

Prospective Observational Study of Functional and Sensory Outcomes after Moberg Flap Reconstruction for Thumb-Tip Injuries in a Tertiary Care Hospital - PMCH

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Abstract

Background: The thumb is essential for opposition, precision pinch, grasp and fine manipulation. Its importance has also been appreciated in ancient Indian literature; in the Mahabharata, Guru Dronacharya asked Eklavya to offer his right thumb as guru dakshina, reflecting the long-recognised importance of the thumb in skilled hand function. Thumb-tip injuries can therefore result in significant functional impairment because loss of pulp tissue affects both mechanical stability and tactile sensibility. Reconstruction should provide durable soft-tissue coverage while preserving thumb length, mobility, sensation and appearance. The Moberg advancement flap is a useful local reconstructive option for selected distal thumb defects because it provides sensate tissue from the thumb itself and avoids a distant donor site.

Aim: To evaluate the functional and sensory outcomes following Moberg flap reconstruction in patients with traumatic thumb-tip injuries.

Methods: A prospective observational study was conducted from April 2024 to March 2026. Forty patients with traumatic thumb-tip defects suitable for Moberg flap reconstruction were included. Demographic and injury characteristics were recorded. All patients underwent Moberg advancement flap reconstruction. Postoperative assessment included flap survival, static two-point discrimination, thumb interphalangeal joint range of motion, grip strength, pinch strength, QuickDASH score, postoperative complications and patient satisfaction. Patients were followed clinically at scheduled postoperative visits. Data were analysed using descriptive statistical methods and appropriate comparative tests where applicable.

Results: Forty patients were included, with a mean age of 37.8 ± 12.4 years. There were 34 males and 6 females. The right thumb was involved in 25 patients and the left thumb in 15. Crush injury was the most frequent mechanism, followed by injuries sustained during sickle use. The mean defect size was 1.6 ± 0.4 cm. Primary coverage without additional bony shortening was achieved in 33 patients, while 7 required limited bony shortening.

Complete flap survival was achieved in 39 patients (97.5%), while partial marginal necrosis occurred in 1 patient (2.5%). No complete flap loss was observed. At final follow-up, mean static two-point discrimination was 6.2 ± 1.3 mm. Normal or near-normal protective sensibility was achieved in 31 patients (77.5%). The mean interphalangeal joint flexion was $53.5 \pm 8.6^\circ$, with a mean extension deficit of $3.1 \pm 4.2^\circ$. Mean grip strength was 31.8 ± 6.7 kg and mean pinch strength was 6.8 ± 1.5 kg. The mean QuickDASH score was 12.8 ± 8.7 . Cold intolerance was reported by 9 patients (22.5%), while hypersensitivity was observed in 5 patients (12.5%). Overall, 24 patients (60.0%) reported being satisfied or very satisfied with the reconstruction.

Conclusion: Moberg flap reconstruction provided reliable soft-tissue coverage with high flap survival and satisfactory sensory and functional recovery in patients with selected thumb-tip injuries. The ability to provide sensate tissue while preserving thumb length and avoiding a distant donor site makes the Moberg flap a useful reconstructive option for appropriately selected distal thumb defects.

Keywords: Moberg flap; thumb-tip injury; thumb pulp reconstruction; thumb reconstruction; sensory recovery; two-point discrimination; grip strength; pinch strength; QuickDASH.

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Introduction

The functional importance of the thumb has also been appreciated in ancient Indian literature. In the Mahabharata, Guru Dronacharya asked Eklavya to offer his right thumb as guru dakshina, reflecting the long-recognised importance of the thumb in skilled hand function.

The thumb has a central role in hand function because it participates in opposition, precision pinch, power grip and manipulation of objects. Loss of tissue from the distal thumb can therefore produce functional impairment that is disproportionate to the apparent size of the defect. The major objectives of thumb-tip reconstruction are preservation of length, restoration of stable soft-tissue coverage, recovery of sensibility, maintenance of joint mobility and achievement of an acceptable appearance. [1–3]

Thumb-tip injuries are frequently caused by occupational trauma, machinery-related injuries, crush injuries and sharp trauma. The extent of tissue loss varies from superficial pulp defects to injuries involving the nail complex, distal phalanx, tendon or joint. The choice of reconstruction depends on the location and size of the defect, exposed structures, available local tissue and the functional requirements of the patient. [3,4]

