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Irreducible metacarpophalangeal joint dislocations: Clinical characteristics, surgical approaches, and outcomes

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ABSTRACT

Objectives: This study aims to evaluate the clinical characteristics, surgical management, and outcomes of irreducible metacarpophalangeal (MCP) dislocations.

Patients and methods: Between August 2020 and August 2024, a total of 13 patients (7 males, 6 females; mean age: 29.2 ± 23.7 years; range, 7 to 78 years) with MCP dislocations who were surgically treated were retrospectively analyzed. Demographics, dislocation patterns, obstructing elements, operative approach, and postoperative complications were documented. Functional outcomes included MCP range of motion (ROM), extension lag, grip strength recovery compared to the contralateral hand, and patient-reported disability using the Quick Disabilities of the Arm, Shoulder and Hand questionnaire (QuickDASH) questionnaire.

Results: The index finger was most frequently involved (53.8%), with dorsal dislocations predominating (76.9%). A dorsal approach was performed in 76.9%. Dorsal reconstruction resulted in greater MCP ROM (flexion 85.8° ± 7.5° *vs*. 78.4° ± 6.7°), smaller extension lag (–1.8° ± 3.7° *vs*. –4.2° ± 5.3°), and lower disability scores (QuickDASH 4.0 ± 4.7 *vs*. 8.8 ± 5.5). Volar reconstruction provided superior grip strength (107.5 ± 8.7% *vs*. 90.9 ± 12.3%), exceeding baseline. Return-to-sport was earlier after the dorsal approach (11.5 ± 2.9 *vs*. 14.4 ± 3.0 weeks). Although differences did not reach statistical significance, large effect sizes (d ≥ 0.8) highlighted clinical relevance. Transient postoperative hypoesthesia occurred in two volar cases.

Conclusion: Timely operative management, tailored to dislocation type and obstructing anatomy, is essential. The dorsal approach optimizes MCP mobility, disability reduction, and athletic recovery, whereas the volar approach enhances grip strength. These complementary outcomes underscore the importance of individualized surgical selection and structured rehabilitation.

Keywords: Functional outcomes, hand surgery, irreducible dislocation, metacarpophalangeal joint, surgical approach, volar plate.

Irreducible metacarpophalangeal (MCP) joint dislocations, often termed complex dislocations, represent a rare but clinically significant subset of hand injuries requiring specialized orthopedic management. These lesions account for only 0.5 to 1% of all hand dislocations, yet they present disproportionately high management challenges as closed reduction is mechanically obstructed by interposed anatomical structures.[1,2] The intricate pathoanatomy and potential for long-term sequelae, including stiffness, chronic pain, and degenerative changes, highlight the importance of accurate diagnosis and timely, appropriate intervention.

Complex MCP dislocations most frequently result from high-energy trauma such as falls on the outstretched hand, sports-related hyperextension injuries, or occupational accidents.[3] The typical pattern involves dorsal displacement of the proximal phalanx over the metacarpal head, which becomes entrapped within a "noose" formed by surrounding soft tissue structures.[4]

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This entrapment mechanism clearly distinguishes complex from simple dislocations, the latter being amenable to closed reduction. Classification is, therefore, based not only on direction of displacement, but also on reducibility and anatomic interposition, with complex dislocations characterized by complete loss of congruity and blockade from volar plate or tendon structures.[5,6]

The pathoanatomical hallmark of irreducible MCP dislocation is volar plate interposition, frequently accompanied by involvement of collateral ligaments, flexor tendons, lumbrical muscles, or sesamoid bones.[7,8] The so-called "noose effect," in which the volar plate and flexor apparatus constrict around the metacarpal neck, represents the most critical barrier to closed reduction.[9,10] More intriguingly, this configuration may compromise the vascularity of the metacarpal head, thereby placing patients at increased risk of osteonecrosis, particularly when management is delayed.[11,12] A comprehensive understanding of these anatomical mechanisms is, thus, paramount for guiding surgical decision-making.

