International Journal of Research and Review
[Indexed, Peer-Reviewed Journal]
Volume 12; Issue: 10; October 2025
Website: www.ijrrjournal.com
E-ISSN: 2349-9788; P-ISSN: 2454-2237

Review Paper

Comparing Suture Techniques for Flexor Tendon Repair: A Systematic Review and Literature Study

I Made Surya Budikusuma[1], Made Bramantya Karna[2], Anak Agung Gde Yuda Asmara[2]

[1]Resident of Orthopaedic and Traumatology Department, General Hospital Prof. IGNG Ngoerah, Faculty of Medicine, Udayana University, Bali, Indonesia
[2]Consultant of Orthopaedic and Traumatology Department, General Hospital Prof. IGNG Ngoerah, Faculty of Medicine, Udayana University, Bali, Indonesia

Corresponding Author: I Made Surya Budikusuma

DOI: https://doi.org/10.52403/ijrr.20251037

ABSTRACT

Background: Flexor tendon injuries continue to be a major cause of illness among young males. Since the tendon's primary role is force transmission, the repair's strength is crucial because it must be able to sustain the high stresses. This has led to numerous suturing methods in the literature, mostly focused on improving repair strength and refining effective techniques.
Methods: "Suture" AND "Techniques" OR “Knots” AND "Flexor Tendon" OR “Flexor” AND "Repair" were used to search PubMed, the Cochrane Library, and Wiley online. (MeSH keywords) in the abstract or title field between January 1, 2020 to December 31, 2024. Using standard techniques, the quality of published papers was evaluated. We included observational and experimental research, including cross sectional, cohort, randomized control trials, and case series.
Results: Eight studies were found to meet the inclusion criteria after the studies and their reference lists were screened. Kessler's and modified Kessler's sutures were among the first and most popular core suture configurations. All studies indicated that multistrand suture technique significantly improve gap resistance, allowing early mobilization of the affected digit. Only passive mobilization techniques are possible with a two-strand repair, at least four strands are required for active mobilization.
Conclusion: The strength of the flexor tendon repair especially depends on the number of strands crossing the repair site, because strength is increased with an increase in the number of core strands. Multistrand suture technique can greatly increase the gap resistance of surgical repair, facilitating early mobilization of the affected digit.

Keywords: flexor tendon injury, repair, suture technique

INTRODUCTION

Flexor tendon is a muscle that flexes the fingers and thumb, surrounded by a fibrous sheath that contains pulleys that help prevent the tendon from bowstringing. Each digit has two flexor tendons: the flexor digitorum profundus (FDP) and the flexor digitorum superficialis (FDS). The FDS tendons are superficial to the FDP in the palm, but the FDS divides into two slips (chiasma of Camper) at the level of the MCP joint, allowing the FDP to move between them before becoming superficial to the FDS. All grip types, including power and delicate pinch grips, depend on flexor tendons, which are critical for hand function.[1]

According to studies, 7-14% of all hand injuries are flexor tendon injuries.[2] They continue to be a major cause of illness among young males in their working years (20 to 45 years old) and usually involving nerve damage. Deep cuts to the fingers, palm, or forearm are often the cause of these injuries. When handling a sharp object or catching a falling object, the dominant hand is more likely to sustain an injury than the non-dominant hand.[3] Significant functional disability from these injuries may include trouble with everyday life, employment, and leisure activities. In order to maximize healing and reduce functional loss, prompt and adequate therapy is crucial. Successful repair rates of 70–90% have been reported for flexor tendon injuries treated surgically.[4]

Repairing flexor tendon injuries surgically is still a difficult issue. The optimal primary flexor tendon repair should have smooth joints, secure knots, little gapping, minimal interference with tendon vascularity, ease of placement, and enough strength to withstand early motion stress during the healing process.[5] Restoring full range of motion and normal grip strength in the hands and wrists is a difficult objective. Joint stiffness, adhesions, gapping, and tendon rupture are possible complications. Age, the mechanism of the injury, the extent of the lesion, the repair method, and the rehabilitation regimen all affect these problems.[6]