Several techniques have been described for thumb-tip reconstruction, including healing by secondary intention, skin grafting, V-Y advancement flaps, Moberg advancement flaps, first dorsal metacarpal artery flaps, heterodigital neurovascular island flaps and free tissue transfer. The choice of technique should aim to provide durable coverage while preserving sensation and thumb function. Recent systematic reviews continue to identify local flaps, including Moberg and first dorsal metacarpal artery flaps, as important options for selected thumb-pulp defects. [5,6] The Moberg advancement flap was introduced as a volar advancement flap for reconstruction of distal thumb defects. The flap incorporates the volar skin and subcutaneous tissue of the thumb while maintaining its neurovascular supply. Its principal advantage is the replacement of lost pulp with tissue of similar thickness, texture and sensory characteristics. Because the flap remains attached to the thumb, there is no need for a distant donor site. [7]

Baumeister et al. evaluated 36 Moberg flaps and reported complete flap survival, successful coverage without additional bony shortening in most cases, favourable sensory recovery and only minor functional impairment. Their study also demonstrated that permanent flexion contracture

was not observed and that the flap itself did not significantly compromise grip strength. [7]

More recent literature has continued to support the role of Moberg and modified Moberg flaps. A systematic review of 15 studies involving 169 patients reported high flap viability, favourable aesthetic results and absence of postoperative flexion contracture in the evaluated series, although cold intolerance and infection remained recognised complications. [8] A 2024 systematic review of local flaps for thumb-pulp reconstruction also identified the Moberg flap among the techniques with favourable sensory and functional outcomes. [5]

Indian experience with modifications of the Moberg flap has also been reported. Jayachandiran et al. described Elliot's modification of the Moberg flap in 12 patients and reported satisfactory flap healing without interphalangeal joint deformity. [9] Other injury mechanism Indian studies evaluating thumb reconstruction have similarly emphasised the importance of sensate coverage and functional recovery. [10–12]

Despite the established use of the Moberg flap, prospective clinical data evaluating multiple functional and sensory parameters together are relatively limited. Therefore, the present study was undertaken to prospectively evaluate functional and sensory outcomes following Moberg flap reconstruction for traumatic thumb-tip injuries.

Aim: To evaluate the functional and sensory outcomes following Moberg flap reconstruction for traumatic thumb-tip injuries.

Objective

1. To assess flap survival following Moberg flap reconstruction.
2. To evaluate sensory recovery using static two-point discrimination.
3. To assess thumb interphalangeal joint range of motion.
4. To evaluate grip and pinch strength after reconstruction.
5. To assess patient-reported functional outcome using the QuickDASH questionnaire.
6. To document postoperative complications and patient satisfaction.

Materials and Methods

Study Design: This was a prospective observational study evaluating functional and sensory outcomes following Moberg flap reconstruction for traumatic thumb-tip injuries.

Study Period: The study was conducted from April 2024 to March 2026.

Study Setting: The study was conducted in the Department of Plastic and Reconstructive Surgery at PMCH, Patna, and Bihar, India.

Study Population: Patients presenting with traumatic thumb-tip defects requiring soft-tissue reconstruction and considered suitable for Moberg advancement flap coverage were evaluated for inclusion.

As this was a prospective observational study conducted at a single tertiary care centre, all consecutive patients fulfilling the predefined inclusion criteria and undergoing Moberg flap reconstruction during the study period (April 2024 to March 2026) & completing the follow up schedule were included.

A total of 40 patients were included in the study.

Inclusion Criteria

Patients fulfilling the following criteria were included:

- Traumatic distal thumb or thumb-tip soft-tissue defect.
- Defect suitable for reconstruction with a Moberg advancement flap.
- Exposed bone or other structures requiring durable soft-tissue coverage.
- Adequate vascularity of the remaining thumb.
- Patients willing to undergo reconstruction and postoperative follow-up.
- Written informed consent for participation.

Exclusion Criteria

Patients were excluded if they had:

- Previous major injury or surgery involving the affected thumb.
- Severe vascular compromise of the thumb.
- Extensive tissue loss unsuitable for Moberg flap reconstruction.
- Active uncontrolled infection at the operative site.
- Associated injuries preventing reliable assessment of thumb function.
- Patients unwilling to participate in follow-up.