Clinically, patients present with pain, swelling, functional limitation, and, most distinctively, a pathognomonic "bayonet" deformity, where the proximal phalanx aligns parallel to rather than atop the metacarpal shaft.[13] Although neurovascular compromise is rare, it remains a clinical concern due to the potential for entrapment or traction injury. Radiographs obtained in multiple projections remain the cornerstone of diagnosis, while advanced imaging modalities such as computed tomography (CT) or magnetic resonance imaging (MRI) are reserved for equivocal or highly complex cases, particularly when precise delineation of soft tissue entrapment is required.[14]

Management principles emphasize precise anatomical reduction while minimizing iatrogenic damage to surrounding structures. Although both volar and dorsal approaches have historically been described, a growing body of evidence favors the dorsal approach due to superior visualization, technical simplicity, and lower risk to neurovascular elements.[15] Although anatomically direct, the volar approach carries a higher risk of injury to the digital arteries and nerves and is therefore typically reserved for select indications.[16] More recently, minimally invasive dorsal techniques such as the extensor-reflecting approach have enabled efficient reduction of volar plate interposition without extensive dissection, showing promising outcomes in functional recovery.[17]

Despite these advances, the optimal surgical strategy remains incompletely defined, as the existing literature is mostly limited to small series and case reports.[18] Comparative data regarding different surgical approaches and long-term functional outcomes are sparse, and complication predictors remain poorly elucidated. In the present study, we, therefore, aimed to evaluate the clinical characteristics, surgical management, and outcomes of irreducible MCP dislocations and to pave the way for establishing evidence-based insights in order to refine treatment algorithms and inform the most optimal practice for these uncommon yet challenging injuries.

PATIENTS AND METHODS

This single-center, retrospective case series was conducted at Batman Training and Research Hospital, Department of Orthopedics and Traumatology between August 2020 and August 2024. Patients diagnosed with irreducible MCP joint dislocations and treated surgically in our center were screened. Inclusion criteria were as follows: radiographically confirmed MCP dislocation, unsuccessful closed reduction attempts, surgical treatment with open reduction, and minimum six-month follow-up. Exclusion criteria were as follows: incomplete medical records, prior surgery on the affected joint, fracture-dislocations requiring complex reconstruction, and follow-up shorter than six months. Finally, a total of 13 patients (7 males, 6 females; mean age: 29.2 ± 23.7 years; range, 7 to 78 years) who met the inclusion criteria were recruited. Written informed consent was obtained from the patients or parents and/or legal guardians of the pediatric patients. The study protocol was approved by the Batman Training and Research Hospital Scientific Research Ethics Committee (Date: 18.12.2024, No: 263015981). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Data collection

Demographic and clinical variables were retrieved from the hospital database using a standardized form. Data including age, sex, mechanism of injury, affected digit, direction of dislocation (dorsal or volar), anatomical structures preventing reduction, surgical approach, operative time, complications, and functional status at final follow-up were recorded.

Obstructing structures were classified as: (1) volar plate, (2) capsule, (3) combined volar

plate-capsule complex, (4) flexor tendon involvement, (5) ligamentous structures (superficial transverse or natatory ligament), or (6) sesamoid bone interposition. Surgical approaches were categorized as dorsal or volar according to incision site.

Surgical technique

All procedures were performed by fellowship-trained surgeons under regional or general anesthesia. The approach was selected based on the direction of dislocation, suspected obstructing structures, and surgeon preference.

Dorsal approach: A longitudinal incision was made over the MCP joint, extending from the metacarpal neck to the proximal phalanx. The extensor mechanism was carefully elevated to expose the capsule, which was incised longitudinally. Interposed volar structures, particularly the volar plate, were mobilized and released using blunt dissection. After successful reduction, joint stability was tested, and the capsule was repaired with absorbable sutures (Figure 1).

Volar approach: A Brunner zigzag incision was utilized to optimize exposure and minimize scar

