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Original Research Article

Management of Kaplan's Dislocation by Open Dorsal Approach

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Conflict of interest: Nil

Abstract

Objective: To evaluate the efficacy and clinical outcomes of open dorsal approach for managing Kaplan's dislocation (dorsal metacarpophalangeal joint dislocation) in patients with failed closed reduction.

Methods: A prospective case series of 11 patients with Kaplan's dislocation was conducted at the Department of Orthopaedics, Gauhati Medical College and Hospital from 2022 to 2023. Patients aged 18-60 years with confirmed dorsal MCP joint dislocation requiring open reduction were included. An open dorsal approach with precise reduction and K-wire fixation was performed. Postoperative rehabilitation included ROM exercises. Clinical outcomes have been assessed by employing Visual Analog Scale (VAS) for pain and goniometric measurements for range of motion (ROM) at 6 and 12 weeks post-surgery.

Results: All 11 patients achieved successful joint reduction and stabilization. Mean VAS scores improved from preoperative 7.72 ± 0.65 to 1.45 ± 0.69 at 12 weeks ($p < 0.001$). Total Active Motion (TAM) score at 12 weeks was 316.5° ± 32.8° with a mean recovery of 90.4% compared to the contralateral unaffected joint. Clinical outcomes were excellent in 8 patients (72.7%) and good in 3 patients (27.3%). No major complications were observed during follow-up.

Conclusion: The open dorsal approach for Kaplan's dislocation provides a reliable surgical technique for achieving anatomical reduction and stable joint fixation. This approach minimizes complications associated with repeated closed reduction attempts and facilitates early functional recovery, making it a viable surgical option for managing these complex injuries.

Keywords: Kaplan's Dislocation, Metacarpophalangeal Dislocation, Open Dorsal Approach, Hand Surgery, Joint Instability.

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Introduction

Metacarpophalangeal (MCP) joint dislocations represent approximately 5% of upper extremity injuries and are less frequent than proximal interphalangeal (PIP) joint dislocations [1]. Among MCP joint dislocations, involvement of index finger is relatively uncommon, and when it occurs as a complex dorsal dislocation with soft tissue interposition, it presents significant management challenges [2].

Kaplan's lesion, first comprehensively described by Kaplan in 1957, refers to a complex dorsal dislocation of MCP joint, typically affecting index finger [3]. The pathophysiology involves disruption of the volar plate from its proximal attachment at metacarpal neck, allowing it to prolapse into the joint space and act as a mechanical barrier to reduction [2]. The volar plate, along with deep transverse metacarpal ligament, flexor tendons, and tendinous band of palmar fascia, forms a

constricting "buttonhole-like" loop around the metacarpal head, preventing spontaneous or manual reduction [4].

Closed reduction techniques frequently fail in Kaplan's dislocation because the interposed soft tissue structures create an insurmountable mechanical barrier. Repeated closed reduction attempts not only fail to restore joint congruity but may also cause additional trauma, leading to serious complications, including osteonecrosis, post-traumatic osteoarthritis, joint stiffness, and premature physeal closure in younger patients[1,4].

Four surgical approaches were described for managing complex dorsal MCP dislocations: volar, modified volar, dorsal, and lateral methods [5]. Each approach has distinct advantages and disadvantages. The dorsal approach lowers risk of neurovascular complications and provides adequate exposure for managing associated osteochondral fractures. However, it provides limited visualization of the volar plate [5]. Despite the literature on various surgical techniques, consensus on the optimal approach remains lacking due to the rarity of these injuries and limited clinical case series [4].

This prospective case series aims to evaluate the efficacy, safety, and functional outcomes of open dorsal approach in the management of Kaplan's dislocation with emphasis on achieving anatomical reduction, joint stability, and functional recovery.

Materials and Methods

Study Design and Setting: From 2022 to 2023, a prospective case series of 11 patients with Kaplan's dislocation was carried out at Gauhati Medical College and Hospital's Department of Orthopaedics. All cases were managed with an open dorsal approach for reduction and stabilization.

Patient Selection

Inclusion Criteria:

- Age 18-60 years
- Confirmed diagnosis of Kaplan's dislocation on plain radiographs and clinical examination
- Failed closed reduction or acute presentation with anticipated failure of closed reduction
- Requirement for joint stabilization
- Presence of associated fractures amenable to surgical fixation
- Stable and viable soft tissue with no severe contamination. Minimal follow-up period of one year

Exclusion Criteria:

- Severe osteoarthritis or joint degeneration
- Severe soft tissue damage or infection
- Active inflammatory conditions
- Poor surgical candidates (medical comorbidities precluding anesthesia)
- Non-compliant or unmotivated patients Extremes of age (< 18 or > 60 years)
- Psychiatric or cognitive impairment

Clinical Assessment: All patients were evaluated for clinical symptoms, including severe pain at the MCP joint, limited finger extension, hyperextension posture, and ulnar deviation. Physical examination documented characteristic findings: puckering of palmar skin (due to underlying metacarpal head), palpable metacarpal head in the palm, dorsally visible void, intact sensory and motor function. Plain radiographs in anteroposterior and lateral views confirmed the diagnosis, with lateral view revealing dorsal dislocation and AP view showing ulnar deviation of the proximal phalanx with expanded joint space.