Preoperative Assessment: A detailed history was obtained from every patient. The mechanism of injury, time since injury, affected side, hand dominance, occupation and associated injuries were documented. The defect was examined for its location, size, depth and involvement of bone, tendon, nail bed or joint. The vascular status of the remaining thumb was assessed clinically.

The size of the soft-tissue defect was measured after adequate wound preparation.

Surgical Technique : The procedure was performed under appropriate anaesthesia according to the clinical condition of the patient.

Following wound preparation and debridement of nonviable tissue, the dimensions of the defect were assessed. Where required, limited bone shortening was performed to facilitate adequate soft-tissue coverage while attempting to preserve maximum thumb length.

A volar Moberg advancement flap was designed over the thumb. The flap was elevated carefully while preserving the neurovascular bundles. The flap was advanced distally to cover the defect without excessive tension.

After adequate haemostasis, the flap was inset with interrupted sutures. The donor site was closed primarily whenever possible. Care was taken to avoid excessive tension that could compromise perfusion or restrict interphalangeal joint movement.

A sterile dressing was applied and the thumb was appropriately immobilised during the early healing period.

Postoperative Care

Postoperative monitoring included assessment of:

- Flap colour
- Temperature
- Capillary refill
- Venous congestion
- Arterial insufficiency
- Wound condition
- Infection
- Pain

Patients were advised appropriate immobilisation during the initial postoperative period followed by gradual mobilisation.

Hand exercises were started after adequate wound healing according to the treating surgeon's protocol.

Outcome Assessment

Flap Survival

Flap viability was assessed clinically and classified as:

- Complete survival
- Partial/marginal necrosis
- Complete flap loss

Sensory Assessment: Sensory recovery was evaluated using static two-point discrimination at the reconstructed thumb pulp.

The measurement was performed using a standard two-point discriminator, with the value recorded in millimetres.

Thumb Range of Motion: Active interphalangeal joint movement was assessed using a goniometer.

Flexion and extension were recorded. Any extension deficit or flexion contracture was documented.

Grip Strength: Grip strength was measured using a hand dynamometer and recorded in kilograms.

Where feasible, the affected hand was compared with the contralateral hand.

Pinch Strength: Key/lateral pinch strength was measured using a pinch dynamometer and recorded in kilograms.

QuickDASH: Patient-reported functional outcome was assessed using the QuickDASH questionnaire. QuickDASH is an 11-item patient-reported outcome measure for upper-limb disorders that evaluates physical function and symptoms. The questionnaire assesses activities and symptoms including opening a tight jar, performing heavy household work, carrying a shopping bag, washing the back, cutting food with a knife, recreational activities requiring force, interference with social activities, limitation of work or daily activities, pain, tingling and sleep disturbance due to pain. The final score ranges from 0 to 100, with higher scores indicating greater disability and lower scores indicating better functional status.

Complications

The following complications were recorded:

- Flap necrosis
- Infection
- Wound dehiscence
- Hypersensitivity
- Cold intolerance
- Painful scar
- Persistent pain
- Interphalangeal joint stiffness
- Flexion contracture
- Need for secondary procedure

“Patients could experience more than one postoperative complication: therefore, the reported complication percentages were not mutually exclusive and did not necessarily sum to 100%.”

Patient Satisfaction: Patient satisfaction was assessed at the final follow-up and classified as:

- Very satisfied
- Satisfied
- Neutral
- Dissatisfied
- Very dissatisfied

Follow-up: Patients were reviewed during the early postoperative period and subsequently at scheduled outpatient visits.

- 1 week-flap viability/wound
- 2 weeks-wound healing/sutures
- 6 weeks-ROM and functional recovery
- 3 months- functional/sensory assessment
- 6 months- Final clinical evaluation

Functional and sensory outcomes were assessed at the final available follow-up.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using appropriate statistical software. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range, depending on distribution. Categorical variables were expressed as frequency and percentage. For comparisons of continuous measurements between the reconstructed and contralateral thumb/hand, a paired Student's t-test or Wilcoxon signed-rank test was used according to data distribution. Categorical variables were analysed using the Chi-square test or Fisher's exact test where appropriate. A p-value <0.05 was considered statistically significant.

