

The Thenar Flap for Allen Type I and II Fingertip Injuries in Adults: A Retrospective Series and Rehabilitation Protocol

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[DOI: 10.58542/jbota.v63i1.204](https://doi.org/10.58542/jbota.v63i1.204)

Abstract

Background: Fingertip injuries are among the most common traumatic lesions of the upper extremity and carry a disproportionate functional and socioeconomic impact. Injuries corresponding to Allen type I and selected type II patterns frequently involve volar pulp loss with exposed bone, rendering conservative management or skin grafting unreliable. Despite the development of various local reconstructive options, the thenar flap remains a valuable technique for achieving durable, sensate coverage.

Methods: A retrospective case series was conducted including adult patients who underwent staged thenar flap reconstruction for acute fingertip injuries. Eleven patients (10 male, 1 female; mean age 56 years) were treated. Follow-up of at least 7 months was achieved using patient-reported and objective outcome measures, including Visual Analog Scale (VAS) for pain, static two-point discrimination (2PD), and active range of motion (ROM). Surgical technique followed contemporary refinements in flap design (“mirror image” planning), positioning, and staged division, combined with a structured postoperative rehabilitation protocol.

Results: No flap losses or secondary infections were observed. Functional outcomes were favorable, with preservation of interphalangeal joint motion in all but one patient, who developed a mild cicatricial contracture not requiring surgical intervention. One patient reported persistent sensory disturbance; however, protective sensibility was preserved in all evaluated cases. No clinically significant nail deformities or donor-site complications were recorded.

Conclusion: In adult patients with fingertip injuries corresponding to Allen type I and selected type II patterns, the thenar flap remains a reliable and effective reconstructive option. When performed using modern planning principles and combined with structured rehabilitation, it provides durable glabrous padding, preserves digital length, and supports satisfactory functional and sensory recovery with a low complication profile.

Keywords—fingertip injuries, adults, thenar flap, emergency hand trauma.

1 Introduction

1. Anatomical and Epidemiological Imperative

The human hand is a highly specialized sensory and functional organ that enables interaction with the physical environment, communication, and fine motor control¹. Within this complex biomechanical system, the fingertip—defined as the anatomical region distal to the insertion of the flexor digitorum profundus and extensor tendons on the distal phalanx—serves as the primary interface for tactile exploration and precision manipulation¹. Owing to its exposed position and constant involvement in daily activities, the fingertip is the most frequently injured segment of the upper extremity^{1,2}.

Management of fingertip injuries extends beyond simple wound closure; it requires a reconstructive approach aimed at restoring a painless, stable, and sensate digital pulp while preserving functional length and acceptable aesthetic appearance². While small distal defects (Allen type I) are often managed conservatively by secondary intention [1], injuries presenting with significant soft-tissue loss, exposed bone, or tendon—particularly those corresponding to Allen type II and complex distal patterns—may require vascularized tissue coverage to ensure durable healing and prevent hook-nail deformity. Among the available reconstructive options, the thenar flap remains a cornerstone technique. First described in the early twentieth century by Gatewood, the thenar flap embodies the fundamental plastic surgery principle of replacing "like with like" by utilizing glabrous palmar skin to reconstruct the specialized pulp of the fingertip³.

1.1 Global Epidemiology of Hand and Fingertip Trauma

Fingertip injuries represent a substantial and persistent public health burden. Hand injuries account for a significant proportion of emergency department trauma presentations worldwide, with fingertip injuries forming a major subset^{1,2}. This high incidence reflects the constant exposure of the hand to occupational, domestic, and recreational hazards. Epidemiological studies consistently demonstrate a bimodal age distribution. The first incidence peak occurs in early childhood, where crush injuries predominate. The second and more pronounced peak affects young and working-age adults, in whom occupational exposure to machinery, power tools, and sharp instruments represents the dominant mechanism of injury¹.

A marked male predominance is reported across studies, with men accounting for approximately 80–90% of traumatic fingertip and hand injuries. This disparity is largely attributable to workforce distribution in high-risk manual labor sectors such as construction, manufacturing, and agriculture^{4,5}. Recent large retrospective registry data further confirm the predominance of crush and work-related mechanisms, with male patients representing the majority of cases and fingertip injuries accounting for a substantial proportion of emergency hand trauma presentations⁶.