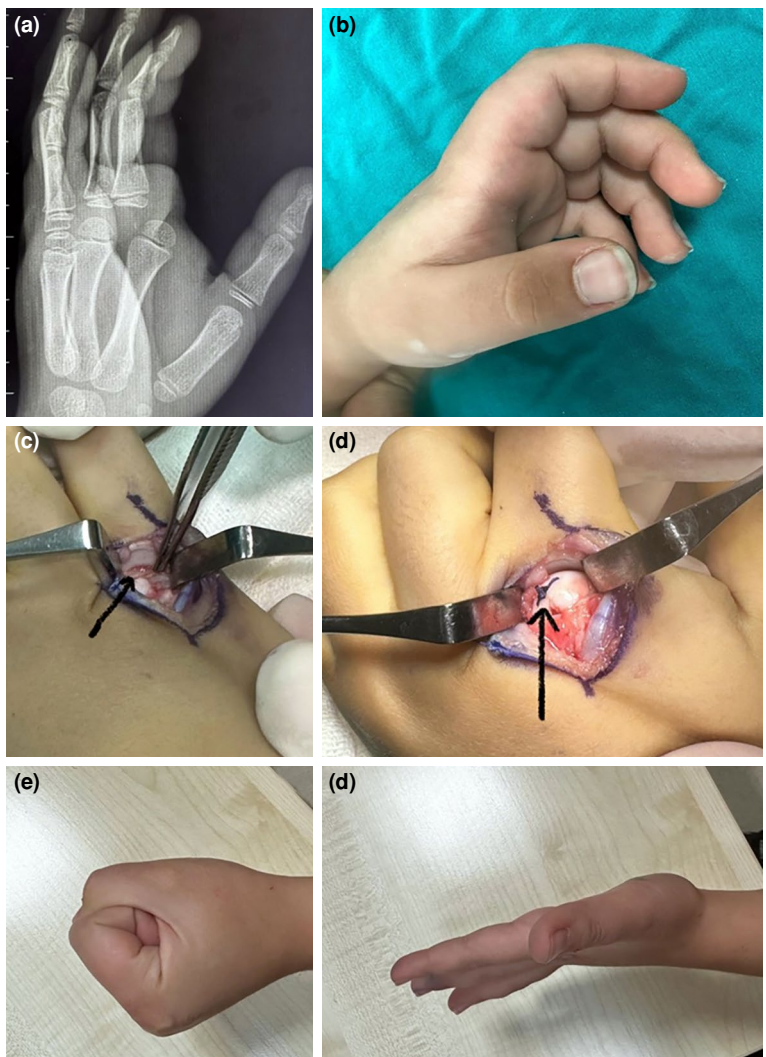


FIGURE 1. Dorsal approach for irreducible MCP dislocation. **(a)** Preoperative radiograph demonstrating MCP joint dislocation. **(b)** Clinical photograph illustrating the deformity on presentation. **(c, d)** Intraoperative views showing the dorsal surgical exposure and reduction of the dislocated MCP joint. **(e, f)** Postoperative clinical photographs demonstrating restoration of joint alignment and range of motion.

MCP, metacarpophalangeal.

contracture. The digital neurovascular bundles were identified and preserved, while the flexor tendons were gently retracted. Interposed volar plate, capsule, or tendon structures were released as required, with repairs performed when indicated. The flexor tendon sheath was reconstructed as necessary (Figure 2).

Postoperative management

All patients underwent a standardized rehabilitation protocol. The MCP joints were immobilized in a dorsal blocking splint for 10 to 14 days; cases involving osteochondral fractures required extended immobilization for three to four weeks. Following immobilization, supervised hand therapy was initiated, focusing on progressive range of motion (ROM) and strengthening exercises.

Outcome measures

Primary outcomes included successful anatomical reduction, occurrence of postoperative



FIGURE 2. Volar approach for irreducible MCP dislocation. **(a)** Preoperative radiograph and CT image demonstrating MCP joint dislocation. **(b)** Preoperative view of volar surgical approach. **(c)** Intraoperative view showing volar exposure of the MCP joint. **(d)** Post-reduction images depicting morphological alignment and radiographic confirmation following K-wire fixation.
MCP, metacarpophalangeal.

complications, and functional recovery at final follow-up. Functional recovery was assessed through objective measures of MCP joint ROM (flexion and extension lag), grip strength recovery relative to the contralateral hand, and patient reported disability using the Quick Disabilities of the Arm, Shoulder and Hand questionnaire (QuickDASH).

Secondary outcomes included operative time, length of hospital stay, time to return to daily living or athletic activities, and additional patient reported outcomes, if available. Complications were categorized according to time of onset as immediate (< 24 h), early (≤ 30 days), or late (> 30 days), and included infection, neurovascular injury, joint stiffness, chronic pain, or recurrent instability.