The results of tendon restoration have been demonstrated to be influenced by several factors. Since the tendon's primary role is force transmission, the repair's strength is crucial because it must be able to sustain the high stresses applied by early active mobilization. This has resulted in a wide variety of suturing methods being documented in the literature, the majority of which concentrate on enhancing repair strength and encourage additional variations of the more effective methods.[7]

Over the past 20 years, there has been a growing interest in and scientific investigation into suture techniques for flexor tendon repair. Despite many in vivo clinical studies and ex vivo tensile tests comparing different suture techniques, a variety of different repair methods are employed in the clinical setting, indicating that there is currently no unified technique for tendon repair. To our knowledge, there is not much literature discussing comparation the repair strength and outcomes of some commonly used repair techniques. The purpose of this study to evaluate the comparation of suture techniques for flexor tendon repair.

METHODS

Search Strategy

The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guideline statement was followed when doing the research. From January 1, 2020 to December 31, 2024, a thorough search was conducted to find studies that might be included in this analysis. PubMed, Cochrane, and Wiley Online are the databases that are used. Researcher using a combination of keywords such as "Suture" AND "Techniques" OR “Knots” AND "Flexor Tendon" OR “Flexor” AND "Repair". The reference lists and abstracts were checked separately by reviewers. Conflicts amongst reviewers about whether to include or not include a study will be settled by consensus and, if necessary, discussion with an outside reviewer. This research will include studies that employ full text, are in English, and provide the data about comparation of suture techniques for flexor tendon repair.

Inclusion Criteria

The criteria for including studies were as follows: (1) Study that provide comparation of suture techniques for flexor tendon repair; (2) English language studies; (3) Studies published within 2020-2024 which this timeframe was utilized to provide the most recent data; Excluded from consideration were studies reporting on another site of flexor tendon injury or studies that did not present outcomes data (Table 1).

Table 1. PICO Criteria for Inclusion Study

	Inclusion	Exclusion
Population	• Any age • Any sex • Human or animal studies • In vivo or in vitro studies • Injury in flexor tendons	• Crush injuries, lack of adequate skin cover • Previous hand trauma
Intervention	Patients treated with any tendon suturing techniques with comparation (ex McLarney four-strand vs Kessler two-strands)	Patients treated with another conservative management or other than tendon suturing techniques or with only one method of treatment
Outcome	Symptomatic improvement or disabilities or functional capabilities	Outcomes not clearly mentioned Outcome with other parameter than our inclusion criteria
Design	Randomized controlled trials (RCT), cohort, case control, case series, cross sectional	Systematic review or meta-analysis

Quality Evaluation

Every manuscript was subjected to an impartial review by reviewers. Any disparities found were settled by thorough debate and consensus. The seven Cochrane criteria for assessing risk of bias in the "Risk of bias" assessment tool—which include selection, performance, detection, attrition, reporting, and other bias—will be used by the same independent reviewers to evaluate the quality of the included studies (Figure 1 and Figure 2).

Data Synthesis

Two authors conducted an independent title and abstract screening followed by a full-text screening of the study, and any inconsistencies were referred to a second author. For every study that was found and included, data extraction was gathered using specified tables under the headings of fundamental characteristics and results. The data extraction process was conducted by main authors independently, and a second author reviewed it.

RESULT

Search and Selection Method

By searching the databases we utilized, we were able to find 7646 research publications. After removing duplicates, we had 43 articles that needed to be evaluated. After assessing their titles, abstracts, and complete texts, we narrowed down to 8 studies[8-15] that fit our criteria and were eligible for systematic review, as shown in Figure 3.

Baseline Characteristics

Eight studies[8-15] that included 5 randomized controlled trial, 2 retrospective comparative study, and 1 retrospective case control were included. There were various suture techniques and its measurement outcome for flexor tendon repair, as shown in Table 2.