1.2 The Burden of Injury in Europe and Bulgaria

Within the European Union, hand injuries remain a major occupational health concern. Eurostat data indicate that "wounds and superficial injuries"—a category heavily dominated by hand trauma—accounted for more than 76% of all non-fatal occupational

accidents in recent reporting years⁷. Considerable variation exists between member states, reflecting differences in industrial profiles, safety regulations, and reporting practices.

Bulgaria presents a distinct epidemiological pattern. Official statistics report relatively low rates of non-fatal occupational accidents; however, this is widely interpreted as reflecting under-reporting rather than superior workplace safety. In contrast, Bulgaria reports one of the highest rates of fatal occupational accidents within the EU, suggesting a severity bias in injury reporting⁷. Regional data from Eastern Europe further demonstrate that hand and wrist injuries are a leading cause of work-related disability. In industrial urban populations, traumatic hand injuries—including fingertip amputations—account for a substantial proportion of permanent disability among male manual workers^{4,8}. This places significant pressure on healthcare systems to deliver effective emergency reconstructive strategies that prioritize functional durability and early return to work.

1.3 Economic Impact and the Cost of Disability

Although rarely life-threatening, fingertip injuries impose a disproportionate economic burden due to their impact on productivity and long-term functional capacity. Cost-of-illness analyses demonstrate that hand and wrist injuries generate higher overall societal costs than many lower limb injuries, primarily due to indirect costs related to work absence and reduced earning potential⁹. Direct costs include emergency care, surgical intervention, hospitalization, and rehabilitation services. However, indirect costs—derived from sick leave, lost wages, retraining, and permanent occupational disability—account for approximately 56–79% of the total economic burden^{9,10}.

For manual laborers, particularly in Eastern Europe, a fingertip injury may threaten long-term employability. Chronic pain, hypersensitivity, cold intolerance, or digit shortening may necessitate job modification or permanent career change. Consequently, the economic evaluation of reconstructive techniques must extend beyond immediate operative costs. Although the thenar flap involves a staged procedure and temporary immobilization, its ability to preserve finger length and provide durable padded coverage may reduce long-term disability and associated indirect costs^{3,11}.

2. Clinical Rationale: Anatomical and Classification-Based Considerations

The indication for a thenar flap in fingertip reconstruction is grounded in a precise understanding of fingertip anatomy and the extent of tissue loss as defined by established classification systems. Anatomical characteristics of the fingertip pulp and nail complex, combined with the level of injury, determine whether conservative treatment, local advancement, or regional flap coverage is required.

2.1 Anatomy of the Fingertip Pulp

The fingertip pulp is a highly specialized structure optimized for stability and sensitivity. It consists of densely packed fibro-fatty tissue organized into compartments by vertical fibrous septa extending from the periosteum of the distal phalanx to the dermis. This architecture anchors the pulp to the underlying bone and prevents shearing during grip and pinch activities¹. The volar skin of the fingertip is glabrous and characterized

by a thick epidermis with pronounced papillary ridges that enhance friction and tactile control. Beneath the epidermis lies a dense concentration of sensory receptors responsible for discriminative touch and pressure perception^{1,2}.

The nail complex provides rigid dorsal counter-support to the pulp, which is essential for precision pinch. Due to the intimate anatomical relationship between the nail bed and distal phalanx, crush or avulsion injuries frequently involve simultaneous nail bed disruption and bone exposure².

2.2 The Allen Classification System

Several classification systems exist for fingertip injuries; however, the Allen classification remains the most clinically practical framework for guiding reconstructive decision-making. It correlates the level of tissue loss with nail bed involvement and reconstructive requirements¹. Allen type II injuries, characterized by pulp and nail bed involvement with exposed or minimally protruding bone, represent the threshold at which flap reconstruction becomes essential to preserve finger length, function, and sensibility.

