SCIENTIFIC ARTICLE

A Systematic Review of 2-Strand Versus Multistrand Core Suture Techniques and Functional Outcome After Digital Flexor Tendon Repair

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Purpose To determine published evidence to evaluate the hypothesis that multistrand techniques result in a poorer outcome than 2-strand techniques for digital flexor tendon repairs.

Methods A systematic review was undertaken to compare outcomes and rupture rates between 2-strand and multistrand core sutures in digital flexor zones 2 to 5. Outcome was measured by the American Society for Surgery of the Hand criteria, original or modified Strickland criteria, or Buck-Gramcko criteria.

Results A total of 1,878 patients (2,585 digits; 3,749 tendons) were included from the selected studies. Thirty-three studies reported 2-strand repairs and 15 reported multistrand repairs. Of the total tendon injuries, 59% were flexor digitorum profundus, 38% were flexor digitorum superficialis, and 2% were flexor pollicis longus. The pooled rupture rate was 3.9 per 100 digits. No significant difference was detected between 2-strand and multistrand repairs for outcomes by all measures or rupture rate.

Conclusions Because of the wide variation in reporting of outcomes and study design on which this analysis was based, we cannot definitively confirm our hypothesis. We present the standards for outcomes as well as rupture rate for digital flexor tendon repair. *(J Hand Surg Am. 2014;39(4):686–695. Copyright © 2014 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic III.

Key words Core suture, flexor tendon, outcomes, repair technique, systematic review.

Surgical repair of flexor tendons was described as early as 1917, and since then, multiple techniques have been described.[1] Each technique aims to achieve the ideal tendon repair: minimal gapping at the site of repair, little interference with tendon vasculature, adequate strength for healing, and a smooth junction where the tendon ends meet.[2] Unfortunately, there is a paucity of high-level clinical outcome evidence to guide surgical technique for acute flexor tendon injuries. Therefore, current practice sees individual surgeons selecting their own preferred method of repair.

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TABLE 1. Inclusion and Exclusion Criteria Applied to the Screened Articles and Data Selected for Extraction

	Inclusion Criteria	Exclusion Criteria	Data Extracted
Population	Digital flexor tendon repair using a core suture technique	Nondigital flexor tendon, core suture technique not recorded	Patients (n) Core suture technique
	Human participants	In vitro or ex vivo biomechanical studies	
	Participants > 13 y	Participants < 13 y	
Intervention	Randomized and nonrandomized studies, noncomparative studies, case series	Single case reports, review articles	Year of publication Nature of study
	English language	Language other than English	
	Injuries to FDS/FDP/FPL	Partial tendon injury	Tendons injured (n) Digits injured (n) Tendons repaired (n) FDS/FDP/FPL repairs (n)
	Injuries in zones 2–5	Injuries in zone 1	Zone(s) of injury Management of pulleys
	Primary tendon repair	Secondary tendon repairs Tendon reconstruction Tendon grafts Tendon transfers	Core strands (n) Core suture material, epitendinous suture technique Epitendinous suture material
	All rehabilitation programs	Cohort with < 50% follow-up	Nature of rehabilitation program
	Prospective or retrospective data	< 2 mo follow-up	
Outcome	Outcome measures of function: ASSH, modified or original Strickland, or Buck-Gramcko	Other outcome measures	Outcome assessment measure: excellent (n); good (n); fair (n); poor (n); rupture rate (n)

FDP, flexor digitorum profundus; FDS, flexor digitorum superficialis; FPL, flexor pollicis longus.

Modern flexor tendon repairs are based on a combination of a variety of core suture techniques and a circumferential suture. Circumferential sutures increase the strength of repair and significantly decrease the rate of reoperation.[3,4] However, there is still considerable debate over the method and number of strands to use in the core suture. Up until the last decade, 2-strand repairs were the most common technique in use. Based largely on laboratory work and uncontrolled case series, some surgeons began to increase the number of strands in the repair because this was felt to increase the strength of the repair and, therefore, reduce rupture rate. Although biomechanical studies in cadaveric models and animals have proven that increasing number of strands in the core suture results in stronger repairs,[5–7] a recent meta-analysis showed no relationship between number of strands and clinical rupture rate.[4] In addition, increasing the number of strands increases the bulk of the tendon repair, and this may result in reduced tendon gliding as the bulkier tendon tries to pass through the flexor sheath. In a cadaveric model, a 6-strand repair was shown to double the work of flexion as compared with a 2-strand repair.[8] In a clinical setting, this may manifest as stiffness and reduced active motion.

The aim of this literature review was to evaluate the published clinical data with respect to movement and functional outcome following flexor tendon repairs. We hypothesized that a difference exists in functional outcomes between 2- and multistrand core suture flexor tendon repairs.

MATERIALS AND METHODS

Identification and eligibility of relevant studies

A literature search of the following electronic databases was conducted: Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, MEDLINE, CINAHL, and EMBASE. The keywords were: (flexor) AND (tendon) AND (repair OR tenorrhaphy) AND (function OR motion OR outcome OR Strickland OR tam OR Buck-Gramcko).