

Zone II Flexor Tendon Repair: Surgical Principles, Rehabilitation Strategies, And Functional Outcomes

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ABSTRACT

Zone II flexor tendon injuries remain among the most challenging conditions in hand surgery because they involve a narrow fibro-osseous tunnel containing both the flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) tendons, surrounded by a pulley system that is essential for digital motion. Although advances in suture design, multistrand core repair, epitendinous augmentation, wide-awake local anesthesia no tourniquet (WALANT) techniques, and early controlled rehabilitation have improved outcomes, the management of zone II injuries continues to require careful balance between repair strength, tendon gliding, pulley preservation, and prevention of adhesions or rupture. This narrative review summarizes contemporary evidence regarding surgical timing, operative technique, anesthesia selection, pulley management, rehabilitation protocols, complication prevention, and functional outcomes after zone II flexor tendon repair. Current evidence supports strong multistrand repair, meticulous handling of tendon and sheath structures, early protected motion when feasible, close communication between surgeon and hand therapist, and individualized rehabilitation based on repair strength, patient factors, and adherence risk. Despite substantial progress, complications such as adhesions, stiffness, rupture, reoperation, and delayed return of function remain clinically relevant.

KEYWORDS: zone II flexor tendon repair, flexor tendon injury, hand surgery, tendon rehabilitation, early active motion

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INTRODUCTION

Flexor tendon injuries of the hand are functionally significant lesions that can impair grip strength, dexterity, occupational performance, and quality of life. Zone II injuries are particularly important because they occur in the region where the FDS and FDP tendons travel together within a narrow fibro-osseous sheath, historically described as “no man’s land” because of the high risk of adhesions, stiffness, and poor functional recovery [1].

Contemporary management has improved substantially with stronger repair constructs, refined suture techniques, better understanding of tendon biomechanics, and structured postoperative rehabilitation [2]. The main objective of zone II repair is to restore tendon continuity while preserving tendon gliding. This requires a repair that is strong enough to tolerate

early protected mobilization but smooth enough to minimize friction within the sheath [3]. Current recommendations emphasize atraumatic exposure, precise tendon-end approximation, multistrand core suturing, circumferential epitendinous repair, selective pulley management, and close communication between the surgeon and hand therapist [4]. Despite these advances, complications remain clinically relevant. Adhesions, stiffness, rupture, infection, flexion contracture, and need for tenolysis can significantly affect final hand function [5]. Therefore, this review summarizes current surgical principles, rehabilitation strategies, and functional outcomes in zone II flexor tendon repair, with emphasis on practical decision-making for plastic, reconstructive, and hand surgeons.

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METHODS

This narrative review was conducted using PubMed-indexed literature published between January 2020 and May 2026. Search terms included “zone II flexor tendon repair,” “flexor tendon injury,” “flexor tendon rehabilitation,” “early active motion,” “WALANT,” “pulley venting,” “adhesion prevention,” and “functional outcomes.” Priority was given to systematic reviews, meta-analyses, randomized controlled trials, cohort studies, registry-based studies, expert reviews, and clinically relevant technical reports. Articles were selected based on relevance to surgical timing, operative technique, anesthesia, pulley management, rehabilitation, complications, and outcome assessment. Irrelevant articles, non-hand flexor tendon studies, and publications without clear applicability to zone II injuries were excluded.

REVIEW

Surgical anatomy and clinical relevance of zone II

Zone II extends from the distal palmar crease to the insertion of the FDS tendon. In this region, both flexor tendons travel through a confined fibro-osseous canal stabilized by annular and cruciate pulleys. The limited space available for tendon excursion explains why small increases in repair bulk, edema, hematoma, or scar formation can compromise gliding and produce stiffness [6].

Clinical examination remains essential in zone II flexor tendon injuries because isolated FDP disruption may be missed when the superficial flexor tendon remains intact. Loss of active distal interphalangeal (DIP) joint flexion, abnormal digital cascade, and mechanism of injury should raise suspicion for FDP laceration in zone II [7].



Figure 1. Clinical presentation of isolated flexor digitorum profundus tendon lacerations in flexor zone II.