2.3 Rationale for Thenar Flap Reconstruction in Allen Type I and II Injuries

Skin grafting over exposed cortical bone is unreliable, as grafts require a vascularized bed for survival. Even when graft take occurs, the resulting adherent scar is often painful and unstable, particularly under load, and may predispose to hook-nail deformity due to secondary contraction¹. The thenar flap provides glabrous, well-padded tissue that closely matches the biomechanical and sensory properties of native fingertip pulp, adhering to the "like-with-like" reconstructive principle³. By importing vascularized tissue, it allows preservation of distal phalanx length and nail bed support, reducing the risk of nail deformity¹¹. Although not a formally innervated flap, the thenar flap demonstrates reliable secondary sensory neurotization. Studies report recovery of protective sensibility and static two-point discrimination adequate for functional use^{11,12}.

3. Comparative Analysis: Thenar Flaps Versus Local Reconstructive Alternatives

Selection of the optimal reconstructive technique for fingertip injuries requires balancing defect characteristics, functional demands, donor-site morbidity, and procedural complexity. In clinical practice, the thenar flap is most frequently weighed against local advancement techniques—particularly the V-Y advancement flap (Atasoy)—and regional options such as the cross-finger flap.

3.1 Thenar Flap Versus V-Y Advancement Flap (Atasoy)

The V-Y advancement flap, originally described by Atasoy, is a homodigital volar advancement flap that mobilizes proximal pulp tissue distally to cover fingertip defects. V-Y advancement flaps offer the advantage of single-stage reconstruction and preservation of native sensibility; however, advancement is biomechanically limited, typically not exceeding 8–10 mm. Excessive tension increases the risk of flap ischemia, necrosis, and hook-nail deformity, particularly in Allen type II injuries¹³. In contrast, the thenar flap introduces additional tissue volume without tension, restoring pulp contour and durability in larger or volar-oblique defects³.

3.2 Thenar Flap Versus Cross-Finger Flap

Cross-finger flaps provide reliable coverage for larger defects but at the cost of donor-site morbidity, dorsal skin mismatch, and immobilization of an adjacent healthy digit. These factors increase stiffness risk and may delay functional recovery¹². The thenar flap avoids these disadvantages by confining morbidity to the palm, where scars are typically well tolerated and functionally insignificant¹¹.

In summary, while each reconstructive option has a defined role, the thenar flap occupies a distinct position in the treatment algorithm for Allen type I and selected type II fingertip injuries. It offers superior tissue match, preservation of finger length, and durable pulp reconstruction with acceptable sensory recovery, at the cost of a staged procedure and temporary immobilization.

In this article, we present and discuss the results concerning the thenar flap reconstruction for acute fingertip injuries.

2. Materials and Methods

2.1 Study Design, Setting, and Follow-up

A retrospective case series was performed including patients treated operatively for acute fingertip injuries with a staged thenar flap reconstruction. Follow-up was obtained for a minimum period of 7 months, using patient-reported and objective functional assessments.

2.2 Patients and Injury Characteristics

A total of 11 patients were treated (10 male, 1 female), with a mean age of 56 years. Injuries involved predominantly the right hand (81%) compared with the left (19%), and the distribution by digit was: second finger 36%, third finger 34%, fourth finger 30%. Injuries were categorized clinically using the Allen system to guide treatment selection, consistent with common fingertip reconstruction decision-making.

Indications: The primary indication for thenar flap reconstruction in this series was fingertip soft-tissue defects where durable glabrous coverage was required (e.g., volar pulp loss with insufficient local tissue for tension-free advancement). This specifically included patterns analogous to Allen type I–II clinical problems where grafting or primary closure would be unstable or would require excessive bone shortening¹¹.

Exclusion Criteria: Injuries proximal to the lunula requiring alternative strategies (revision amputation, replantation, or other flap choices), doubtful local vascularity, prior neurovascular compromise, or inability to comply with staged immobilization and postoperative therapy principles described for flap survival and stiffness avoidance¹¹.

2.3 Outcome Measures

Follow-up was performed using:

- *Pain:* Assessed on a Visual Analog Scale (VAS).
- *Sensibility:* Assessed by static two-point discrimination (2PD).
- *Range of Motion (ROM):* Assessed clinically (active ROM measured at the injured digit joints).

- **Complications:** Recorded complications included joint stiffness or contracture (especially flexion contracture of the proximal interphalangeal (PIP) joint, a traditionally cited risk)¹¹.

4.4 Operative Technique: Thenar Flap (Two-Stage Protocol)

Stage 1: Debridement, Flap Design, Elevation, and Inset.

