Primary Pulley Enlargement in Zone 2 by Incision and Repair With an Extensor Retinaculum Graft

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Purpose This retrospective study documents the results of primary enlargement of tendon sheath pulleys by incision and extensor retinaculum graft repair during flexor tendon repairs in zone 2 in 9 fingers.

Methods The entire A2 or A4 pulley was enlarged by complete incision and repaired with an interposed extensor retinaculum graft at the time of primary flexor tendon repair in a total of 9 fingers in 7 patients, ages 15 to 54 years. The indication for primary pulley enlargement was failure of the tendon repair to glide smoothly and without snagging through the normally tight-fitting pulley system. In no case was more than one major pulley enlarged, and the entire A1 pulley was never enlarged. The zone 2 tendon repairs were done using a 2-strand modified Kessler 3-0 core suture and a 6-0 nylon running circumferential suture. The follow-up averaged 3.6 years. Interphalangeal total active motion and Strickland-Glogovac grade in patients with adequate follow-up of more than 6 months or obtaining full range of motion were obtained from a retrospective chart review.

Results Interphalangeal total active motion averaged 127° and the scores according to the Strickland-Glogovac system were excellent for 3, good for 2, fair for 2, and poor for 2. There were no tendon ruptures. Two fingers in one patient required a tenolysis and a third finger had secondary skin scar lengthening. Two fingers had visible and palpable bowstringing when seen at long-term follow-up and there was an average flexion contracture of 21°.

Conclusions Primary pulley enlargement using a free graft in zone 2 tendon injuries may achieve the 3 goals of providing a good gliding environment, avoiding triggering, and minimizing bowstringing. These initial clinical outcomes are average for zone 2 tendon repair, but encouraging. Further research and refinement in surgical technique and rehabilitation method are needed to minimize flexion contractures. *(J Hand Surg 2010;35A:785–790.*

Type of study/level of evidence Therapeutic IV.

Key words Flexor tendon, tendon sheath, pulley, tendon injuries, zone 2.

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A LACK OF AGREEMENT persists on the best method to manage the flexor pulleys when repairing zone 2 flexor tendon injuries to provide free gliding of the repair, avoid triggering of the repair on an edge of sheath, and control bowstringing.[1–3] Venting (incomplete incision of a major pulley) is commonly used,[4–8] but a vented pulley does not guide the repair into the sheath as described and advocated by Lister.[1,2] Also, after the repair reenters the intact part of a vented sheath, it may encounter resistance to easy gliding, which has led some authors to advocate complete pulley division,[5–8] which may result in bowstringing.[9,10]

TABLE 1. Clinical Description

Digit	Patient	Age (y)/ Gender	Type of Injury	Level of Sheath Injury	Tendon(s) Repaired	Associated Injury	Pulleys Incised	Additional Surgery
1	1	54/M	Metal edge	A3	FDP/FDS	None	Mid-A2, A3, A4	
2	2	18/M	Glass	A3	FDP/FDS	Ulnar digital nerve	Mid-A2, A3, A4	Skin scar z-plasty + PIP joint capsulotomy at 2 y
3	3	21/M	Knife	A3/A4	FDP	Ulnar digital nerve	A3, A4	Tenolysis at 6 mo to improve flexion
4				A4	FDP	None	A3, A4	
5	4	17/M	Knife	A3	FDP/FDS	None	A3, A4	
6				A3	FDP/FDS	None	A3, A4	
7	5	20/M	Knife	A3	FDP/FDS	Ulnar digital nerve	A2, A3	
8	6	45/F	Glass	A2	FDP/FDS	Radial digital nerve	A2, A3	
9	7	15/M	Glass	A3	FDP/FDS	Both digital nerves	Mid-A1, A2, A3	

Opinion and practice also vary on the issue of sheath management[10] from resection,[11,12] to laying or tacking flaps in place,[5,6,13–16] to complete closure[1,2,17–20] The disadvantages of sheath closure according to Strickland are that it is technically difficult and it may narrow the sheath and restrict tendon gliding.[10] Manske, however, stated that closing the sheath with an enlarging graft could re-establish the integrity of the sheath without diminishing its volume.[3] The series presented here reports the results of complete A2 or A4 pulley incision combined with sheath closure using an extensor retinaculum graft with the purpose of repairing the pulley during primary flexor tendon repair in zone 2. This technique was intended to provide free tendon gliding, to avoid triggering by guiding the repair into the sheath, and to limit bowstringing. In no case was more than one major pulley enlarged.

MATERIALS AND METHODS

Between 1985 and 2004, 12 fingers in 9 patients with flexor tendon severance in zone 2 were treated using primary tendon repair combined with pulley enlargement. Two patients were excluded from the study because of inadequate follow-up. The remaining 7 patients' ages ranged from 15 to 54 years (average, 27 years of age); 6 patients were men. These 9 fingers had injuries located within the confines of the A2 through A4 pulleys; 6 were sharply incised wounds and one had a crush element. Five of the 9 digits had one or both digital nerves cut. All digital nerve lacerations were repaired primarily under 3.5× loupe magnification using interrupted 8-0 nylon stitches. Table 1 lists details of the 7 patients' injury and surgery information. All repairs were done under short-acting regional block or, preferably, general anesthesia so exercises could be started in the immediate postoperative period.

Surgical technique

The skin was opened with a zigzag incision to expose the flexor tendon sheath while the finger was held in full extension. The tendon injuries were evaluated and the expected excursion of the tendon repairs identified. If the FDP laceration was distal to the A4 pulley, an attempt was made to repair the tendon without the need for a complete pulley incision by exposing the tendon distally. If the flexor digitorum profundus (FDP) laceration was under the A4 pulley or if it was anticipated that both tendon repairs would have to pass under the A2 pulley, the retinacular sheath (including any part of a pulley) was incised far enough to provide adequate exposure for easy tendon repair. The sheath was incised distally from the injury site until, with the help of distal interphalangeal joint flexion, a core suture could be placed in the FDP stump. The sheath/pulley incision was kept lateral to the volar midline, leaving enough sheath tissue to secure a suture, and adjusting the incision to fit the conditions of the original injury. The distal flexor digitorum superficialis (FDS) was always longer than the FDP and readily visible with this exposure. The proximal tendons were retrieved. If needed, the proximal sheath/pulley was incised to allow room for easy tendon repair.

All FDP tendons were repaired with a 2-strand, modified Kessler[21] core suture using 3-0 Supramid suture (S. Jackson, Inc., Alexandria, VA). The repair was reinforced and the tendon edges aligned, coapted, and