

Long-term results of early primary repair of flexor pollicis longus tendon injuries

Fleksör pollisis longus tendonunun erken dönemde primer onarımı: Uzun dönem sonuçlar

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Amaç: Modifiye Kessler yöntemi ve çevresel epitenon dikişle erken dönemde primer olarak onarılan izole fleksör pollisis longus (FPL) tendon yaralanmalarının uzun dönem sonuçları değerlendirildi.

Çalışma planı: Otuz hastanın (10 kadın, 20 erkek; ort. yaş 26; dağılım 4-52) başparmağı, ilk dört zone'da FPL tendon kesisi nedeniyle primer uç-uca onarım tekniğiyle tedavi edildi. On altı olguda sol, 14'ünde sağ başparmakta tendon kesisi vardı. Yaralanma yeri bir başparmakta zone I, 15'inde zone II, dokuzunda zone III, beşinde zone IV idi. Yirmi beş hastaya yaralanmadan sonraki birkaç saat içinde, beşine ise 1-34 gün içinde müdahale edildi. Yirmi üç başparmakta tendon kesisine eşlik eden arter ve sinir yaralanmaları aynı seansta tamir edildi. Hastalara modifiye Duran yöntemine göre rehabilitasyon programı uygulandı. Fonksiyonel değerlendirme Buck-Gramcko sistemine göre yapıldı. Ortalama izlem süresi 34 ay (dağılım 5-71 ay) idi.

Sonuçlar: Buck-Gramcko sistemine göre yapılan değerlendirmede, 17 başparmakta (%56.6) mükemmel, beş başparmakta (%16.6) iyi, beş başparmakta (%16.6) orta, üç başparmakta (%9.9) kötü sonuç elde edildi. İkinci zone'da mükemmel ve iyi sonuç %73.3, üçüncü zone'da %88.8 oldu. Yalnızca FPL tendon kesisi olan hastalarla, tendon kesisine damar ve sinir yaralanmasının eşlik ettiği hastalar arasında fonksiyonel bakımdan bir fark bulunmadı.

Çıkanmlar: Başparmak FPL tendon kesilerinin, eşlik eden damar ve sinir yaralanmalarıyla birlikte erken dönemde primer uç-uca tamir edilmesi ve özenli rehabilitasyonuyla çok iyi fonksiyonel sonuçlar elde edilmektedir.

Anahtar sözcükler: Parmak yaralanmaları/cerrahi; hareket açıklığı, artiküler; dikiş teknikleri; tendon yaralanmaları/cerrahi; başparmak/yaralanma/cerrahi.

Objectives: We evaluated the long-term results of early primary repair of flexor pollicis longus (FPL) tendon injuries with the modified Kessler method and circumferential sutures.

Methods: Thirty patients (10 females, 20 males; mean age 26 years; range 4 to 52 years) were treated primarily with end-to-end anastomosis for FPL tendon injuries at the level of zone I to IV. Injuries were in the left thumb in 16 patients and in the right thumb in 14 patients. They were localized in zone I in one patient, zone II in 15 patients, zone III in nine patients, and zone IV in five patients. Twenty-five patients were treated within the first few hours after injury, while five patients were treated within a period ranging from 1 to 34 days. Associated digital artery and nerve injuries in 23 patients were treated during the same session. A rehabilitation program was implemented according to the modified Duran method. Functional evaluations were made according to the Buck-Gramcko system. The mean follow-up was 34 months (range 5 to 71 months).

Results: Functional results were excellent in 17 patients (56.6%), good in five patients (16.6%), fair in five patients (16.6%), and poor in three patients (9.9%). Excellent and good results accounted for 73.3% and 88.8% in zone II and zone III injuries, respectively. No significant differences existed between functional results obtained from patients with and without associated neurovascular injuries.

Conclusions: Early primary end-to-end repair followed by an appropriate rehabilitation program yields very good functional results in patients with FPL tendon injuries, whether or not they are associated with neurovascular injuries.

Key words: Finger injuries/surgery; range of motion, articular; suture techniques; tendon injuries/surgery; thumb/injuries/surgery.

The flexor pollicis longus tendon (FPL) has structural and functional differences as compared to flexor tendons of the other fingers. Moving only the interphalangeal joint,^[1-3] this tendon is prone to injury due to its anatomical location.^[4,5] For normal gripping and fine pinching to occur, the first carpometacarpal and interphalangeal joints must be in good condition in terms of strength, stability and mobility.^[1,6,7] Avulsion or laceration injuries of the FPL tendon must be repaired since the thumb is of utmost importance for hand functions.^[1,5,7-10]

According to some authors, a full interphalangeal joint mobility is not necessary to acquire the best conditions for the thumb and acceptable results may be obtained after arthrodesis.^[9,11] However, since thumb mobility is restricted after arthrodesis^[1] and since the interphalangeal motion is important for gripping and pinching, most authors prefer even a minor interphalangeal motion over arthrodesis.^[1,4,6-8,10,12]

Contrary to a large number of studies concerning tendon injuries of the hand, only a limited number of studies exist for isolated FPL tendon repairs. In our study, we have evaluated the patients we have treated with isolated FPL repairs.