Results

Demographic Characteristics: A total of 40 patients underwent Moberg flap reconstruction during the study period. The mean age of the patients was 37.8 ± 12.4 years, with an age range of 18–67 years. There were 34 males (85.0%) and 6 females (15.0%). The right thumb was involved in 25 patients (62.5%), while the left thumb was involved in 15 patients (37.5%). The dominant hand was involved in 23 patients (57.5%).

Table 1: Demographic Characteristics

Variable	Number	Percentage
Total patients	40	100
Male	34	85.0
Female	6	15.0
Right thumb	25	62.5
Left thumb	15	37.5
Dominant hand involved	23	57.5
Mean age	37.8 ± 12.4 years	—

Mechanism and Characteristics of Injury: Crush injury was the most frequent mechanism of injury, followed by injuries sustained during sickle use. Other injury mechanism mechanisms of trauma were less frequent. The mean defect size was 1.6 ± 0.4 cm, ranging from 1.0 to 2.5 cm. Bone exposure

was present in 18 patients (45.0%), while tendon exposure was documented in 5 patients (12.5%).

Limited bony shortening was required in 7 patients (17.5%), whereas 33 patients (82.5%) were reconstructed without additional bony shortening.

Table 2: Injury Characteristics

Injury characteristic	Number	Percentage
Crush injury	20	50
Sickle-related injury	12	30
Other injury mechanisms	8	20
Note	Crush and sickle-related injuries were the two most frequent mechanisms	—
Bone exposure	18	45.0
Tendon exposure	5	12.5
Bony shortening required	7	17.5
No bony shortening	33	82.5

Flap Survival: Complete flap survival was observed in 39 patients (97.5%). One patient (2.5%) developed limited marginal flap necrosis, which was managed conservatively with wound care and healed without the need for further flap reconstruction. No complete flap loss occurred.

Table 3: Flap Survival

Flap outcome	Number	Percentage
Complete survival	39	97.5
Partial/marginal necrosis	1	2.5
Complete flap loss	0	0
Secondary flap reconstruction	0	0

Sensory Outcome: At final follow-up, static two-point discrimination at the reconstructed thumb pulp was 6.2 ± 1.3 mm. Protective or near-normal sensibility was present in 31 patients (77.5%), while reduced discriminatory sensation was observed in 9 patients (22.5%). The sensory result was considered satisfactory in the majority of patients.

Table 4: Sensory Outcome at Final Follow-up

Sensory outcome	Number	Percentage
Normal/near-normal protective sensation	31	77.5
Reduced discriminatory sensation	9	22.5
Mean static 2PD	6.2 ± 1.3 mm	—

Functional Outcome: At final follow-up, mean interphalangeal joint flexion was $53.5 \pm 8.6^\circ$. The mean extension deficit was $3.1 \pm 4.2^\circ$. Five patients (12.5%) demonstrated flexion deformity of the interphalangeal joint. The remaining patients had satisfactory interphalangeal joint movement without clinically significant flexion deformity.

Mean grip strength of the affected hand was 31.8 ± 6.7 kg, while mean key pinch strength was 6.8 ± 1.5 kg.

The mean QuickDASH score was 12.8 ± 8.7 , indicating generally mild functional disability.

Table 5: Functional Outcomes

Parameter	Result
IP joint flexion	$53.5 \pm 8.6^\circ$
Mean extension deficit	$3.1 \pm 4.2^\circ$
Patients with mild ROM restriction	5 (12.5%)
Flexion deformity	5 (12.5%)
Grip strength	31.8 ± 6.7 kg
Key pinch strength	6.8 ± 1.5 kg
QuickDASH score	12.8 ± 8.7

Postoperative Complications: Overall postoperative morbidity was low.

Cold intolerance was reported by 9 patients (22.5%), while hypersensitivity was reported by 5

patients (12.5%). Painful scar was present in 3 patients (7.5%). Postoperative infection occurred in 2 patients (5.0%) and was successfully managed with local wound care and antibiotics. One patient

(2.5%) developed marginal flap necrosis. No patient developed complete flap loss. Flexion deformity was observed in 5 patients (12.5%).