Clinical photographs from five reported cases showing volar finger lacerations associated with impaired active DIP flexion. The red circles indicate the affected digits, in which loss of DIP flexion was attributed to isolated FDP tendon injury. These findings highlight the importance of systematic assessment of FDP function in patients with volar finger wounds. FDP: flexor digitorum profundus; DIP: distal interphalangeal joint. Adapted from Alkandari et al. [7] under the Creative Commons Attribution 4.0 International License. Preoperative evaluation should include assessment of active flexion at the distal and proximal interphalangeal joints, digital cascade, tenodesis effect, sensory function, capillary refill, wound contamination, and associated nerve, vessel, bone, or soft-tissue injury. Combined injuries may alter timing, surgical exposure, postoperative protection, and prognosis [8].

Timing of repair

Primary repair is generally preferred when the wound is clean, soft tissues are suitable, and experienced surgical care

is available. Early repair may reduce tendon retraction, facilitate tendon identification, and allow initiation of structured rehabilitation [9]. However, delayed primary repair may be appropriate in selected cases, particularly when presentation is delayed, the wound requires optimization, or immediate surgical resources are unavailable [10].

Recent evidence suggests that delayed primary repair in zone II can still achieve favorable outcomes when performed with careful technique and appropriate rehabilitation [11]. Delays of several weeks have also been reported with acceptable results in selected patients, although delayed repair may increase technical difficulty because of tendon retraction, sheath scarring, and early adhesion formation [12].

Delayed or staged reconstruction

Chronic or untreated zone II flexor tendon injuries may require staged reconstruction when primary repair is no longer feasible because of tendon retraction, scarring, tendon loss, or sheath compromise. In selected cases, a two-stage approach using a silicone spacer followed by tendon grafting

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may restore tendon continuity and functional flexion, although this strategy requires careful surgical planning and prolonged postoperative rehabilitation [12].

