), attrition of the tendon on a sharp fragment of bone or callus (Helal et al. 1982), attrition on a roughened area of the radius or from nonunion of Lister's tubercle (Stahl and Wolff 1988), tenosynovitis from repetitive activities (Düms 1896), or a combination of impaired nutrition and attrition of the tendon (Hirasawa et al. 1990).

The proposed treatment of extensor pollicis longus tendon ruptures generally fall into 3 categories: primary repair, tendon transfer, or graft.

Primary repair is rarely possible because of tendon substance loss or delay of treatment and subsequent muscle contracture. Some series recommend end-to-end reapproximation with subcutaneous rerouting to gain length (McMaster 1932), bridging of the defect

with foreign material or fascia, or repair with nylon sutures leaving a gap in which scar tissue would restore continuity (Trevor 1950).

Nearly every tendon on the dorsum of the hand has been transferred to restore function after extensor pollicis longus tendon rupture. The first described tendon transfer for this condition was the extensor carpi radialis longus (Duplay 1876), and some authors still recommend this transfer as the first choice (Mannerfelt et al. 1990). The tendon most commonly used is the extensor indicis proprius (Wilhelm 1980, Schneider and Rosenstein 1983, Hoch et al. 1988, Nigst and Linder 1989). This tendon has the appropriate direction and excursion to replace extensor pollicis longus function. The surgical technique is simple and the results in most series are good.

However, this transfer may lead to permanent index finger lag, weakness, or deviation (Magnell et al. 1988). Some authors therefore recommend other methods like tendon graft or other transfers for certain professions (Nigst and Linder 1989). In our study the extensor indicis was sectioned proximal to the sagittal hood, and we had no patients with permanent extension lag of the index finger. The finding is supported by studies claiming that extensor lag after indicis proprius transfer is not caused by removal of the force of the tendon *per se*, but by factors which cause either disruption of normal hood function or tethering of its normal excursion (Browne et al. 1979). Any technique that tightens or tethers the hood and constricts the sagittal fibers will limit index finger extension (Moore et al. 1987). Scarring or anatomical anomalies like intrinsic muscle variations, inadequate common extensor motors, or intertendinous bands are unpredictable factors responsible for index finger lag.

Careful surgical technique when harvesting the extensor indicis proprius, including avoidance of injury to the dorsal extensor apparatus should, in most cases, avoid the problem of index finger extension lag. However, in several recent series (Nigst and Linder 1989, Belsole and Hess 1993), as in our study, a few patients still have some problems with forceful, independent index extension. This indicates that an alternative method should be recommended for patients with professions where individual extension of the index finger is of paramount importance.

Tendon graft is the third general type of method for reconstruction of the extensor pollicis longus tendon after rupture. The intercalated graft avoids the use of an adjacent motor tendon unit. In addition, index finger function is not jeopardized. Magnell et al. (1988) found that muscle contracture of up to 5 months was reversible. Others describe a graft placed 4 years after laceration with excellent result (Hamlin and Littler

1977). The disadvantages are more extensive dissection and 2 tendon junctures.

Magnel et al. (1988) reported graft survival in all 21 patients after subcutaneous rerouting of the graft. Mannerfelt et al. (1990) reported that patients with free tendon grafts regained good function in a shorter period of time than patients treated by extensor carpi radialis longus tendon transfer.

We conclude that the indicis proprius tendon transfer in most cases of delayed rupture of the extensor pollicis longus tendon provides an acceptable outcome. However, in musicians who require independent extension of the index finger, e.g., trumpet players, another transfer or tendon graft should be considered.

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