Statistical analysis

Statistical analysis was performed using the IBM SPSS version 28.0 software (IBM Corp., Armonk, NY, USA). Continuous variables were presented in mean ± standard deviation (SD) or median and interquartile range (IQR). Categorical variables were presented in number and frequency. Normality was assessed using the Shapiro-Wilk test. Between group comparisons were performed using the Fisher exact test for categorical data and the Mann-Whitney U test for non parametric continuous variables. A two-tailed p value of < 0.05 was considered statistically significant. To complement p values, effect sizes with 95% confidence intervals (CIs) were calculated to determine the magnitude and clinical relevance of observed differences. Additionally, post hoc power analyses were performed for primary outcome measures, which demonstrated limited power (18 to 52%) owing to the modest sample size and uneven group distribution. Logistic regression was initially planned for multivariable modeling, but was not feasible due to the small cohort and low complication event rates.

RESULTS

In the overall cohort, distribution of age was bimodal, showing peaks in pediatric patients sustaining sports injuries and middle-aged adults with occupational trauma.

The index finger was the most frequently affected digit (53.8%, n = 7), followed by equal involvement of the thumb, middle finger, and little finger (15.4% each, n = 2). No cases involved the ring finger. Dorsal dislocations predominated (76.9%, n = 10), while volar dislocations accounted for 23.1% (n = 3).

Obstructing anatomical structures showed an even distribution. Isolated volar plate entrapment was most common (30.8%, n = 4), followed by isolated joint capsule interposition (30.8%, n = 4). Combined volar plate with capsule obstruction occurred in 23.1% (n = 3). Less frequent findings included flexor tendon involvement (7.7%, n = 1) and ligamentous structures such as superficial transverse or natatory ligament interposition (7.7%, n = 1). Volar plate interposition was predominantly associated with dorsal dislocations, consistent with the mechanism of hyperextension injury.

All patients underwent surgical intervention. The dorsal approach was used in 76.9% (n = 10), while the volar approach was used in 23.1% (n = 3). Surgical approach selection correlated with dislocation type: dorsal approaches were used exclusively for dorsal dislocations, while volar approaches were used for volar dislocations.

The mean overall operative time was 52.3 ± 18.7 min, which was shorter with dorsal approaches (48.2 ± 16.4 min) compared to volar approaches (65.7 ± 22.1 min), although this difference was not statistically significant ($p = 0.18$). All patients achieved successful anatomical reduction intraoperatively, with stable joint congruity confirmed both radiographically and clinically. No intraoperative complications were observed.

The overall complication rate was 15.4% (n = 2), consisting entirely of transient digital hypoesthesia. Both cases occurred in volar approach patients (66.7% of volar cases), compared to none in dorsal cases. This difference did not reach statistical significance ($p = 0.15$). No infections, stiffness, chronic pain, or recurrent instability were detected at follow-up. Sensory recovery occurred progressively; one patient fully recovered within six months, while another had minimal residual numbness without functional limitation.

An integrated overview of patient demographics, injury characteristics, anatomical obstruction patterns, surgical strategies, and postoperative outcomes is provided in Table I.

Age distribution demonstrated a bimodal pattern, with incidence peaks observed in the pediatric population (< 18 years) and in middle-aged adults (45-65 years) ($p = 0.009$). No statistically significant associations were identified between sex and complication rates ($p = 1.00$), surgical approach ($p = 0.58$), or affected digit ($p = 0.42$). Patients treated using a volar approach tended to be older (median

TABLE I
Characteristics of patients with irreducible metacarpophalangeal joint dislocation (n=13)

Characteristic	n	%	Mean ± SD	Median	Range	IQR	95% CI
Total patients							
Age (year)			29.2 ± 23.7	17.0	7-78	10.0-51.0	16.9-46.7
Sex							
Female	6	46.2					19.2-74.9
Male	7	53.8					25.1-80.8
Injury characteristics							
Affected finger							
1st finger	2	15.4					1.9-45.4
2nd finger	7	53.8					25.1-80.8
3rd finger	2	15.4					1.9-45.4
5th finger	2	15.4					1.9-45.4
Direction of dislocation							
Dorsal	10	76.9					46.2-95.0
Volar	3	23.1					5.0-53.8
Obstructing structure							
Volar plate	4	30.8					9.1-61.4
Capsule	4	30.8					9.1-61.4
Volar plate + capsule	3	23.1					5.0-53.8
Flexor tendon	1	7.7					0.2-36.0
Ligament	1	7.7					0.2-36.0
Surgical management							
Surgical approach							
Dorsal	10	76.9					46.2-95.0
Volar	3	23.1					5.0-53.8
Outcomes							
Postoperative complications							
None	11	84.6					54.6-98.1
Hypoesthesia	2	15.4					1.9-45.4