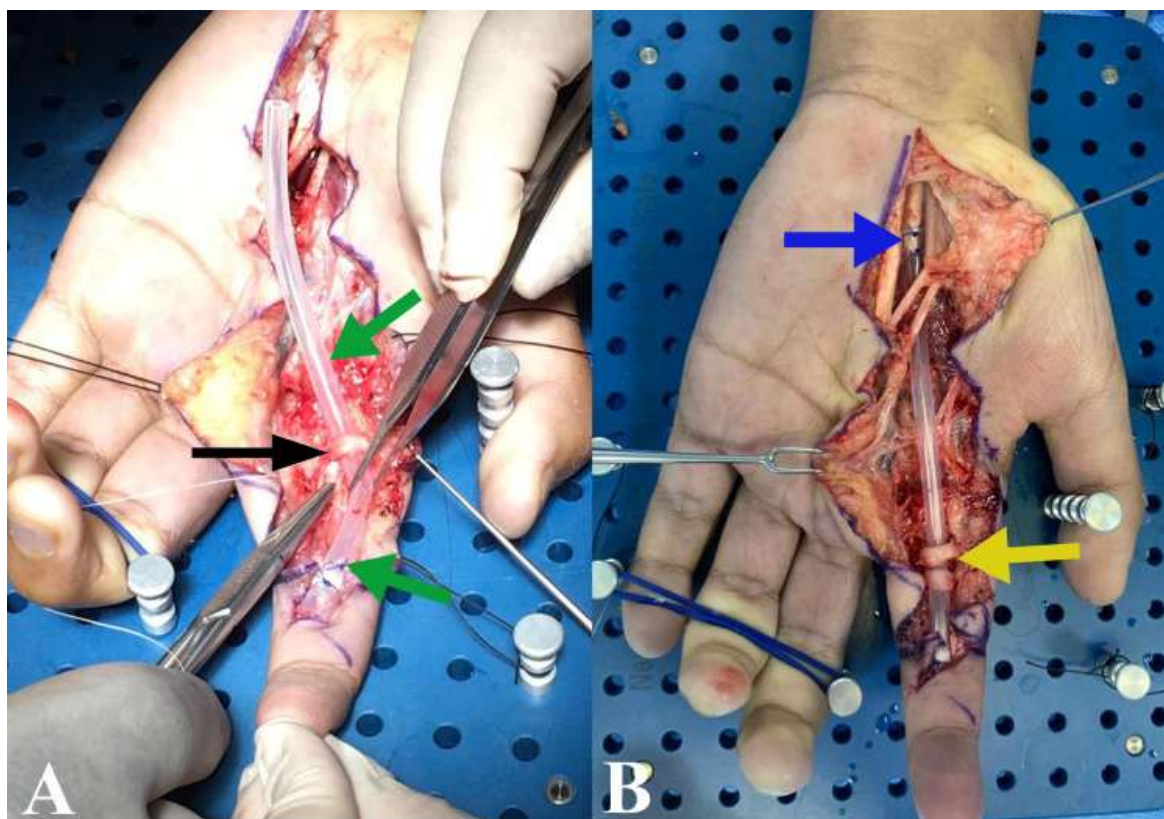


Figure 2. Cadaveric tendon allograft placement during two-stage reconstruction of a chronic zone II flexor tendon injury.

(A) Intraoperative view showing replacement of the silicone spacer with a cadaveric tendon allograft during the second stage of reconstruction. (B) Cadaveric tendon allograft after passage through the flexor tendon sheath, exiting at the level of the middle phalanx. This case illustrates a staged reconstructive option for chronic or untreated zone II flexor tendon injuries in which primary repair is not feasible because of tendon loss, scarring, or delayed presentation. Adapted from Lizarzaburu-Ortiz et al. [12] under the Creative Commons Attribution 4.0 International License.

Anesthesia selection and the role of WALANT

WALANT has become increasingly relevant in flexor tendon surgery. Its main advantage is the ability to test active digital motion intraoperatively, allowing the surgeon to identify gapping, catching, pulley impingement, excessive repair bulk, or inadequate tendon excursion before closure [13].

Randomized evidence comparing WALANT and general anesthesia in zone II flexor tendon repair suggests that WALANT may provide practical intraoperative advantages, although superiority in long-term functional outcomes has not been definitively established [14]. Comparative studies of WALANT and brachial plexus block also support its feasibility in selected patients [15]. WALANT may be especially useful when intraoperative confirmation of tendon gliding is necessary, but its success depends on patient

cooperation, surgeon experience, and careful local anesthetic technique [16,17].

Some centers have also explored procedure-room or clinic-based flexor tendon repair models, aiming to reduce cost and improve access while maintaining safety [18]. This approach may be useful in appropriately selected cases, but it requires careful protocols, sterility, emergency preparedness, and institutional support.

Core surgical principles

The ideal zone II repair should be strong, smooth, minimally bulky, and tissue-sparing. Modern repairs usually rely on multistrand core sutures combined with a circumferential epitendinous suture to improve strength and reduce gapping [19]. Increasing the number of core strands generally improves tensile strength, but excessive suture material may increase repair bulk and friction. Therefore, the surgeon must balance strength with gliding efficiency [20].

Technical reports have described augmented or protected repair constructs designed to reduce tension across the primary repair and permit safer mobilization [21]. These concepts are attractive because early motion depends on repair strength, but they require technical precision and further validation. Repair quality should be judged not only by tendon-end approximation but also by absence of gapping during passive or active motion testing.

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Modern zone II flexor tendon repair requires a balance between repair strength and tendon gliding. The repair must be strong enough to tolerate early protected rehabilitation while remaining smooth and low-profile to reduce friction

within the fibro-osseous sheath. Table 1 summarizes the main surgical principles that guide intraoperative decision-making [1-6,17-21].

Table 1. Key surgical principles in zone II flexor tendon repair.

Surgical principle	Purpose	Practical implication
Multistrand core repair	Increases tensile strength	Allows safer early protected mobilization
Epitendinous suture	Improves smoothness and adds strength	Reduces gapping and friction
Low-bulk repair	Preserves tendon gliding	Avoids catching within the sheath
Selective pulley venting	Improves tendon excursion when needed	Should be limited to avoid bowstringing
Atraumatic handling	Reduces inflammation and scarring	Helps decrease adhesion formation
Intraoperative motion testing	Detects gapping, catching, or impingement	Especially useful with WALANT
Individualized FDS management	Reduces crowding in the sheath	Consider injury pattern and tendon gliding

FDS: flexor digitorum superficialis; WALANT: wide-awake local anesthesia no tourniquet. The ideal repair should be strong, smooth, and biologically conservative and tissue-sparing, with decisions tailored to intraoperative tendon gliding.

Optimization of FDP repair is particularly important because DIP flexion contributes substantially to grip and fine pinch function [22]. In combined FDP and FDS injuries, treatment of both tendons must be individualized. Repairing both slips may improve strength but may also increase crowding within the sheath.