Table 6: Postoperative Complications

Complication	Number	Percentage
Cold intolerance	9	22.5
Hypersensitivity	5	12.5
Painful scar	3	7.5
Infection	2	5.0
Marginal flap necrosis	1	2.5
Complete flap loss	0	0
Flexion deformity	5	12.5

Patient Satisfaction: “Eight patients (20.0%) were very satisfied and 16 patients (40.0%) were satisfied. Ten patients (25.0%) reported neutral satisfaction, five (12.5%) were dissatisfied, and one (2.5%) was very dissatisfied. Overall, 24 patients (60.0%) were satisfied or very satisfied.

Table 7: Patient Satisfaction

Satisfaction	Number	Percentage
Very satisfied	8	20.0
Satisfied	16	40.0
Neutral	10	25.0
Dissatisfied	5	12.5
Very dissatisfied	1	2.5

Return to Routine Activities: Thirty-six patients (90.0%) returned to their routine daily activities without significant restriction. The mean time to return to routine activities was 6.2 ± 1.8 weeks. Among patients engaged in manual occupations, most were able to resume their previous work after completion of wound healing and functional rehabilitation.

Table 8: Return to Activities

Outcome	Number	Percentage
Returned to routine activities	36	90.0
Required prolonged rehabilitation	4	10.0
Mean time to routine activities	6.2 ± 1.8 weeks	—

Overall Outcome: Considering flap survival, sensory recovery, thumb movement, grip and pinch function, patient-reported disability and satisfaction, the overall outcome was favourable in the majority of patients. The combination of high flap survival, satisfactory sensibility, preserved interphalangeal joint movement and low functional disability supported the effectiveness of the Moberg flap for selected thumb-tip defects.

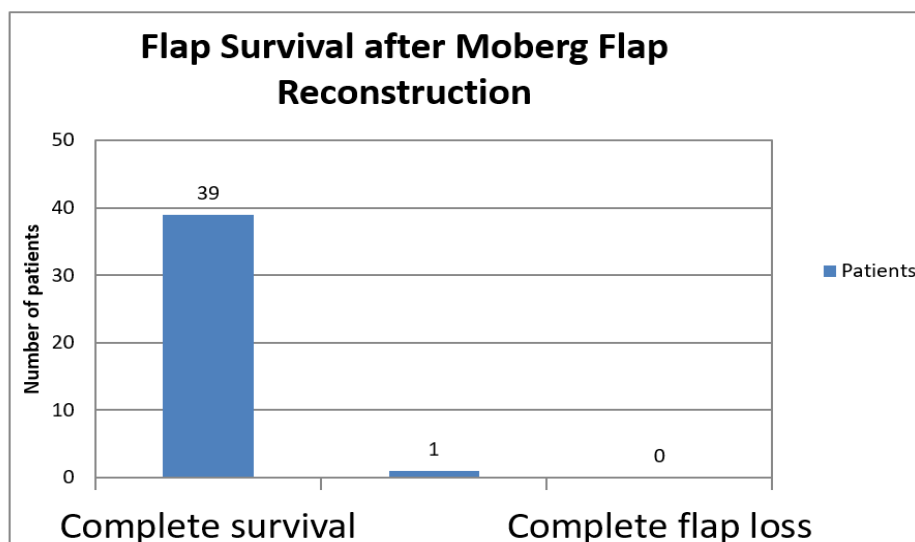


Figure 1: Flap Survival after Moberg Flap Reconstruction

Distribution of patients according to flap survival following Moberg flap reconstruction. Complete flap survival was observed in the majority of patients, while only a small proportion developed partial/marginal flap necrosis. No complete flap loss was observed