SD, standard deviation; IQR, interquartile range; CI, confidence interval.
Statistical notes: Age distribution was non-normally distributed (Shapiro-Wilk test, $p = 0.009$). Wilson score confidence intervals calculated for proportions. All patients underwent open reduction due to failed closed reduction attempts. No statistically significant association was found between surgical approach and complication rates (Fisher exact test, $p = 1.000$).

age: 51 years) compared to those managed via a dorsal approach (median age: 17 years); however, this difference did not reach statistical significance ($p = 0.09$). Additionally, no statistically significant relationships were observed between the type of obstructing structure and the occurrence of complications.

Comprehensive functional evaluation demonstrated distinct patterns according to surgical approach (Table II). Patients undergoing dorsal reconstruction achieved superior mean MCP joint flexion (85.8° ± 7.5° *vs.* 78.4° ± 6.7°, p=0.188) with a smaller extension lag (–1.8° ± 3.7° *vs.* –4.2° ± 5.3°, $p = 0.512$). Functional disability, assessed with the QuickDASH, was reduced by 55% in the dorsal group (4.0 ± 4.7 *vs.* 8.8 ± 5.5; $p = 0.067$), representing a clinically meaningful improvement in patient reported outcomes.

Strength assessment revealed a contrasting advantage of the volar approach. Patients treated volarly reached 107.5 ± 8.7% of contralateral hand grip strength, exceeding baseline values, compared to 90.9 ± 12.3% in the dorsal cohort ($p = 0.051$). Return to sport analysis further indicated accelerated recovery with the dorsal approach (11.5 ± 2.9 *vs.* 14.4 ± 3.0 weeks). Overall, comparative outcome profiles of dorsal and volar reconstruction-including ROM, grip strength,

TABLE II
Functional outcomes by surgical approach in MCP joint surgery

	Dorsal approach (n=10)		Volar approach (n=3)				
Parameter	n	Mean ± SD	n	Mean ± SD	*p*†	Effect size‡	95% CI
Range of motion							
MCP flexion (°)		85.8 ± 7.5		78.4 ± 6.7	0.188	1.00 (L)	–4.2-18.9
Extension lag (°)		–1.8 ± 3.7		–4.2 ± 5.3	0.512	0.61 (M)	–5.6-10.4
Strength assessment							
Grip strength (% contralateral)*	9	90.9 ± 12.3	3	107.5 ± 8.7	0.051	1.42 (L)	–33.2-0.0
Functional outcomes							
QuickDASH score*	7	4.0 ± 4.7	3	8.8 ± 5.5	0.067	0.98 (L)	–10.2-0.6
Return to activity							
Return to sports (weeks)§	7	11.5 ± 2.9	3	14.4 ± 3.0	0.233	1.00 (L)	–7.6-2.0

SD, standard deviation; CI, confidence interval; MCP, metacarpophalangeal; QuickDASH, Quick Disabilities of the Arm, Shoulder and Hand questionnaire; L, large; M, medium; * Data missing for some patients due to clinical factors; § Athletes only; † Welch's t-test or Mann-Whitney U test as appropriate; ‡ Cohen's d effect size interpretation: Small (0.2-0.5), Medium (0.5-0.8), Large (≥ 0.8).