Pulley management

Preservation of the pulley system is central to flexor tendon biomechanics. However, rigid preservation of every pulley at the expense of tendon gliding may be counterproductive. Selective venting of pulleys may be necessary when the repaired tendon catches or fails to glide smoothly [23].

Biomechanical evidence shows that division of flexor tendon pulleys can affect tendon excursion and work of flexion [24]. Therefore, pulley release should be limited, strategic, and directed toward improving gliding while preserving essential biomechanical function. The A2 and A4 pulleys are particularly important, but partial venting may be acceptable when needed to avoid friction and triggering at the repair site.

Adhesion prevention and biologic adjuncts

Adhesion formation remains one of the most important barriers to optimal recovery after zone II flexor tendon repair. Adhesions may limit tendon excursion, reduce total active motion, and lead to secondary procedures such as tenolysis. Current strategies to reduce adhesions include atraumatic technique, limited handling of tendon surfaces, preservation of sheath structures when feasible, meticulous hemostasis, smooth repair configuration, and early controlled mobilization [25].

Biologic and barrier adjuncts have also been explored. Amniotic membrane has been studied as a possible anti-adhesion adjunct in flexor tendon repair [26]. Collagen-based materials have also been evaluated as barriers around the repair site [27]. However, evidence remains heterogeneous, and these materials should be considered adjunctive rather than substitutes for sound surgical technique and rehabilitation.

Rehabilitation after zone II repair

Postoperative rehabilitation is as important as the surgical repair itself. The goal is to protect the repair while promoting tendon gliding, minimizing edema, preventing joint stiffness, and avoiding rupture. Contemporary rehabilitation strategies include early passive motion, early active motion, controlled active motion, place-and-hold exercises, relative motion flexion splinting, and individualized protocols based on repair strength and patient factors [28].

Systematic reviews and meta-analyses suggest that early mobilization protocols are central to modern zone II care. Early active motion may improve range of motion in selected patients, whereas early passive motion may provide protection in patients at higher risk of rupture or poor adherence [29]. However, no single rehabilitation protocol is universally applicable across all patients. Rehabilitation should be selected according to repair strength, tendon quality, associated injuries, edema, pain, cognitive ability, social support, and access to specialized hand therapy [30]. Randomized long-term data comparing passive mobilization with place-and-hold or active mobilization protocols suggest that differences in early recovery may not always translate into large long-term differences, although early motion remains important for tendon gliding [31]. Recent randomized evidence comparing controlled active motion and early passive mobilization after zone II repair continues to

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support the relevance of early protected movement while highlighting the need to balance range-of-motion gains against rupture risk [32].

Relative motion flexion splinting has emerged as a potential strategy for selected zone I–III repairs [33]. Systematic review data suggest that this approach may be promising, but further studies are required before broad adoption [34].

Adherence is a major determinant of outcome. Smartphone-based rehabilitation support has been evaluated as a method to improve home exercise adherence after flexor tendon repair [35]. Qualitative studies show that patient

understanding, motivation, therapist communication, pain, fear of rupture, and practical barriers influence adherence [36]. Variation in patient information and rehabilitation regimens remains common, which may contribute to inconsistent outcomes across institutions [37].

Postoperative rehabilitation is a major determinant of functional recovery after zone II flexor tendon repair. The selected protocol should protect the repair while promoting tendon excursion, minimizing adhesions, and preventing stiffness. Table 2 summarizes the main rehabilitation strategies described in contemporary practice [25-35].

Table 2. Rehabilitation strategies after zone II flexor tendon repair.

Strategy	Main objective	Key consideration
Early passive motion	Promote tendon gliding with low repair stress	Useful when rupture risk or adherence concern is higher
Early active motion	Improve active tendon excursion	Requires strong repair and reliable patient adherence
Place-and-hold exercises	Controlled tendon activation	Requires close therapist supervision
Controlled active motion	Balance motion and protection	Progression must be individualized
Relative motion flexion splinting	Facilitate selected controlled movement	Promising, but not universally applicable
Smartphone-assisted therapy	Improve home-exercise adherence	Depends on patient engagement
Early hand therapy referral	Start splinting, education, and motion early	Delays may worsen functional recovery

Rehabilitation should be individualized according to repair strength, injury complexity, edema, pain, associated injuries, patient reliability, and access to specialized hand therapy.