Operative Procedure: All patients underwent surgery under general or regional anesthesia within three days of hospital admission. The operative technique included:

Incision and Exposure: A straight or gently curved dorsal longitudinal incision has been made over second MCP joint, extending 2cm proximal to MCP joint and 2 cm distal to the joint. Careful dissection preserved dorsal veins and branches of the radial nerve's dorsal sensory division. Subcutaneous tissue was elevated as a single layer to prevent skin sloughing.

Joint Exposure: The ulnar aspect was identified, and soft tissue was dissected with care to retract extensor ligaments. A longitudinal capsulotomy was performed using a 15 mm blade to expose MCP joint capsule. A longitudinal incision was made over center of the volar plate using ne retractors.

Reduction Technique: The metacarpal head was gently raised and permitted to travel in both radial and ulnar directions between the plate leaflets. The interposed volar plate, identified as a taut, shiny, glistening white structure, was mobilized ventrally using a freer elevator. Reduction was facilitated by releasing collateral ligaments when necessary.

Stabilization: K-wire fixation was achieved by inserting a K-wire from head of the proximal phalanx through MCP joint into the metacarpal head in the reduced position. Thorough wound irrigation was performed.

Closure: After confirming reduction clinically (joint moved freely through flexion extension range with restoration of normal joint relationship), wound closure was performed in layers using absorbable polyglactin suture for deep layers and nonabsorbable synthetic nylon suture for skin closure.

Postoperative Management

Postoperative management followed a structured protocol:

Weeks 0-3: Joint immobilization in extension

Weeks 3-4: Suture and K-wire removal; active ROM exercises in removable dorsal extension block splint

Weeks 4-6: Splint utilized only for protection during functional activities.

Week 6 onward: Splint discontinued; unrestricted ROM exercises

ROM exercises were progressively advanced to restore full functional ROM. Patients were counseled regarding activity progression and functional goals.

Outcome Assessment

Primary Outcome: Successful joint reduction and clinical stability assessed during surgery and confirmed on postoperative radiographs.

Secondary Outcomes:

1. **Pain Assessment:** VAS scores noted preoperatively, at 6 weeks, and at 12 weeks postoperatively
2. **Range of Motion:** Goniometric measurements of MCP, PIP, and DIP joint flexion and extension deficits at 12 weeks postoperatively
3. **Functional Outcome:** TAM score calculated as: TAM = (MCP flexion + PIP flexion + DIP flexion) - (MCP extension deficit + PIP extension deficit + DIP extension deficit)
4. **Recovery Percentage:** (TAM score / 350°) × 100
5. **Complication Assessment:** Monitoring for joint stiffness, osteonecrosis, posttraumatic osteoarthritis, infection, and other surgical complications

Statistical Analysis: Microsoft Excel 2010 has been utilized for data analysis. Categorical variables were presented as frequency counts.

Numerical variables were presented as mean ± standard deviation. Preoperative and postoperative measures were compared using the paired t-test.

For the analysis of categorical data, the chi-square test was employed. Statistical significance was defined as a P-value of less than 0.05.

Results

Demographic and Injury Characteristics: Eleven patients with Kaplan's dislocation have been included in the research.

The mean age has been 34.5 ± 12.8 years (range: 18-60 years). Male predominance was observed with 7 males (63.6%) and 4 females (36.4%).

Table 1: Age and Sex Distribution

Age Group (years)	Male	Female	Total
18-25	2	0	2
26-35	3	2	5
36-45	2	2	4
45-60	0	0	0
Total	**7**	**4**	**11**
p-value			0.4741

Mechanism of injury analysis revealed:

Table 2: Mode of Injury

Mechanism of Injury	Number of Patients
Direct Injury	8
Road Traffic Accident (RTA)	3
Total	**11**
p-value	0.1317

Pain Assessment: Preoperative VAS scores ranged from 7 to 9, with a mean of 7.72 ± 0.65. Postoperative VAS scores at 12 weeks ranged from 1 to 3 with a mean of 1.45 ± 0.69. The mean pain reduction was 6.27 ± 0.48 points, representing a significant improvement (paired t-test: $p < 0.001$).