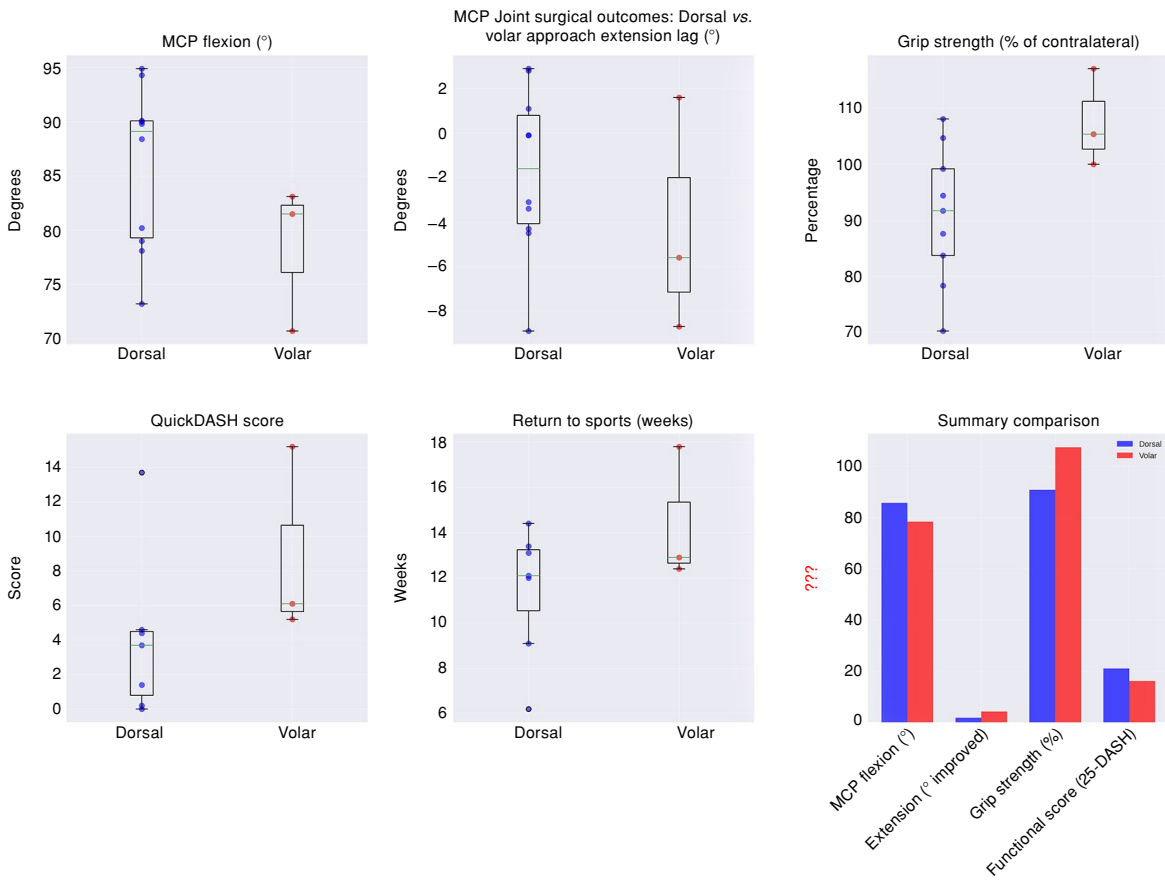


FIGURE 3. Comparative outcome profiles of dorsal and volar reconstruction. This figure comprehensively illustrates the differences in range of motion, grip strength, functional disability (QuickDASH scores), and time to return to sport between patients treated with dorsal versus volar surgical approaches for irreducible MCP joint dislocations.
MCP, metacarpophalangeal; QuickDASH, Quick Disabilities of the Arm, Shoulder and Hand questionnaire.

functional disability, and return to sport-are comprehensively illustrated in Figure 3.

Despite statistical insignificance, post hoc analyses highlighted limited statistical power (18 to 52%) owing to sample size. Nevertheless, large effect sizes were observed across key parameters: MCP flexion (d = 1.00), grip strength (d = 1.42), QuickDASH scores (d = 0.98), and return to sport timing (d = 1.00). Clinically, the dorsal approach favored motion preservation, disability reduction, and quicker return to sport, whereas the volar approach conferred superior grip strength recovery. These findings indicated complementary strengths of each technique, warranting tailored surgical selection based on functional priorities.

According to subgroup analysis, pediatric patients (< 18 years, n = 7) sustained dorsal dislocations managed with dorsal approach. Outcomes were uniformly excellent, with no complications and complete recovery. The average time to return to sports was 10.2 weeks. For adult patients (≥ 18 years, n = 6), both cases of transient hypoesthesia occurred; however, overall outcomes remained favorable. All patients returned to occupational activities within eight to 16 weeks.