All procedures were performed under regional/local anesthesia using a digital nerve block. After irrigation and debridement, devitalized tissue was excised and the distal phalanx edge was conservatively trimmed only when required to remove sharp spicules, aiming to preserve length and provide a stable recipient bed¹¹.

- **Flap planning ("Mirror Image" principle):** A template of the fingertip defect was created and transferred to the thenar donor area with the injured digit positioned in a comfortable contact posture. The design emphasized reproducing the planned inset geometry to minimize rotational mismatch and tension during attachment¹¹. Particular attention was paid to avoiding prolonged, excessive PIP flexion during immobilization, as sustained flexed posture is a key contributor to contracture¹¹.
- **Elevation and Inset:** The flap was elevated in the subcutaneous plane with adequate fat to recreate pulp padding. The flap was inset to the fingertip defect with nonabsorbable sutures in a tension-free manner. The donor site was closed primarily whenever feasible, reflecting modern refinements aimed at reducing donor morbidity¹¹.

Stage 2: Flap Division and Final Inset.

Flap division was performed as a planned second-stage procedure once clinical vascular integration was adequate. During division, care was taken to avoid creating a secondary defect at the fingertip from an overly broad pedicle, and final contouring was performed as needed to optimize pulp shape¹¹.

4.5 Postoperative Rehabilitation Protocol

Rehabilitation was treated as an essential component of outcome, targeting both stiffness prevention and functional sensory recovery¹¹.

1. **Phase I (Protection; until flap division):** A bulky bandage was used to protect the pedicle. Patients were instructed to mobilize uninvolved digits and proximal joints to reduce edema and prevent generalized hand stiffness, consistent with standard hand therapy principles¹⁴.
2. **Phase II (Mobilization; after division):** After division and wound stability, therapy emphasized progressive active ROM and structured exercises to restore digital motion. Tendon-gliding style exercise patterns and controlled digital motion principles were followed consistent with established hand therapy protocols^{14,15}. Early controlled motion is emphasized in modern thenar flap refinements to reduce adhesions and joint contracture risk¹¹.
3. **Phase III (Desensitization):** Because hypersensitivity and "avoidance" behaviors can limit function after fingertip injury, patients were instructed in graduated desensitization strategies (texture progression, immersion-type exposure, and vibration) consistent with common occupational therapy guidance¹⁶.

4. Phase IV (Sensory Re-education): Once pain and hypersensitivity improved, patients were encouraged to practice discriminative tasks (object identification without visual input) to promote functional sensibility and cortical reintegration after pulp reconstruction.

3. Results

A total of 11 patients (10 males and 1 female) were included in this study, with a mean age of 56 years. Injuries predominantly affected the right hand (81%) compared to the left (19%); the distribution by digit was as follows: second finger 36%, third finger 34% and fourth finger 30%. Clinical assessment of the injuries was performed using the Allen classification system [Allen type I – 4 patients (*Figures 1 and 2*); Allen type II – 6 patients; Allen type III (borderline) – 1 patient. (*Figures 3-6*)]. No flap losses or secondary infections were observed.