Table 2. Characteristic of the Studies

No	Author (Year)	Country	Study Design	Population	Main consideration	Measurement	Outcome
1	Brenacet al (2024) [8]	France	Randomized controlled trial	Forty fresh deep flexor tendons from porcine forelimbs were used	Biomechanical comparison of suture techniques	Gap-forming force, maximum force before rupture, mode of repair failure, stress, and stiffness	The ST-knot shows comparable results to the double-Kessler, regardless of the thread used. Because it involves fewer steps than conventional techniques, and it is easy to perform, the ST-knot may offer a therapeutic solution, particularly in complex traumas with multiple tendon injuries.
2	Elfatry et al (2024) [9]	Egypt	Randomized controlled trial	Patient with flexor tendon injuries who undergone four strands cruciate technique versus two strands kessler technique	Biomechanical comparison of suture techniques	Motion range, grip strength, the zone of injury, and the likelihood of complications	Using a four-strand locked cruciate instead of a two-strand Kessler, then starting early postoperative controlled active rehabilitation will lead to a better functional outcome, particularly in terms of motion quality, such as motion arc, coordination, and speed
3	Kusano et al (2023) [10]	Japan	Randomized controlled trial	Flexor digitorum profundus tendons harvested from fresh frozen human cadaver hands were repaired in zone 2 utilizing one of three repair techniques	Biomechanical comparison of suture techniques in zone 2	Gap size, stiffness, repair-site strain, ultimate force	Tensile characteristics of the TLS and Y1 methods enable early active mobilization. Gaps of less than 2 mm were absent from all tendons treated using the TLS approach.
4	Nassar et al (2023) [11]	Egypt	Retrospective comparative study	Goat deep digital flexor tendons injury who were repaired with the 4-strand double-modified Kessler, the 4-strand augmented Becker, the 4-strand Savage, and the 4-strand	Biomechanical comparison of suture techniques	Yield force, operative time, ultimate strength, and resistance to gapping	All 4 techniques demonstrated similar yield force, with differences in operative time, ultimate strength, and resistance to gapping. The augmented Becker 4-strand technique had the greatest ultimate strength while the modified double

				modified Tang techniques			Kessler technique was the weakest in resisting a 2-mm gap formation
5	Benameur et al (2022) [12]	Morocco	Retrospective comparative study	Patients who presented with a unidigital laceration of at least one flexor digitorum profundus tendon in zone II of the hand according to Verdan, and aged over 16 years	Biomechanical comparison of suture techniques in zone 2	Degrees of flexion of the PIP and DIP and their extension deficit	Patients who underwent surgery using the McLarney four-strand technique had a higher post-operative functional outcome and a reduced chance of post-operative rupture than those who underwent surgery using the modified Kessler two-strand technique
6	Fuentes et al (2022) [13]	Colombia	Randomized controlled trial	Ex vivo animal models	Biomechanical comparison of suture techniques	Ultimate tensil strength, load to 2-mm gap force, stiffness, failure mode, deformation	Compared to two conventional methods, the helical 6-strand cruciate tenorrhaphy offers superior biomechanical qualities and can sustain the stresses required to start early mobilization in the postoperative phase
7	Dawood et al (2020) [14]	Iraq	Retrospective case control	Patients with flexor tendon injuries involving zone II, III and V with or without vessels or nerve injuries	Biomechanical comparison of suture techniques	Functional outcome	The 4-strand cruciate repair technique had better functional outcome compared to modified Kessler repair technique, especially in zone II and III
8	Sajid et al (2020) [15]	UK	Randomized controlled trial	Fresh porcine flexor digitorum tendons were used	Biomechanical comparison of suture techniques in tendon grafting	Tendon repair	STS repairs are less likely to elongate after cyclic loading and can withstand greater loads where these properties can be valuable in allowing patients to commence mobilization immediately after surgery.