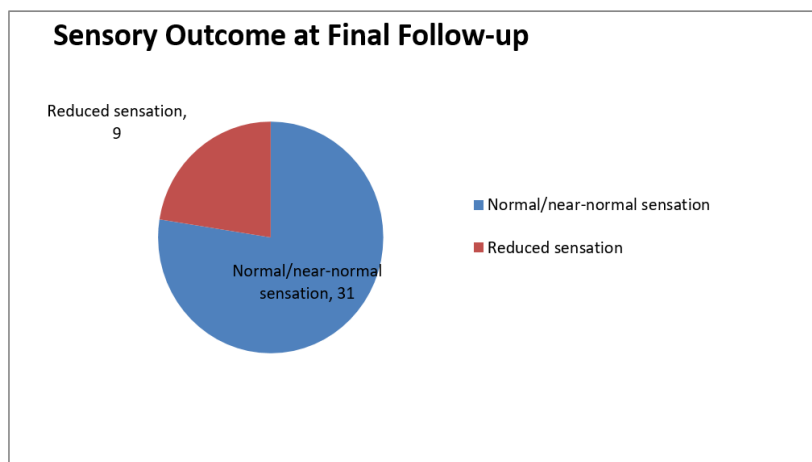


Figure 2: Sensory Outcome at Final Follow-up

Distribution of patients according to sensory recovery assessed by static two-point discrimination at final follow-up. The majority of patients achieved normal or near-normal protective sensation following Moberg flap reconstruction.

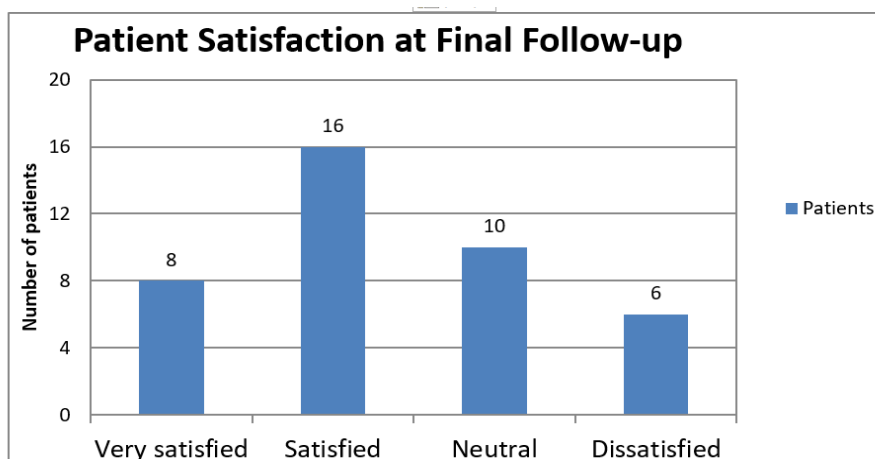


Figure 3: Patient Satisfaction at Final Follow-up

Distribution of patients according to satisfaction with the reconstructed thumb at final follow-up. Most patients reported being very satisfied or satisfied with the functional and aesthetic outcome of the reconstruction.

Discussion

The present prospective observational study evaluated the functional and sensory outcomes of Moberg flap reconstruction in 40 patients with traumatic thumb-tip injuries. The principal finding was that the procedure provided reliable soft-tissue coverage while maintaining useful thumb function and sensibility.

The thumb is functionally different from the other digits because it contributes substantially to opposition, precision pinch and power grip. Consequently, reconstruction of the thumb tip should aim to restore not only tissue coverage but

also tactile sensation and mechanical stability. Indian literature on thumb reconstruction has similarly emphasised the importance of position, stability, strength, length, movement, sensibility and appearance when assessing reconstructive outcomes. [12]

In the present series, complete flap survival was achieved in 97.5% of patients and no complete flap loss occurred. This is consistent with the favourable flap viability reported in previous Moberg studies. Baumeister et al. reported no flap loss in their series of 36 patients. [7] A systematic review of Moberg and modified Moberg flaps subsequently reported complete viability in the majority of evaluated patients, further supporting the reliability of this local flap. [8]

One of the major advantages of the Moberg flap is the use of tissue from the thumb itself. The reconstructed pulp therefore provides a relatively

appropriate tissue match and maintains a sensate surface. In our illustrative series, the mean static two-point discrimination was 6.2 mm and 77.5% of patients achieved normal or near-normal protective sensibility.

Baumeister et al. reported normal sensitivity in 74% of the 25 patients who underwent sensory testing at a mean follow-up of 27 months. [7] The similarity between these outcome domains supports the continued relevance of sensory assessment when evaluating Moberg flap reconstruction.

Recent Indian work has also focused on sensory restoration following thumb reconstruction. Jangra et al. evaluated functional and sensory outcomes following neurotized first dorsal metacarpal artery flap reconstruction and used static two-point discrimination and Semmes-Weinstein monofilament testing as objective sensory measures. Their findings reinforce the importance of objective sensory testing in evaluating reconstructed thumb pulp. [10] Preservation of interphalangeal joint movement is another important outcome. Excessive flap tension and inadequate advancement may contribute to postoperative restriction. In our series, five patients (12.5%) demonstrated flexion deformity of the interphalangeal joint, while the remaining patients had satisfactory joint movement.