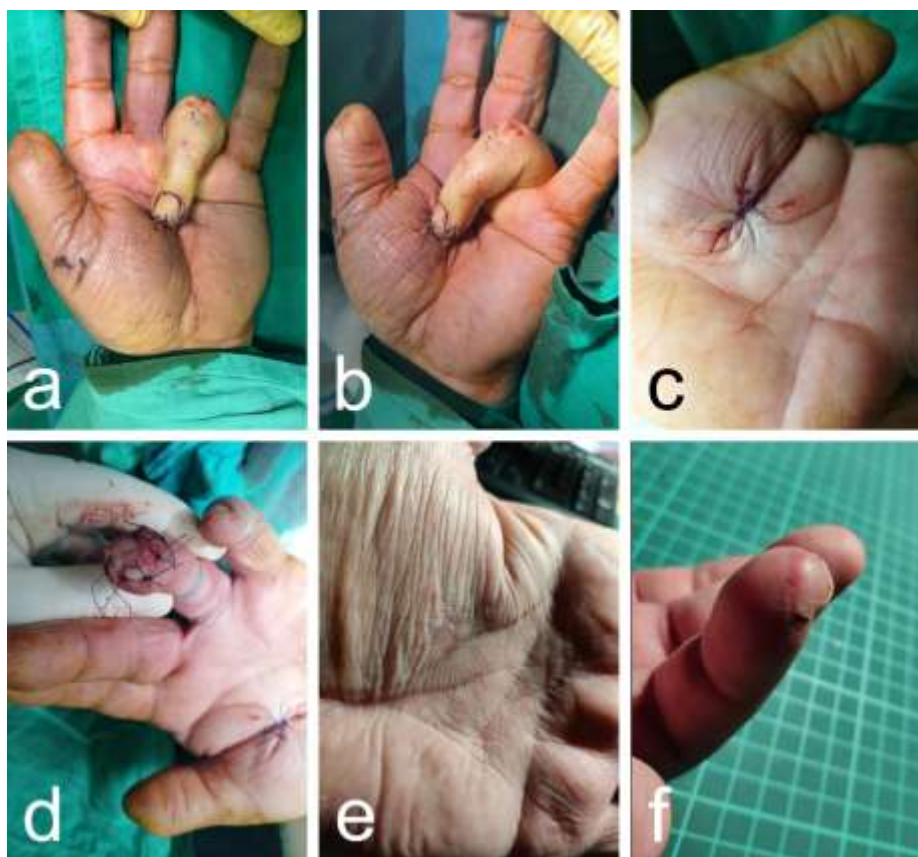


Figure 1. Photographs illustrate the different stages of thenar flap surgery and the donor site in an Allen type I injury of the fourth finger.



Figure 2. Preoperative roentgenography of an Allen type I injury of the fourth finger.



Figure 3. Photographs illustrate the different stages of thenar flap surgery. The injury depicted involved substantial pulp loss and distal phalanx exposure. Although initially assessed as Allen type II, intraoperative debridement resulted in loss of approximately 50% of the distal phalanx, consistent with an Allen type III pattern. The adjacent digit, which sustained a superficial soft tissue injury, was treated conservatively, achieving healing by secondary intention but with less durable padding compared to the reconstructed digit.



Figure 4. Preoperative roentgenography of an Allen type II injury of the third finger.



Figure 5. Photographs illustrate the different stages of thenar flap surgery and the donor site in an Allen type II injury of the index finger.



Figure 6. Preoperative roentgenography of an Allen type II injury of the index finger.

Functional Outcomes: Functional outcomes were favorable, with preservation of interphalangeal joint motion in all but one patient, who developed a mild cicatricial contracture not requiring surgical intervention. This supports the efficacy of the modified positioning and rehabilitation protocol in mitigating stiffness.

Sensory Outcomes: One patient reported persistent sensory disturbance; however, protective sensibility was preserved in all evaluated cases. No clinically significant nail deformities or donor-site complications were recorded.

The results of outcome measures are summarized on Figure 7.

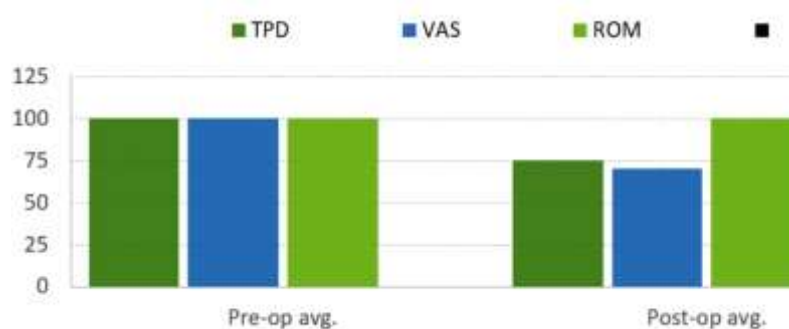


Figure 7. Figure 7 present the outcome measures of TPD, VAS and ROM.

4. Discussion

This study supports the continued role of the thenar flap in contemporary emergency fingertip reconstruction. When applied to appropriately selected injuries, it provides durable coverage, preserves finger length, and achieves satisfactory functional and sensory outcomes, consistent with previously published clinical series^{11,12}.