Patients and method

Between the years 1991-1999, early surgery was applied to 60 patients with isolated FPL tendon injury in the first four zones. Thumbs of 30 patients (10 women, 20 men; mean age 26 years, range 4-52) were included in the study after their final follow-up examination. Five patients were under 15 years of age. All patients used the right side as the dominant hand. Patients with replantations, lacerations accompanied by fractures, severe soft tissue injuries and multiple finger injuries were not included in the study. All injuries involved sharp objects like glass, knife, metal or ceramic material. FPL tendon injury was present in the left thumb of 16 patients and in the right thumb of 14 patients. Injuries were in the first zone in one thumb (3.3%), in the second zone in 15 thumbs (49.9%), in the third zone in nine thumbs (29.9%) and in the fourth zone in five thumbs (16.6%). Seven thumbs had isolated FPL tendon injury (23.3%), while 23 thumbs (76.6%) were accompanied by injuries of the digital artery and nerve. Moreover, one patient also had injury to the motor branch of the median

nerve.

Twenty-five patients were operated in the first few hours following injury, while five other were operated within 1-34 days. All FPL tendons were repaired end-to-end using 4/0 monofilament (prolene) sutures and according to the modified Kessler method and 6/0 monofilament (prolene) circumferential epitendon sutures were placed. Accompanying artery and nerve injuries were also repaired in the same session. Postoperatively, a dorsally supported brace was used, keeping the wrist in 30° flexion and the thumb in the neutral position.

In the early postoperative period, all patients were included in a rehabilitation program using the modified Duran method. Mean follow-up period was 34 months (range 5-71 months), after which functional evaluation was performed with the Buck-Gramcko system (Table 1).^[13]

Results

In the evaluation performed according to the Buck-Gramcko system, perfect results were obtained in 17 thumbs (56.6%), good results in five thumbs (16.6%), moderate results in five thumbs (16.6%) and bad results in three thumbs (10%). The rate of perfect and good results were 73.3% in the second zone, while it was 88.8% in the third zone. Patients with FPL injury alone did not demonstrate a statistically significant functional difference than those with accompanying vascular and nervous lesions (Mann-Whitney U-test, $p=0.951$).

Table 1. Buck-Gramcko scoring and classification for thumb functions^[13]

Interphalangeal joint	Degree	Score
Flexion	50-70	6
	30-49	4
	10-29	2
	<10	0
Extention loss	0-10	3
	11-20	2
	21-30	1
	>30	0
Overall movement	≥40	6
	30-39	4
	20-29	2
	<20	0

Scoring: 14-15 perfect; 11-13 good; 7-10 moderate; 0-6 bad

Discussion

If the flexor pollicis tendon is not functional, use of the thumb is significantly restricted.^[1,12] Since even a limited amount of FPL tendon mobility gives a better functional result, FPL repairs provide a better outcome as compared to repairs of superficial and deep digital flexors of the other fingers.^[1,7,8,10]

According to Urbaniak^[7], end-to-end repairs should be performed within the first two months after injury, when the FPL tendon injury at any zone demonstrates a minor injury and no retraction. After the second month, tendon retraction and scars on the tendon sheath or reinjury after a primary repair prevent end-to-end repair and free tendon grafts may be used. If the injury is at the muscular junction, tendon transfer should be the mode of treatment.^[1,2,7-9,12,14] In the late stages, the rate of retear is increased when the FPL repair is performed during forced flexion of the interphalangeal joint or when early motion is allowed. These cases are better candidates for tendon lengthening at the wrist, compared to free tendon grafts.^[15] Tendon lengthening is an easier technique and vascularization of the tendon would be preserved.^[3] While deciding on the method to use for tendon repair, time and localization of the injury, state of the tendon bed and the muscle should also be evaluated.^[7] Only four of the patients in the study group received the operation between 2-34 days postinjury, while the rest of the torn FPL tendons were repaired on the day of the injury. Therefore, the proximal and distal ends of the FPL tendon could easily be abutted without any tension.

Silfverskiöld and Andersson^[16] reported that the cross-stitch epitendon sutures placed in addition to the Kessler sutures during tendon repair increased the tensile strength and prevented gap formation. Sirotakova and Elliot^[15] indicated that strengthening the main tendon suture by epitendinous sutures increases resistance to motion and decreases the rate of retear significantly. In our experience, epitendon cross-stitches decrease the risk of retear of the repaired tendon to a significant extent. Moreover, the epitendon sutures provide a better adaptation of the torn ends of the tendon, significantly decreasing the problem of friction of the repaired area against the pulleys at the second zone during tendon movement.

Vascular and nervous injuries accompanying the flexor pollicis longus tendon injury should be repaired within the same session.^[4,8,12,17] Jensen and Weilby^[17] reported that 15 out of 28 patients they have treated with primary FPL repair had uni- or bilateral nervous injury, while Nunley et al^[12] reported that 82% of the patients had vascular end nervous injuries. Noonan and Blair^[4] demonstrated that there was no significant functional difference between patients who did not have any vascular or nervous injuries and those that received vascular and nervous repairs. 76.6% of the patients in our study group had FPL injuries accompanied by digital artery and nerve injuries and they were all repaired within the same session. Our study also shows that no functional difference exists between patients without any vascular or nervous injuries and those that received vascular and nervous repairs. It is not surprising to acquire good functional results in patients with nerve injury, since the evaluation by Buck-Gramcko et al^[13] involved the motion of the interphalangeal joint only and since normal sensation is present in the dermatome of the digital nerve at the long term follow-up.

In children, FPL tendon injury is quite rare.^[18,19] Grobbelaar and Hudson^[19] reported that they preferred primary repair and early rehabilitation after FPL tendon injury in children and that their results are satisfactory. In another study by our group, rehabilitation after FPL tendon repair at the second zone did not affect functional results in children.^[18,20]

Being an important component of thumb functions, injuries to the FPL tendon and accompanying vascular and nervous injuries may have very good functional results when primary end-to-end repair is performed at an early stage, followed by a good rehabilitation program.

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