ST: suture technique, TLS: triple looped suture, Y1: Yoshizu #1 suture, STS: Side-to-Side, PTW: Pulvertaft Weave, PIP: proximal interphalangeal DP: distal interphalangeal

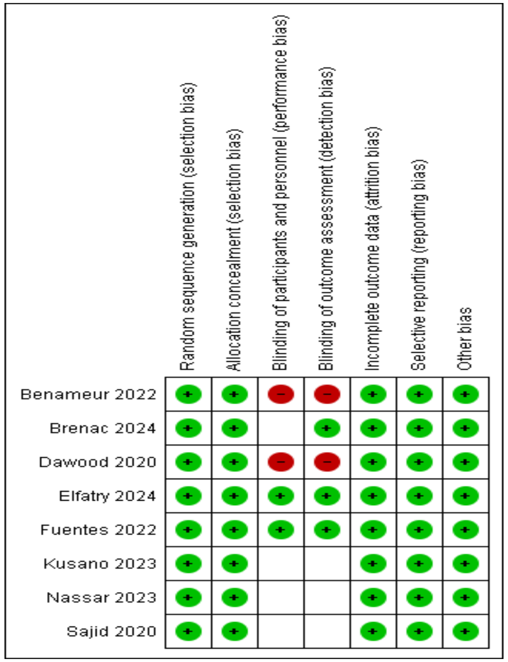

Figure 1. Risk of Bias Graph

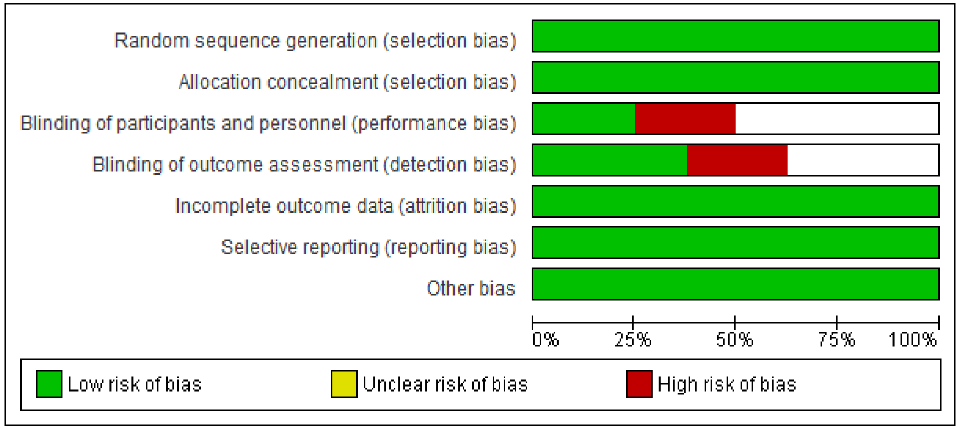

Figure 2. Risk of Bias Summary

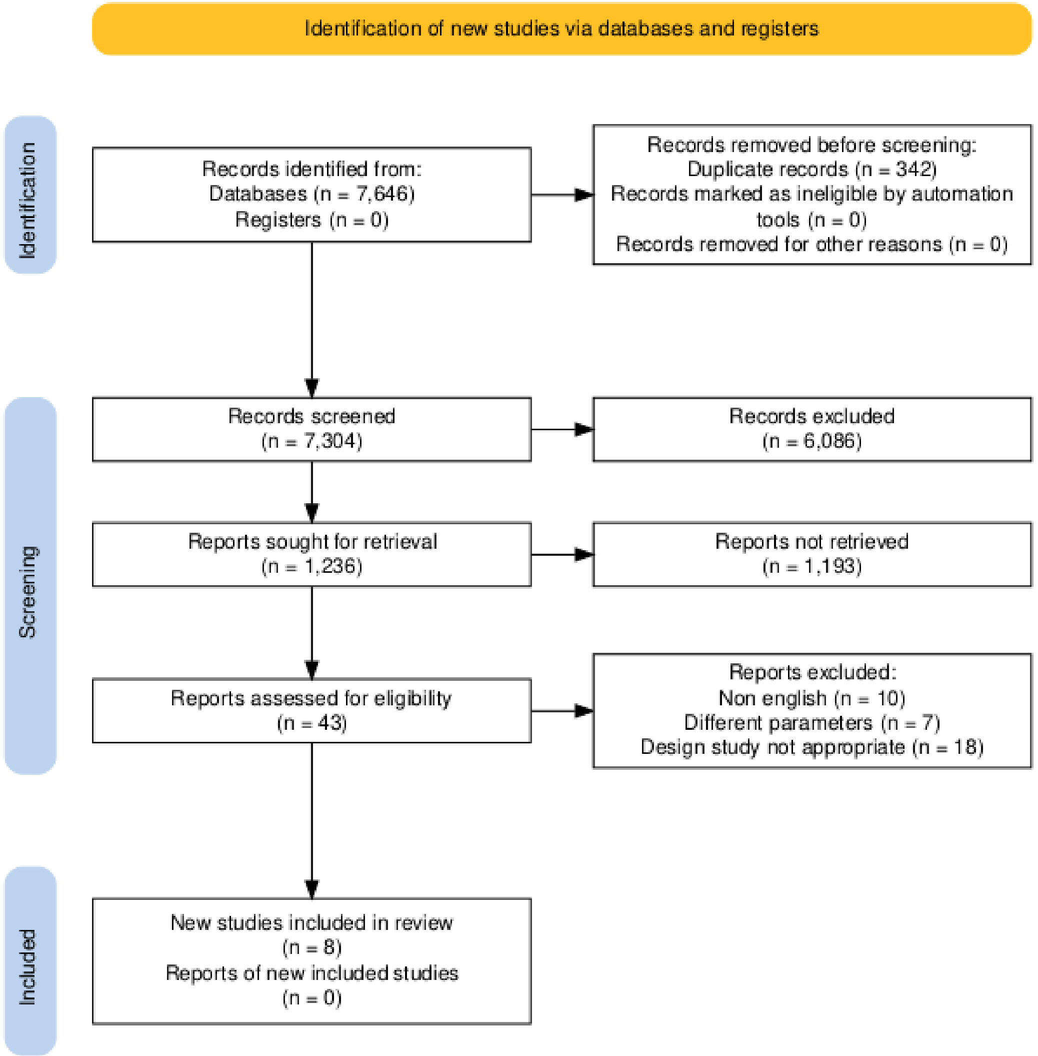

Figure 3. PRISMA flowchart for the included study

Outcomes Measured Across the Studies

All of the studies reportedly that the evolution in surgical technique and suture technology has provided an abundance of options for flexor tendon repairs. There is a tendency that multistrand suture technique can greatly increase the gap resistance of surgical repair, facilitating early mobilization of the affected digit. However, the rehabilitation process appears to be one of the major determinants of the success following a flexor tendon repair.

The new suture (ST-knot) was compared to a traditional suture 5 (double Kessler) in one study. PDS 4.0 was used to prepare ten tendons from group 1 (ST-knot) and ten tendons from group 2 (double Kessler) (single thread for Kessler, but double for ST-knot). The force needed to create a 2 mm tendon gap did not significantly differ between groups, and this tendency held true when a stronger thread was used. There were no appreciable variations between the groups in terms of the maximal force prior to rupture, the manner of repair failure, stress, or stiffness.[8]