4.1 Role of the Thenar Flap in Contemporary Fingertip Reconstruction

Despite the expanding availability of local advancement flaps, homodigital island flaps, and perforator-based techniques¹⁷⁻²¹, the thenar flap continues to occupy a well-defined niche in fingertip reconstruction. Its principal advantage lies in the transfer of glabrous, thick, and well-padded palmar skin that closely replicates native fingertip pulp, adhering to the reconstructive principle of replacing "like with like"^{3,11}.

In the present series, thenar flaps were primarily used for fingertip injuries analogous to Allen type I–II patterns in which local tissue was insufficient for tension-free closure. While our series focused on Allen type II injuries, one case necessitated bone trimming effectively converting it to a distal type III defect; the thenar flap provided adequate padding despite the bone loss. While superficial distal defects may often be managed conservatively or with local advancement flaps, volar-oblique injuries or defects exceeding the advancement capacity of V-Y flaps require regional flap coverage to achieve durable reconstruction^{1,13}. In such cases, skin grafting over exposed or poorly vascularized bone is unreliable and predisposes to painful scarring and nail deformity¹. In cases with dorsal involvement where the periosteum is stripped and cortical bone is exposed, free nail bed grafts are also unreliable. In such instances (Fig. 5), the thenar flap serves as a salvage option to preserve length, accepting that the resulting bulky soft tissue coverage will preclude normal nail adherence.

4.2 Functional Outcomes and Joint Stiffness

Historically, concerns regarding proximal interphalangeal (PIP) joint flexion contracture limited the use of thenar flaps in adult patients. Earlier experiences associated prolonged immobilization and excessive finger flexion with postoperative stiffness. However, contemporary refinements in flap design, finger positioning, and earlier division have substantially mitigated this risk¹¹.

In the present cohort, no clinically significant interphalangeal joint contractures were observed, and functional range of motion was preserved in the majority of patients. These findings align with modern series reporting near-normal metacarpophalangeal and PIP joint motion following thenar flap reconstruction when early mobilization protocols are respected^{11,12}. These data reinforce the concept that joint stiffness is not an inherent limitation of the thenar flap but rather a modifiable risk dependent on surgical positioning, timing of flap division, and structured rehabilitation.

4.3 Sensory Recovery and Functional Use

Sensory restoration is a critical determinant of fingertip function. Although the thenar flap is not an innervated flap, it demonstrates reliable secondary sensory neurotization due to the rich neural environment of the fingertip recipient bed³.

Reported static two-point discrimination values following thenar flap reconstruction typically range between approximately 5.5 and 7.0 mm, with high patient-reported aesthetic satisfaction and durable pulp contour in adult patients¹².

In the present series, sensory outcomes were satisfactory, with protective sensibility preserved in all followed cases and only one patient reporting persistent sensory disturbance. These findings are consistent with published outcomes and compare favorably with regional flap alternatives, while remaining superior to outcomes achieved with skin grafting over scarred or poorly vascularized beds^{1,12}.

4.4 Rehabilitation as a Determinant of Outcome

A key finding reinforced by this study is that successful fingertip reconstruction does not end at hospital discharge. Hypersensitivity, edema, and joint stiffness are common sequelae of fingertip trauma and may result in functional avoidance of the injured digit if not actively addressed¹⁶. The structured, phase-based rehabilitation protocol employed in this series—incorporating early mobilization, edema control, desensitization, and sensory re-education—mirrors best-practice recommendations in hand therapy literature and likely contributed to the favorable functional outcomes observed¹⁵.

5. Conclusion

In selected adult patients with distal fingertip injuries—particularly defects corresponding to Allen type II patterns where local tissues are insufficient for stable coverage—the thenar flap remains a **valuable** reconstructive option. When applied using contemporary planning principles and refined surgical technique, it **can provide** durable glabrous padding and preserve digital length, **offering** satisfactory functional and sensory recovery with a **manageable** complication profile.

Importantly, successful outcomes are not determined by surgical technique alone. The postoperative pathway is integral to recovery: early controlled mobilization and structured desensitization are **essential components** in minimizing joint stiffness, hypersensitivity, and functional avoidance of the injured digit. In this context, the thenar flap should be viewed not as a **universal** solution, but as one component of a comprehensive reconstructive strategy aimed at restoring hand function in the working adult population when simpler methods are inadequate.