This finding is comparable to the observations of Baumeister et al., who reported that minor motion restriction was mainly related to loss of hyperextension. [7] A systematic review of Moberg and modified Moberg flaps reported generally favourable interphalangeal joint outcomes, although the present study specifically observed flexion deformity in five patients. [8]

Grip and pinch strength are important because the reconstructed thumb must be capable of participating in both power and precision activities. The present study therefore included both grip and pinch strength rather than relying only on joint range of motion.

The mean QuickDASH score in the present series was 12.8, indicating relatively mild patient-reported disability. Baumeister et al. were among the early investigators to use DASH as a standardised patient-reported outcome measure after Moberg flap reconstruction and reported only minor functional impairment. [7]

The current literature supports the use of patient-reported outcomes in addition to objective measurements. A patient may have satisfactory flap survival and range of motion but still experience cold intolerance, hypersensitivity or difficulty with occupational tasks. Therefore, subjective assessment provides complementary information regarding the practical success of reconstruction.

Cold intolerance was the most frequent postoperative complaint in the present series, occurring in 22.5% of patients. This is consistent with the known complication profile of thumb-tip reconstruction. A systematic review of Moberg and modified Moberg flaps reported cold intolerance in approximately 30% of patients for whom this outcome was available. [8]

The rate of infection in the present series was 5%. The systematic review by El Sewify et al. reported an infection rate of approximately 10%, although the included studies differed in patient characteristics, operative technique and follow-up. [8] Recent Indian studies have also demonstrated that local tissue reconstruction can provide good functional outcomes with limited morbidity. Jayachandiran et al. reported 12 cases reconstructed using Elliot's modification of the Moberg flap, with all flaps settling well and no interphalangeal joint deformity. Two patients developed scar hypertrophy that was managed conservatively. [9] Their findings support the use of modified Moberg techniques when additional advancement or tissue is required.

The choice of reconstruction must nevertheless be individualised. The Moberg flap is particularly suitable for selected distal volar thumb defects where sufficient local tissue can be advanced without excessive tension. Larger or more proximal defects may require alternative procedures such as first dorsal metacarpal artery flaps, heterodigital neurovascular island flaps or free tissue transfer. Recent systematic reviews have highlighted the importance of defect size, location, required sensibility, donor-site morbidity and patient-specific functional demands when choosing among these options. [5,6]

The present study therefore supports the concept that a successful thumb-tip reconstruction should be judged using multiple parameters rather than flap survival alone. Sensibility, range of motion, grip and pinch strength, patient-reported disability, complications and satisfaction together provide a more complete assessment.

Limitations

The study has several limitations:

First, the sample size was limited to 40 patients. Second, the study was performed at a single centre and therefore the findings may not be generalisable to all patient populations.

Third, the study did not include a comparison group treated with another reconstructive procedure. Therefore, the results cannot establish superiority of the Moberg flap over alternative techniques.

The functional outcome may also be influenced by the severity and mechanism of injury, occupational requirements, and rehabilitation compliance and associated injuries. Finally, sensory recovery and cold intolerance may continue to change over longer periods, and longer follow-up would provide additional information regarding late functional and sensory outcomes.

Conclusion

Moberg flap reconstruction is a reliable and functionally oriented option for selected traumatic thumb-tip defects.

In this prospective observational series of 40 patients, the procedure provided durable soft-tissue coverage with a high rate of flap survival. Most patients demonstrated satisfactory sensory recovery, preserved interphalangeal joint movement and useful grip and pinch function. Patient-reported functional disability was generally low, and overall satisfaction was favourable. The principal advantage of the Moberg flap is that it provides sensate tissue from the thumb itself while preserving thumb length and avoiding a distant donor site. Cold intolerance and minor sensory complaints may persist in some patients but generally do not preclude satisfactory functional recovery.

A comprehensive assessment incorporating flap survival, sensibility, range of motion, grip and pinch strength, patient-reported function and satisfaction is therefore recommended when evaluating outcomes after Moberg flap reconstruction.

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