Two studies were conducted to compare the four-strand cruciate technique and the two-strand Kessler technique for the treatment of flexor tendon injuries. This study suggests that two or four strands repair procedures can effectively manage flexor tendon injuries in terms of motion range, grip strength, the zone of injury, and the probability of sequelae. Better functional results, especially in terms of motion quality, including motion arc, coordination, and speed, will result from employing a four-strand locked cruciate rather than a two-strand Kessler and beginning early postoperative supervised active therapy.[9,14]

The 4-strand double-modified Kessler, 4-strand augmented Becker, 4-strand Savage, and 4-strand modified Tang procedures were used to repair flexor tendons in one study, and the results showed while the yield force was comparable for all four methods, there were variations in operating time, maximum strength, and gapping resistance.[11]

Due to the numerous variables influencing the prognosis, particularly the type of suture, hand wounds in zone II continue to present a therapeutic challenge for orthopedic surgeons. Two studies examined this and discovered that sutures with more than two strands have demonstrated their efficacy and reproducibility, enabling the surgeon to achieve the desired balance.[10,12]

The results we present not only concern common surgical techniques but also currently developing techniques. Tendon transfer surgery begin commonly performed procedure to restore function to limbs. One study compared Pulvertaft Weave (PTW) and Side-to-Side (STS) in terms of creep after cyclic loading and found STS repairs are less likely to elongate after cyclic loading and can withstand greater loads.[15]

