

Current Practice in Acute Flexor Tendon Repair in Israel

Oren Sarig MD, Abraham Hass MD and Amir Oron MD

Department of Hand Surgery, Kaplan Medical Center, Rehovot, Israel

ABSTRACT: **Background:** Various methods of core suture and suture material are used successfully in acute flexor tendon repair. **Objectives:** To assess the current practice in acute flexor tendon repair among Israeli hand surgeons.

Methods: A five-question survey was conducted among certified hand surgeons in Israel regarding their preferred materials and method for performing acute flexor tendon repair.

Results: Forty-eight hand surgeons participated in the survey. The most widely used core suture in zone 2 (58.3%), as well as in zones 3 and 4 (62.5%), was the modified Kessler type. The most widely used suture material was nylon. All surgeons incorporated epitendinous sutures to augment their core sutures.

Conclusions: The modified Kessler core suture technique is the most widely used technique among Israeli hand surgeons for repairing acute flexor tendon lacerations in zones 2, 3 and 4. This finding agrees with worldwide data and with emerging data attesting to the lower risk of adhesion formation and postoperative tendon ruptures with this method. The core suture technique initially popularized by the late Prof. Isidor Kessler, who headed our department during the years 1973–92, remains the most practiced acute flexor tendon repair technique among hand surgeons in Israel.

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Flexor tendon injuries are relatively common and impose a substantial burden on both the individual and society [1]. Verdan [2] used his knowledge of anatomy to facilitate classification of flexor tendon injuries into five anatomic zones: zone 5 extends from the muscle-tendon junction to the proximal aspect of the carpal tunnel; zone 4 describes the flexor tendons within the carpal tunnel; zone 3 denotes the origin of the lumbricals from the flexor digitorum profundus tendon; the proximal aspect of the A1 pulley is the entrance to zone 2, or “no man’s land”; and zone 1 is distal to the insertion of the flexor digitorum superficialis tendon. Zones 1 and 2 of the FDS and FDP tendons are described by the fibro-osseous digital sheath. Within this sheath the flexor tendons are covered by a layer of flattened

FDS = flexor digitorum superficialis
FDP = flexor digitorum profundus

fibroblasts known as the epitendon [2]. This specialized surface is the crucial gliding surface that can sometimes be restored for a more successful flexor repair. Early controlled motion after flexor tendon repair improves tendon nutrition, healing and the remodeling response, and results in decreased adhesions with greater tendon excursion (the potential of the transferred muscle to elongate).

In order to achieve active motion in the postoperative period a repair that is durable is needed [3]. The goals of surgical treatment for a lacerated flexor tendon remain constant: accurate coaptation of the tendon ends to enable a postoperative rehabilitation protocol that encourages tendon gliding, inhibits the formation of peritendinous adhesions, stimulates restoration of the gliding surface, allows for primary healing of the repair site, and ultimately restores normal range of motion to the finger [4–7]. Many suturing techniques have been used to allow for acute flexor tendon repair. The purpose of this study was to assess common practice in acute flexor tendon repair among hand surgeons in Israel.

SUBJECTS AND METHODS

A five-question survey was conducted among certified hand surgeons in Israel to check the current practice in flexor tendon repair in zones 2, 3 and 4. The questions asked were:

- What is the surgeon’s general experience in the field of hand surgery?
- What is the type of core suture he/she preferentially uses in zone 2 repair?
- What is the type of core suture he/she preferentially uses in zone 3 and 4 repair?
- What is the type of epitendinous suture he/she preferentially uses?
- What type of suture material is preferentially used for the core sutures?

Forty-eight certified hand surgeons participated in the survey. A statistical analysis of the results was performed using the SPSS 10™ software.

RESULTS

The study group comprised 48 certified hand surgeons – 75.4% of all registered hand surgeons in Israel. It is probable

that the number of active hand surgeons participating in the survey was higher than the already impressive number of survey participants.

Survey responses showed that when repairing zone 2 most surgeons use the modified Kessler technique (58.3%), followed by the Kessler and Strickland techniques (12.5% each). When repairing zones 3 and 4 most surgeons use the modified Kessler technique (62.5%), followed by the Strickland (10.4%) and Kessler (8.3%) techniques. Most surgeons use a continuous running suture (79.2%) as their epitendinous suture. The type of suture most commonly used for core sutures is nylon (43.8%), followed by PDS® (27.1%) and Ethibond® (8.3%) (both manufactured by Ethicon, USA).