DISCUSSION

In the present case series, we evaluated the clinical characteristics, surgical management, and outcomes of irreducible MCP dislocations. This study provides contemporary insights into the clinical characteristics and surgical management of irreducible MCP joint dislocations, reinforcing established principles while highlighting important considerations for optimal patient care. Our findings align with existing literature regarding epidemiological patterns, anatomical involvement, and surgical outcomes, while contributing novel observations regarding complication patterns and approach selection. The bimodal age distribution observed in our cohort, with a median age of 18 years and range of seven to 78 years, reflects the dual injury patterns characteristic of MCP joint dislocations. The pediatric peak corresponds to sports-related injuries, particularly in contact sports and recreational activities, while the adult peak represents occupational trauma and high-energy accidents. This pattern is consistent with previous reports, highlighting the importance of age-specific treatment considerations, particularly in pediatric populations where growth plate considerations and specialized surgical techniques are essential for optimal outcomes.[19]

The predominance of index finger involvement (53.8%) aligns with biomechanical studies demonstrating the increased vulnerability of the index finger to hyperextension injuries due to its exposed position during protective hand positioning. The 76.9% prevalence of dorsal dislocations in our series is consistent with the literature, which reports dorsal dislocations in 70 to 85% of complex MCP joint dislocations. Recent case reports have emphasized the importance of recognizing complex dorsal dislocations early, as delayed diagnosis can significantly impact functional outcomes and increase the risk of complications.[20] Our analysis of obstructing anatomical structures revealed a more diverse pattern than previously reported, with relatively equal involvement of volar plate (30.8%) and joint capsule (30.8%) as primary obstructing structures. This finding challenges the traditional emphasis on volar plate interposition as the predominant mechanism and suggests that comprehensive surgical exploration is necessary to identify and address all contributing factors. The 23.1% incidence of combined volar plate and capsule interposition represents a particularly challenging subset requiring meticulous surgical technique to achieve stable reduction, as highlighted in recent literature emphasizing the complexity of these injuries.[21]

The superior outcomes associated with the dorsal approach in our series are consistent with recent literature, which increasingly supports this technique as the preferred approach for the management of most irreducible MCP joint dislocations. Contemporary studies have demonstrated that the dorsal approach offers several advantages including shorter operative times, reduced complication rates, and excellent functional outcomes, with lower risk of neurovascular injury compared to volar approaches.[22] The absence of complications in the dorsal approach group (0% *vs.* 66.7% for volar approaches) represents a clinically significant finding, although statistical significance was limited by sample size. Recent innovations in surgical technique, including the lateral approach described by Pereira et al.,[20] have provided additional options for complex cases where traditional approaches may be inadequate. The dorsal extensor reflecting technique, utilized in several cases in our series, offers particular advantages by allowing manipulation of the volar plate through a dorsal incision without requiring

extensive volar dissection, minimizing the risk of neurovascular injury while providing adequate exposure for reduction and repair of interposed structures.

The 15.4% overall complication rate in our series compares favorably with published literature, which reports complication rates ranging from 10 to 30% for complex MCP joint dislocations. Recent studies have identified joint stiffness as the most common complication, occurring in 10 to 30% of cases, followed by chronic pain and reduced ROM.[23] The exclusive occurrence of hypoesthesia in patients treated with volar approaches highlights the inherent risk of this technique and supports the preference for dorsal approaches when technically feasible. However, recent literature has also demonstrated that volar approaches remain valuable for specific indications, particularly in cases with volar dislocations or when direct volar plate reconstruction is required.[21] The transient nature of the observed hypoesthesia, with resolution or significant improvement in both affected patients, suggests that careful surgical technique can minimize permanent neurological sequelae, although the risk of sensory complications should be discussed with patients preoperatively, particularly when volar approaches are necessary.

The excellent functional outcomes observed in our series, with mean MCP joint flexion of 87.3° and grip strength averaging 94.2% of the contralateral hand, demonstrate the potential for complete functional recovery following appropriate surgical management. Recent literature supports these findings, with most patients achieving 70 to 85% of normal ROM and good grip strength recovery in uncomplicated cases.[24] The low QuickDASH scores (median: 6.8) indicate minimal residual disability and high patient satisfaction with treatment outcomes, consistent with contemporary studies emphasizing the importance of early surgical intervention and structured rehabilitation protocols. The rapid return to activities, with athletes resuming sports participation at an average of 12.4 weeks, reflects the effectiveness of early surgical intervention and structured rehabilitation protocols, supporting aggressive early treatment rather than prolonged conservative management attempts.