6. References

1. Pencle F, Doehrmann R, Waseem M. Fingertip Injuries. 2023 Jul 17. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan–. PMID: 28613777.
2. Yeo CJ, Sebastin SJ, Chong AK. Fingertip injuries. Singapore Med J. 2010;51(1):78-86.
3. Ros S, Monica J. Thenar Flap. Hand Surgery. Edited by Beredjiklian PK, Thieme, 2000, pp. 386-388. doi: 10.1055/b-0040-177490.
4. El Azm AAA, El hawary YM, Turki AM, Mostafa WA. Epidemiology of traumatic hand injuries. Int J Surg Sci. 2024;8(3):01-05. DOI: <https://doi.org/10.33545/surgery.2024.v8.i3a.1086>.
5. Centers for Disease Control (CDC). Occupational finger injuries--United States, 1982. MMWR Morb Mortal Wkly Rep. 1983 Nov 18;32(45):589-91.

6. Alanazi W. Fingertip injury epidemiology, patterns, and clinical management at North Medical Tower Hospital, Northern Border Region of Saudi Arabia: a retrospective analysis. <https://doi.org/10.1186/ISRCTN16461293>
7. Eurostat (2023) 'Accidents at work statistics'. European Commission. Available at: Eurostat Statistics Explained. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Accidents_at_work_statistics
8. Arroyo-Berezowsky C, Quinzaños-Fresnedo J. Epidemiology of hand and wrist injuries treated in a reference specialty center over a year. *Acta Ortop Mex* 2021; 35(5): 429-435. <https://dx.doi.org/10.35366/104570>.
9. de Putter CE, Selles RW, Polinder S, Panneman MJ, Hovius SE, van Beeck EF. Economic impact of hand and wrist injuries: health-care costs and productivity costs in a population-based study. *J Bone Joint Surg Am*. 2012;94(9):e56. doi: 10.2106/JBJS.K.00561.
10. Özgen M, Merve Aydoğan A, Uygur A, Armağan O, Berkan F, Mutlu F. Rehabilitation cost share and cost analysis of traumatic hand injuries: Our single-center results. *Turk J Phys Med Rehabil*. 2021;67(3):308-314. doi: 10.5606/tftrd.2021.5457.
11. Li F, Tie JL, Kang YC, Tan JSW. Refinements in the design and division of the thenar flap to achieve better functional results. *JPRAS Open*. 2021;28:10-18. doi: 10.1016/j.jpra.2021.01.010.
12. Cam N, Kanar M. Are cross finger and thenar flaps effective in the treatment of distal finger amputations with the reposition-flap method?. *Jt Dis Relat Surg*. 2022;33(3):631-638. doi: 10.52312/jdrs.2022.834
13. Chakraborty SS, Kala PC, Sahu RK, Dixit PK, Katrolia D, Kotu S. Fingertip Amputation Reconstruction with VY Advancement Flap: Literature Review and Comparative Analysis of Atasoy and Kutler Flaps. *World J Plast Surg*. 2021;10(3):8-17. doi: 10.29252/wjps.10.3.8.
14. Matev IB, Bankov SD. Rehabilitation of hand injuries. *Medicina i Fizcultura*. 1977, pp. 1-248. [In Bulgarian]
15. Higgins A, Lalonde DH. Flexor Tendon Repair Postoperative Rehabilitation: The Saint John Protocol. *Plast Reconstr Surg Glob Open* 2016;4(11):e1134. doi: 10.1097/GOX.0000000000001134.
16. Burley S, Di Tommaso A, Cox R, Molineux M. An occupational perspective in hand therapy: A scoping review. *Br J Occup Ther*. 2018;81(6):299-318.
17. Kateva M. Dorsocommissural flap. *Med Rev*. 2008;44(4):58- 60.
18. Kateva M. Emergency reconstruction of traumatic finger defects using retrograde homodigital and metacarpal island flaps. PhD Thesis, 2006, Sofia.
19. Kateva M. Local neurovascular flaps for reconstruction of fingertip defects. *Suvr med*. 2008, 4:56-59.
20. Kateva M. Dorsal digital retrograde island flaps. *Khirurgiia (Sofia)*. 2008;(4):56-8.
21. Kateva M. Microsurgical sensate homodigital island flap with retrograde blood flow for reconstruction of distal phalangeal defects of the fingers. *Speshna med*. 2004; 3:12-14.

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