The timing of referral to hand therapy is also important. Delayed initiation of therapy after zone II repair may affect functional recovery and complication risk [38]. Ultrasound-based assessment of tendon tension and repair behavior has been investigated as a tool to guide rehabilitation and improve safety, although its role in routine practice remains evolving [39].

Complications and reoperation

Despite advances in repair strength, tendon handling, anesthesia, and rehabilitation, complications after zone II flexor tendon repair remain clinically important. The most relevant complications include adhesions, stiffness, rupture, infection, flexion contracture, extension lag, scar sensitivity, complex regional pain syndrome-like symptoms, and need for secondary surgery [5,36]. Adhesion formation is particularly important in zone II because even limited scar formation within the fibro-osseous sheath can restrict tendon excursion and reduce total active motion [22]. Large database analyses have shown that zone II flexor tendon repair continues to be associated with measurable rates of complications, reoperations, and healthcare utilization, emphasizing the need for careful patient counseling and structured follow-up [36]. Tenolysis is one of the most important secondary procedures after flexor tendon repair. It is generally considered when

tendon continuity is preserved, passive motion is adequate, but active motion remains limited despite appropriate rehabilitation. Factors associated with flexor tenolysis include injury complexity, scarring, delayed or inadequate therapy, and patient-related factors that interfere with postoperative recovery [37]. Registry data also suggest that reoperation risk after flexor tendon repair is influenced by patient characteristics, injury pattern, treatment factors, and rehabilitation access [38].

Social determinants of health may also influence recovery. Reduced access to specialized hand therapy, social deprivation, and difficulty adhering to rehabilitation protocols have been associated with worse outcomes or increased complications after flexor tendon repair [39]. Cost analyses further demonstrate that isolated flexor tendon injuries can generate substantial healthcare use, especially when therapy requirements, complications, or reoperations are considered [40]. Functional outcome studies in zones II and III show that many patients achieve useful recovery, although residual stiffness, decreased range of motion, and delayed functional improvement remain common [41]. Surveys of clinical practice also demonstrate variability in preferred surgical techniques and rehabilitation protocols, reflecting ongoing uncertainty and regional differences in management [42].

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Functional outcome assessment

Outcome assessment after zone II flexor tendon repair should include both objective and patient-centered measures. Traditional objective measures include total active motion, Strickland and Glogovac criteria, grip strength, pulp-to-palm distance, extension deficit, rupture rate, tenolysis rate, and return to work [23,25,41]. However, patient-reported outcomes are increasingly important because they capture pain, satisfaction, perceived hand function, activity limitations, and ability to return to daily or occupational activities [30,31,40].

Functional recovery is not determined solely by tendon healing. It also depends on joint mobility, scar pliability, edema control, sensory recovery, patient adherence, therapy

quality, psychological readiness, and occupational demands [25,31,39]. Therefore, future studies should include standardized outcome measures, longer follow-up, and consistent reporting of both clinical and patient-reported outcomes to allow better comparison between surgical techniques and rehabilitation strategies [24,41,42].

Although modern repair techniques and early protected rehabilitation have improved outcomes, complications remain clinically relevant after zone II flexor tendon repair. Adhesions, rupture, stiffness, reoperation, and limited therapy access may compromise final function. Table 3 summarizes the main complications and outcome domains that should be considered during follow-up [36-42].

Table 3. Main complications and outcome measures after zone II flexor tendon repair.

Domain	Clinical relevance	Outcome implication
Adhesions	Limit tendon excursion	May require prolonged therapy or tenolysis
Rupture	Loss of tendon continuity	Often requires revision repair
Stiffness	Reduced active or passive motion	Limits hand function and return to work
Tenolysis	Secondary surgery for adhesions	Consider when passive motion is preserved but active motion remains poor
Reoperation	Marker of complicated recovery	Influenced by injury severity and treatment factors
Therapy access	Determines rehabilitation quality	Poor access may worsen outcomes
Total active motion	Objective functional measure	Useful for comparing postoperative recovery
Patient-reported outcomes	Reflect pain, satisfaction, and daily function	Complements objective range-of-motion data

Functional success should not be measured only by tendon continuity or absence of rupture. Final assessment should include range of motion, need for secondary procedures, therapy adherence, patient-reported function, and return to daily activities.