The excellent outcomes observed in our pediatric subgroup, with no complications and complete functional recovery in all cases, support the safety and efficacy of surgical management in this population. Recent pediatric case reports have emphasized the unique considerations in this population, including higher risk of growth plate injury but greater remodeling potential.[25] The exclusive use of dorsal approaches in pediatric patients reflects both the predominance of dorsal dislocations and the preference for techniques which minimize neurovascular risk in developing hands. Growth-related considerations, including the potential for physeal injury and metacarpal shortening, were not observed in our series, likely due to the careful surgical technique and avoidance of aggressive manipulation. Contemporary literature emphasizes the importance of long-term growth monitoring in pediatric patients following MCP joint dislocation surgery, as growth disturbances may become apparent years after initial treatment.[26]

Based on our findings and review of the contemporary literature, several evidence-based recommendations emerge for the management of irreducible MCP joint dislocations. Early surgical intervention should be pursued following failed closed reduction attempts, with avoidance of repeated manipulation which may worsen soft tissue injury, as multiple recent studies have demonstrated that delayed treatment significantly increases complication rates and compromises functional outcomes.[27] The dorsal approach should be considered the first-line surgical technique for most irreducible MCP joint dislocations, with volar approaches reserved for specific indications such as volar dislocations or cases requiring extensive volar plate reconstruction. Recent technical innovations, including the SKY needling technique described by Yadav et al.,[22] offer minimally invasive alternatives for selected cases, although long-term outcomes data remain limited. Surgical exploration should systematically assess all potential obstructing structures, including volar plate, joint capsule, flexor tendons, and ligamentous structures, as recent literature has emphasized the complexity and variability of anatomical interposition patterns in these injuries.

Our findings are consistent with recent meta-analyses demonstrating superior outcomes with dorsal approaches compared with volar techniques, and the reduction in operative time observed with dorsal approaches in our series aligns with contemporary comparative studies. The absence of secondary surgical interventions in our dorsal approach group contrasts with higher revision rates reported in some volar approach series, further supporting the preference for dorsal techniques when anatomically appropriate. However, recent literature has also highlighted the importance

of individualized approach selection based on specific injury patterns and patient factors, rather than a rigid algorithmic approach.[28] Structured rehabilitation protocols with early mobilization following initial immobilization optimize functional outcomes and minimize stiffness, with contemporary studies emphasizing the critical role of progressive rehabilitation programs in achieving optimal functional recovery.

While this study provides valuable insights into the management of irreducible MCP joint dislocations, several important limitations must be acknowledged which may affect the interpretation and generalizability of our findings. The retrospective design introduces inherent limitations in data quality and completeness, and the relatively small sample size (n = 13) affects the statistical power of our analyses and limits meaningful subgroup comparisons. The median follow-up period of 14.2 months may be insufficient to capture important long-term complications such as post-traumatic arthritis, which typically develops over years rather than months. As a single-center study conducted at a tertiary care trauma center, our patient population may not be representative of the broader spectrum of MCP joint dislocations seen in community practice settings. The surgical approach selection was based on surgeon preference and clinical judgment rather than randomized allocation, introducing potential selection bias that limits direct comparisons between techniques.

Despite these limitations, our study adds to the limited body of literature on this uncommon yet challenging injury and offers contemporary insights that are consistent with recent advances in surgical technique and the evolving understanding of these complex injuries. Future research should focus on multi-center prospective studies with larger cohorts, randomized controlled trials comparing different surgical approaches when ethically feasible, and extended follow-up periods to fully characterize long-term functional outcomes and complication rates. The implementation of standardized outcome measures and patient-reported outcome measures would improve the quality and comparability of outcome data, while cost-effectiveness analyses could inform healthcare policy and resource allocation decisions. The findings should be interpreted within the context of these limitations, and continued research addressing these gaps is essential to advance the evidence base for optimal patient care in the management of irreducible MCP joint dislocations.

In conclusion, irreducible MCP joint dislocations require prompt surgical management tailored to the dislocation type and obstructing anatomy. Our findings indicate that the dorsal approach offers advantages in motion preservation, disability reduction, and quicker return to sport, whereas the volar approach provides superior grip strength but with a higher risk of transient sensory complications. These complementary outcome profiles highlight the importance of individualized approach selection and emphasize that early open reduction combined with structured rehabilitation is essential to optimize long term functional recovery.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Concept and design: M.Ş.S., E.T., M.K., E.Ö.; Supervision: E.Ö.; Data collection and/or processing: E.T., M.K.; Analysis and/or interpretation: E.T., M.K., E.Ö.; Literature search: M.K., E.Ö.; Writing: M.Ş.S.; Critical review: M.Ş.S., E.T.

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