DISCUSSION

Strong, silky threads called flexor tendons attach the forearm muscles to the thumb and finger bones. Each finger has two, and the thumb has one. Tendons bend the fingers like a bicycle brake wire and flow through tunnels in the fingers and wrist. Any cut on the palmar surface of the hand or wrist, particularly around the finger creases where the tendons are located just beneath the skin, might harm the tendons. Sometimes a severe pulling injury to the finger causes the tendon to separate from the bone. The precise biomechanical interaction of the intrinsic and extrinsic musculotendinous forces determines the unique mobility of each hand.[16,17] Young, active individuals frequently sustain flexor tendon injury. Glass cuts are the most frequent cause of finger flexor tendon disturbances in youngsters. It is commonly known that superior function is achieved in the restoration of tendons that have been cleanly cut as opposed to crushing injuries.[18]

One of the biggest problems in hand surgery is still getting digital function back after a flexor tendon injury. Developments in the fields of tendon anatomy, nutrition, healing, and postoperative rehabilitation have led to the development of methods that have improved flexor tendon repair outcomes. Although there has been much discussion over the years regarding the surgical repair method for several zone, especially zone two flexor tendon injuries, adhesion formation, suture rupture, and suture locking on the pulley edge are still potential outcomes of a subpar repair. Tendon gliding function may be compromised, even if it makes sense to increase the repair strength by increasing the number of strands crossing the repair site to permit active postoperative movement without raising the danger of rupture.[19]

The optimal repair method of flexor tendon injury ought to have the following properties: it should be robust enough to allow for the simple and dependable execution of active motion. The current flexor tendon digital standard repair involves four or six strands. Even so, the necessity to strands of growth may not be immediately noticeable, the making use of eight or ten strands could allow attain the minimal strength needed in each repaired tendon considering the usual variance in repair strength. For example, when surgeon arbitrarily minimize the force required to close the 2-mm gap. formation as 25 N, per a prior investigation, The 4- and 6-strand methods were adequate with average forces for ten 26 and 27 N samples, in turn.[20]

Strong suture construction, minimizing the creation of gaps between tendon ends, maintaining the tendon's blood supply, and creating a smooth healing interface are all fundamentals of flexor tendon repair. It is crucial to preserve the neurovascular and pulley structures and use full-thickness skin flaps to appropriately expose the injured area. In order to prevent iatrogenic damage, which increases the risk of adhesion formation, direct tendon handling with instruments should be minimized. The sliced ends of the tendon are grasped at the radial or ulnar corners using non-toothed forceps. Once recovered, tendon that has retracted from the injury site (because to muscle tone and delays) can be fastened with a hypodermic needle for tension-free healing. The longitudinal skin incisions used in the mid-lateral and mid-axial techniques are volar and dorsal to the neurovascular bundles, respectively. It is possible to combine the two methods, particularly when adding wounds. To make retrieval easier, distal or proximal extension or further incisions may be necessary if the tendon stump retracts within the sheath.[21]

The original Kessler repair, Tajima modified Kessler, Kirchmayr repair, and Pennington repair are among the frequent 2-stranded repairs whose biomechanical statistics are shown above. The Pennington is probably a variation of the Kirchmayr repair and has historically and incorrectly been referred to as a modified Kessler in numerous publications. The pictures illustrate the main variations in technique, which are related to the type of loop and knot placement utilized to slide the suture through the tendon. The Pennington stitch, also known as the modified Kessler, is doubled to produce four core stranded repairs either by placing two separate Pennington repairs with double-stranded suture, resulting in two knots, or by continuously passing suture to stack repairs next to one another with one knot.[5]