Using one-way ANOVA, a significant difference was shown between the suture techniques used in zone 2; the more experienced surgeons tend to use the modified Kessler suture technique ($P = 0.04$) while the newly certified surgeons use the Strickland technique ($P = 0.02$). Using one-way ANOVA no difference was found in the suture material chosen when compared to surgeon experience. The t -test showed that the more experienced surgeons use multiple single sutures in epitendinous repair ($P = 0.014$). Pearson's chi-square test showed that most surgeons prefer using the modified Kessler technique with nylon in zone 2 (35.4%), followed by the modified Kessler technique with PDS (10.4%). In zones 3 and 4 most surgeons prefer the modified Kessler technique with nylon suture (35.4%), followed by the modified Kessler technique with PDS (12.5%).

DISCUSSION

A recent meta-analysis of 39 studies that included 3852 acute flexor tendon repairs found that the rate of tendon rupture following primary suture was 4%, the estimated reoperation rate was 6%, and the adhesion rate 4%. Tendon repairs that included epitendinous sutures had an 84% lower risk of reoperation. Use of techniques other than the modified Kessler resulted in a 134% increase in the likelihood of adhesions [1]. The authors of the meta-analysis state that it is unclear why the modified Kessler stitches lead to a reduction in adhesion formation, especially when other suture methods have been shown to be more durable in mechanical testing or animal studies [8-11]. Nevertheless, this finding emphasizes the importance of clinical data.

Complex techniques such as the multi-strand repair (four to six suture strands across the repair site) are durable but difficult to perform and have limited practical application compared to two-strand repairs [3].

Our survey demonstrated that the modified Kessler suture technique is the most common method used for suturing flexor tendons in Israel. While new techniques have gained popularity with some hand surgeons, the Kessler suture's simplicity and proven clinical success reinforce it as a valuable tool for the avid hand surgeon. Our findings agree with other studies that the basic modified Kessler suturing technique is the one most frequently used.

Prof. Isidor Kessler was born in Russe, Bulgaria in 1926 and died in Israel in 2007. He founded and headed the Department of Hand Surgery at Kaplan Medical Center in Rehovot from 1973 to 1992. His achievements and pioneering work in the field of hand surgery are recognized around the world. He was a founding member of the International Federation of Societies for Surgery of the Hand and established the foundations for hand surgery in Israel. His legacy is reflected in the wide use of the modified Kessler suturing technique which, as shown in the present study, is still being used for acute flexor tendon repair.

Corresponding author:

Dr. O. Sarig

Dept. of Hand Surgery, Kaplan Medical Center, Rehovot 76100, Israel

Phone: (972-8) 944-1611

Fax: (972-8) 944-1975

email: orens@clalit.org.il

References

- Christopher, Dy CJ, Hernandez-Soria A, Ma Y, Roberts TR, Daluiski A. Complications after flexor tendon repair: a systematic review and meta-analysis. *J Hand Surg Am* 2012; 37 (3): 543-51.
- Verdan CE. Half a century of flexor-tendon surgery. Current status and changing philosophies. *J Bone Joint Surg Am* 1972; 54 (3): 472-91.
- Mishra V, Kuiper JH, Kelly CP. Influence of core suture material and peripheral repair technique on the strength of Kessler flexor tendon repair. *J Hand Surg Br* 2003; 28 (4): 357-62.
- Strickland JW. Flexor tendon injuries. I: Foundations of treatment. *J Am Acad Orthop Surg* 1995; 3: 44-54.
- Strickland JW. Flexor tendon injuries, II: Operative technique. *J Am Acad Orthop Surg* 1995; 3: 55-62.
- Strickland JW. Flexor tendon repair. *Hand Clin* 1985; 1: 55-68.
- Strickland JW, Glogovac SV. Digital function following flexor tendon repair in zone II: a comparison of immobilization and controlled passive motion techniques. *J Hand Surg Am* 1980; 5: 537-43.
- Aslam A, Afroke A. A new core suture technique for flexor tendon repair: biomechanical analysis of tensile strength and gap formation. *J Hand Surg* 2000; 25B: 390-2.
- McLarney E, Hoffman H, Wolfe SW. Biomechanical analysis of the cruciate four-strand flexor tendon repair. *J Hand Surg* 1999; 24A: 295-301.
- Tang JB, Pan CZ, Xie RG, Chen F. A biomechanical study of Tang's multiple locking techniques for flexor tendon repair. *Chir Main* 1999; 18: 254-60.
- Veitch A, Firoozbakhsh K, Pribyl CR, McNally T. In vitro biomechanical evaluation of the double loop suture for flexor tendon repair. *Clin Orthop Relat Res* 2000; 377: 228-34.

"Knowledge tells us that a tomato is a fruit; wisdom prevents us from putting it into a fruit salad"

Miles Kington (1941-2008), British journalist, musician and broadcaster