DISCUSSION

Zone II flexor tendon repair remains one of the most technically demanding areas of hand surgery because it requires restoration of tendon continuity within a narrow fibro-osseous sheath while preserving smooth tendon gliding. Historically, this region was considered difficult because of the close relationship between the FDP, FDS, synovial sheath, and pulley system. Contemporary evidence, however, has shifted management away from prolonged immobilization and toward stronger repairs combined with early protected mobilization [1,2]. This evolution reflects a better understanding that successful outcomes depend not only on tendon healing but also on minimizing adhesions, preventing rupture, maintaining joint mobility, and supporting patient adherence throughout rehabilitation [3,4].

A central principle in modern zone II repair is the balance between repair strength and gliding efficiency. Multistrand core sutures and circumferential epitendinous repair have

improved tensile strength and resistance to gapping, allowing earlier controlled motion [3,6,17]. However, increasing repair strength should not come at the expense of excessive bulk, friction, or triggering within the sheath. A technically strong but bulky repair may increase resistance to gliding and contribute to adhesions or stiffness. Therefore, the ideal repair should be strong enough to tolerate the selected rehabilitation protocol, yet smooth and low-profile enough to move freely through the pulley system [6,17]. This is particularly important in combined FDP and FDS injuries, where tendon crowding may compromise motion if repair strategy is not individualized [19].

Timing of repair is another important consideration. Primary repair remains preferred when soft-tissue conditions are favorable, contamination is controlled, and appropriate surgical expertise is available [9]. Nevertheless, delayed primary repair can still produce acceptable outcomes in selected zone II injuries when meticulous technique and structured rehabilitation are used [10,11]. This is clinically relevant because many patients present late, are referred from other centers, or have associated wounds that require optimization before definitive tendon repair. The available evidence suggests that delay alone should not automatically exclude primary repair, but delayed cases may be technically

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more demanding because of tendon retraction, sheath scarring, edema, and early adhesion formation [10,11].

WALANT has become an important adjunct in flexor tendon surgery because it permits intraoperative active motion testing. This can help the surgeon detect gapping, catching, pulley impingement, inadequate excursion, or excessive repair bulk before wound closure [12,15]. In zone II, where tendon gliding is highly sensitive to small mechanical obstacles, this feedback may be particularly valuable. Randomized and comparative studies suggest that WALANT is feasible and may offer practical advantages compared with general anesthesia or brachial plexus block, although current evidence does not conclusively prove superiority in all functional outcomes [12,15]. Therefore, WALANT should be viewed as a useful tool rather than a universal requirement. Its benefits are likely greatest in cooperative patients, experienced hands, and cases where intraoperative confirmation of tendon excursion can influence pulley management or repair adjustment [15,16].

Pulley management remains an area of practical debate. Preservation of the pulley system is essential for maintaining digital biomechanics and preventing bowstringing, but rigid preservation of every pulley can be counterproductive if the repaired tendon cannot glide freely [20,21]. Selective pulley venting may be necessary when the repair catches beneath a pulley or when there is excessive resistance to tendon excursion [20]. Biomechanical evidence shows that pulley division can alter tendon excursion and work of flexion, which supports a conservative and selective approach rather than routine extensive release [21]. In practice, the goal is not simply to preserve anatomy but to restore functional tendon motion while maintaining the mechanical advantages of the pulley system.

Adhesion prevention remains one of the greatest unresolved challenges after zone II repair. Adhesions can limit active motion, prolong rehabilitation, and lead to secondary procedures such as tenolysis [22,37]. Current prevention strategies rely on atraumatic handling, careful hemostasis, preservation of sheath structures when possible, smooth repair configuration, edema control, and early controlled mobilization [22,25]. Biologic adjuncts, including amniotic membrane and collagen-based barriers, have been explored as methods to reduce adhesion formation [23,24]. Although these approaches are promising, the evidence remains heterogeneous, and they should not replace meticulous surgical technique or structured rehabilitation. Further clinical studies are needed to determine which patients may benefit most from anti-adhesion adjuncts and whether these materials improve long-term function in a cost-effective manner [22-24].