Kessler's and modified Kessler's sutures were among the first and most popular core suture configurations. Unlike the original Kessler suture, the modified Kessler contains a single final knot in the core suture. An additional "epitendinous" suture that went around the tendon smoothed the surface, and two strands of sutures ran across the repair site. These were adequate for passive mobilization, but they were unable to endure the aggressive mobilization regime that was later suggested in order to avoid adhesion formation and premature function restoration. Since more suture combinations have been documented, there are now four, six, or even eight strands across the repair site. Many researchers conclude that the kind of rehabilitation program that may be implemented following a repair is significantly influenced by the type of repair. Only passive mobilization techniques are possible with a two-strand repair. On the other hand, at least four strands must be repaired if an active mobilization technique is chosen.[1]

In comparison to the Kessler, Tang, and Savage repairs, the cruciate suture approach was almost twice as strong as the 2 mm gap formation. Additionally, the Cruciate technique's ultimate tensile strength was noticeably higher than that of the Kessler, Tang, or Savage repairs. The method was comparable in repair time to the 2-stranded Kessler repair and was far faster than the Savage or Tang repairs. The design of the novel suture approach gave the tendon repair the strength it needed to surpass existing 4-strand techniques, while still allowing for the convenience and speed of a 2-strand technique. In addition, 4-strand sutures—whether or not they have epitenon sutures—have a substantially higher tensile strength than 2-strand sutures. According to the literature, zone II had the worst results, Kleinert splints performed better than static splints, and four strand core sutures have a better result with a lower tendon rupture rate than two strand core sutures. All suture techniques used had adequate tensile strength to encourage early mobilization.[22]

The strength of our study design lies in the fact that we followed PRISMA guidelines and screened the databases for relevant articles. We included various study designs, including randomized controlled trials and cohort studies. We also assessed the quality of the included studies using validated tools. However, our study has some limitations that need to be considered. Firstly, the included studies just consist of eight studies which could have introduced bias into our review. Secondly, some of the included studies were comparative studies and case control, which limits the strength of our conclusions.

While the review highlights the comparation of suture techniques for flexor tendon repair, there is a need for further research to evaluate its long-term effects. Future research is necessary to determine the best suture technique, the long-term efficacy and safety, favorable prognostic factors, and the issue of cost-effectiveness must be addressed. We hoped that our systematic review would spark interest in studies to evaluate the best suture techniques for flexor tendon repair.

CONCLUSION

The strength of the flexor tendon repair especially depends on the number of strands crossing the repair site, because strength is increased with an increase in the number of core strands. Multistrand suture technique can greatly increase the gap resistance of surgical repair, facilitating early mobilization of the affected digit.

Declaration by Authors

Ethical Approval: Not applicable

Acknowledgement: None

Source of Funding: None

Conflict of Interest: No conflicts of interest declared.