Postoperative rehabilitation is one of the strongest determinants of outcome. Modern rehabilitation aims to protect the repair while promoting tendon gliding and preventing stiffness [25]. Systematic reviews and meta-analyses support the importance of early protected motion

after zone II repair, but the optimal protocol remains influenced by repair strength, injury complexity, tendon quality, edema, pain, associated injuries, and patient reliability [23,25]. Early active motion may improve tendon excursion and functional recovery in selected patients, whereas early passive motion or more protective protocols may be safer in patients with tenuous repairs, complex injuries, or concerns about adherence [23,26,27]. Therefore, rehabilitation should not be applied as a rigid formula; it should be individualized through communication between the surgeon and hand therapist.

Emerging rehabilitation strategies may improve recovery but require further validation. Relative motion flexion splinting has been proposed for selected zone I–III flexor tendon repairs and may offer practical advantages in carefully chosen patients [28,29]. Technology-assisted rehabilitation, including smartphone-based programs, may improve patient engagement and adherence to home exercises [30]. However, qualitative studies show that adherence depends on more than instructions alone. Pain, fear of rupture, misunderstanding of restrictions, work demands, access to therapy, and patient motivation all influence participation in rehabilitation [31]. These findings are important because even technically successful repairs can fail functionally if postoperative therapy is delayed, inconsistent, or poorly understood [32,33].

Complications and reoperations remain clinically relevant despite modern advances. Large-scale analyses demonstrate that zone II flexor tendon repair continues to be associated with complications, reoperations, and substantial healthcare use [36,40]. Tenolysis remains a key secondary procedure when active motion is limited by adhesions despite preserved passive motion [37]. Registry data further suggest that the risk of reoperation is multifactorial and may be influenced by injury severity, treatment factors, and patient characteristics [38]. These findings emphasize the importance of preoperative counseling. Patients should understand that tendon repair is not a single-event intervention but a prolonged recovery process requiring surgery, splinting, therapy, adherence, and sometimes secondary procedures.

Social factors should also be considered when evaluating outcomes. Access to specialized hand therapy, transportation, work flexibility, health literacy, and social support can influence rehabilitation participation and complication risk [39]. This is particularly important because zone II repairs require close follow-up and precise progression of motion. Patients with limited therapy access or high risk of nonadherence may require modified protocols, additional education, simplified exercise plans, or closer monitoring. In this sense, functional recovery after zone II repair is both a surgical and systems-based outcome [39,40].

Functional outcome reporting remains heterogeneous. Studies may report total active motion, rupture rate, tenolysis rate, grip strength, return to work, or patient-reported function, but these outcomes are not always standardized

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[23,24,41]. This makes it difficult to compare techniques, rehabilitation protocols, and adjunctive therapies across studies. Future research should prioritize standardized outcome sets, longer follow-up, and greater inclusion of patient-reported outcomes. Functional success should not be defined only by tendon continuity or absence of rupture, but by meaningful recovery of hand function, return to daily activities, patient satisfaction, and durability of results [31,41,42].

Overall, the current evidence supports an individualized, multidisciplinary approach to zone II flexor tendon repair. Successful management requires accurate diagnosis, timely repair when feasible, strong and smooth tendon reconstruction, selective pulley management, early protected rehabilitation, and close follow-up [1,4,23]. Although modern techniques have improved outcomes, no single surgical method or rehabilitation protocol is universally superior for all patients. The best results are likely achieved when surgical decisions and therapy progression are tailored to the injury pattern, repair quality, patient factors, and available rehabilitation resources [25,33,42].

As a narrative review, this article is limited by the heterogeneity of available studies, variation in surgical techniques and rehabilitation protocols, and the absence of standardized outcome reporting across the literature.

CONCLUSIONS

Zone II flexor tendon repair remains one of the most complex procedures in hand surgery because it requires restoration of tendon continuity within a narrow sheath while preserving gliding and preventing adhesions. Current evidence supports meticulous multistrand core repair, epitendinous augmentation, selective pulley management, early protected mobilization, and close collaboration between surgeon and hand therapist. WALANT can be useful for intraoperative assessment of tendon gliding but should be applied selectively. Rehabilitation must be individualized according to repair strength, injury complexity, patient adherence, and therapy access. Although modern techniques have improved outcomes, adhesions, stiffness, rupture, and reoperation remain important concerns. Continued research is needed to standardize outcome reporting, refine rehabilitation protocols, and develop effective anti-adhesion strategies.

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