REFERENCES

1. Venkatramani H, Varadharajan V, Bhardwaj P, Vallurupalli A, Sabapathy SR. Flexor tendon injuries. *J Clin Orthop Trauma*. 2019;10(5):853-861.
2. Ranjan V, Mehta M, Mehta M, Mishra P, Joshi T, Kumar T. The Outcomes of Flexor Tendon Injury Repair of the Hand: A Clinico-Epidemiological Study. *Cureus*. 2023;15(1)
3. Çalışkan Uçkun A, Yurdakul FG, Ergani HM, Güler T, Yaşar B, Başkan B, Bodur H, Ünlü RE. Factors predicting reoperation after hand flexor tendon repair. Ulus Travma Acil Cerrahi Derg. 2020 Jan;26(1):115-122
4. Naseem A, Ali FA, Ali H, Waheed U, Ali M, Tasleem S. Comparison of Outcome Between Early and Delayed Repair of Flexor Tendons. Pak Armed Forces Med J 2024; 74(3): 749-753
5. Chauhan A, Palmer BA, Merrell GA. Flexor tendon repairs: techniques, eponyms, and evidence. *J Hand Surg Am*. 2015;39(9):1846-1853.
6. Shaikh SA, Bawa A, Shahzad N, Yasmeen S, Beg MSA. Comparison of Modified Kessler Technique versus Four Strand Cruciate Technique for Repair of Long Flexor Tendons of Fingers: A Randomized Controlled Trial. Surg Med Open Access J 2018; 1:1-4.
7. Nassar M, Sallam A, Sokkar S, Abdelsadek H, Zada M. Comparison of 4 Different 4-Strand Core Suturing Techniques for Flexor Tendon Laceration: An Ex Vivo Biomechanical Study. *Hand (N Y)*. 2023;18(5):820-828.
8. Brenac C, Pithioux M, Tomczak S, Lallemand M, Jaloux C, de Villeneuve Bargemon JB. Biomechanical evaluation of the ST-knot: A new suture for flexor tendon repair. *Hand Surg Rehabil*. 2024;43(2):101650.
9. Elfatry MM, Altramsy AAM, Nafeh AM, Dahy AA. Comparative Study Between Four Strands Cruciate Technique Versus Two Strands Kessler Technique in Repair of Flexor Tendon Injuries. Al-Azhar International Medical Journal. 2023; 4:200-205
10. Kusano N, Zaegel MA, Silva MJ. Cyclic testing of six-strand suture techniques for zone 2 flexor tendon lacerations. J Orthop Sci. 2024 Sep;29(5):1214-1219. doi: 10.1016/j.jos.2023.09.007.
11. Nassar M, Sallam A, Sokkar S, Abdelsadek H, Zada M. Comparison of 4 Different 4-Strand Core Suturing Techniques for Flexor Tendon Laceration: An Ex Vivo Biomechanical Study. *Hand (N Y)*. 2023;18(5):820-828.
12. Benameur H, Bensaleh S, Chagou A, Jaafar A, Chahbouni M. Comparison of Modified Kessler and McLarney techniques in Zone II Flexor Tendon Repair. Cureus. 2022;14(9):e29364.
13. Fuentes CE, Carvajal Flechas FS, Hernández JA, et al. Helical 6-Strand Cruciate Tenorrhaphy: Description of a New Technique and Biomechanical

Comparative Analysis With 2 Standard Techniques. *Hand (N Y)*. 2022;17(1):98-105
14. Dawood AA. Repair of flexor tendon injuries by four strands cruciate technique versus two strands kessler technique. *J Clin Orthop Trauma*. 2020;11(4):646-649.
15. Sajid S, Day E, Kuiper JH, Singh R, Pickard S. Biomechanical Evaluation Comparing Pulvertaft Weave and Side-to-Side Tenorrhaphy Using Porcine Tendons. *J Hand Surg Asian Pac Vol*. 2020;25(4):447-452
16. Nguyen JD, Duong H. Anatomy, Shoulder and Upper Limb, Hand Long Flexor Tendons and Sheaths. [Updated 2023 Aug 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-.
17. Stevens KA, Caruso JC, Fallahi AKM, et al. Flexor Tendon Lacerations. [Updated 2023 Jun 20]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-.
18. Vergara Amador, Enrique & Solano, Manuel. Flexor tendon injuries in children. About a series of cases. Salud Uninorte. 2019; 34:253-262
19. Titan AL, Foster DS, Chang J, Longaker MT. Flexor Tendon: Development, Healing, Adhesion Formation, and Contributing Growth Factors. *Plast Reconstr Surg*. 2019;144(4):639e-647e
20. Lee HI, Lee JS, Kim TH, Chang SH, Park MJ, Lee GJ. Comparison of Flexor Tendon Suture Techniques Including 1 Using 10 Strands. *J Hand Surg Am*. 2015;40(7):1369-1376.
21. Pearce O, Brown MT, Fraser K, Lancerotto L. Flexor tendon injuries: Repair & Rehabilitation. *Injury*. 2021;52(8):2053-2067
22. Putra AAGDM, Karna MB, Asmara AAGY, Meregawa PF. Efficacy Comparison of Various Repair Techniques for Flexor Tendon Injuries: A Systematic Review and Meta-Analysis. JOINTS [Internet]. 2021 Apr. 29 [cited 2025 Mar. 9];10(1):11-2.

How to cite this article: I Made Surya Budikusuma, Made Bramantya Karna, Anak Agung Gde Yuda Asmara. Comparing suture techniques for flexor tendon repair: a systematic review and literature study. *International Journal of Research and Review*. 2025; 12(10): 363-373. DOI: 10.52403/ijrr.20251037

******