Table 3: VAS Scores for Pain Assessment

Patient	Preoperative VAS	Postoperative VAS (12 weeks)
1	8	1
2	7	1
3	8	2
4	7	1
5	7	1
6	8	1
7	8	2
8	8	1
9	8	1
10	7	2
11	9	3
Mean ± SD	**7.72 ± 0.65**	**1.45 ± 0.69**
p-value		< 0.001

Range of Motion and Functional Outcomes: Goniometric measurements at 12 weeks postoperatively demonstrated comprehensive recovery across all measured joints.

Table 4: ROM and TAM Score at 12 Weeks Postoperatively

Pt	MCP Flex	PIP Flex	DIP Flex	MCP Ext Def	PIP Ext Def	DIP Ext Def	TAM Score	Recovery
	(°)	(°)	(°)	(°)	(°)	(°)	(°)	(%)
1	85	90	75	5	5	5	325	92.8
2	80	85	70	10	5	5	305	87.1
3	82	88	72	8	5	5	314	89.7
4	88	92	78	2	3	3	350	100.0
5	83	87	73	7	6	5	315	90.0
6	86	89	74	4	4	4	337	96.3
7	81	84	69	9	7	6	303	86.5
8	79	83	68	11	8	7	294	83.9
9	85	90	75	5	5	5	325	92.8
10	82	87	72	8	6	5	312	89.1
11	78	80	65	12	9	8	284	82.3
Mean	**82.36**	**87.27**	**72.36**	**7.0**	**5.8**	**5.4**	**316.5**	**90.4**
p-value								0.0001

TAM scores at 12 weeks postoperatively ranged from 284° to 350° with a mean of 316.5° ± 32.8°. The mean recovery percentage was 90.4% ± 9.2% compared to the contralateral unaffected hand.

Clinical Outcomes Classification:

Clinical outcomes were classified based on recovery percentage: Excellent (≥ 90%), Good (76-89%), Fair (60-75%), and Poor (< 60%). Results demonstrated:

- Excellent outcome: 8 patients (72.7%)
- Good outcome: 3 patients (27.3%)
- Fair outcome: 0 patients
- Poor outcome: 0 patients

Patient 4 achieved 100% recovery with a TAM score of 350° (excellent outcome).

Patient 11, despite successful reduction and good pain control, achieved 82.3% recovery with a TAM score of 284° (good outcome), representing the lowest functional recovery in the series.

Radiographic and Intraoperative Findings: Postoperative radiographs confirmed accurate anatomical reduction in all 11 cases. K-wire fixation was verified in all patients with correct positioning across the MCP joint. At 3Weeks postoperatively, K-wires were removed following confirmation of fracture healing and joint stability. No cases of secondary displacement or loss of reduction have been noted during 12-week follow-up period. Intraoperative findings and operative technique are illustrated in Figures 2 through 6, showing anatomical landmarks (Figure 1), preoperative clinical presentation (Figure 2), surgical approach and reduction technique (Figure 3), postoperative confirmation (Figure 4), radiographic follow-up at 12 weeks (Figure 5), and functional recovery (Figure 6)

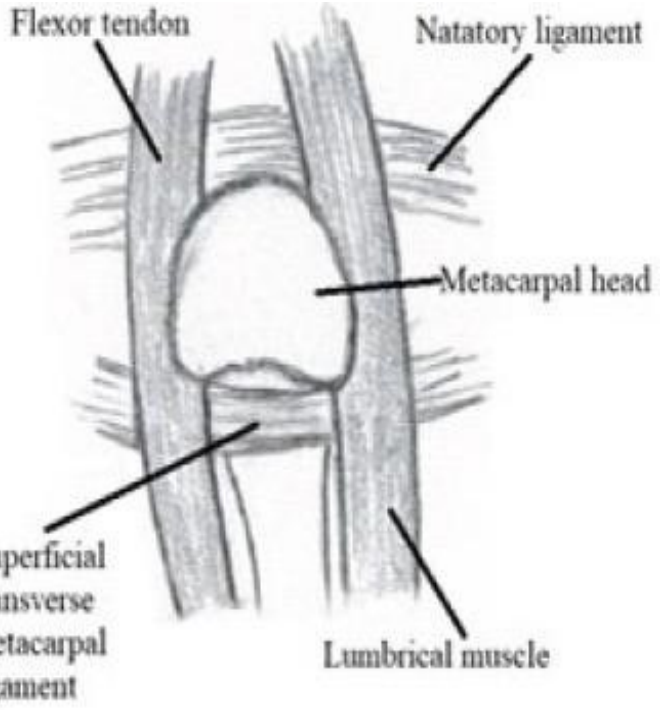

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Figure 1: Anatomy of Volar plate

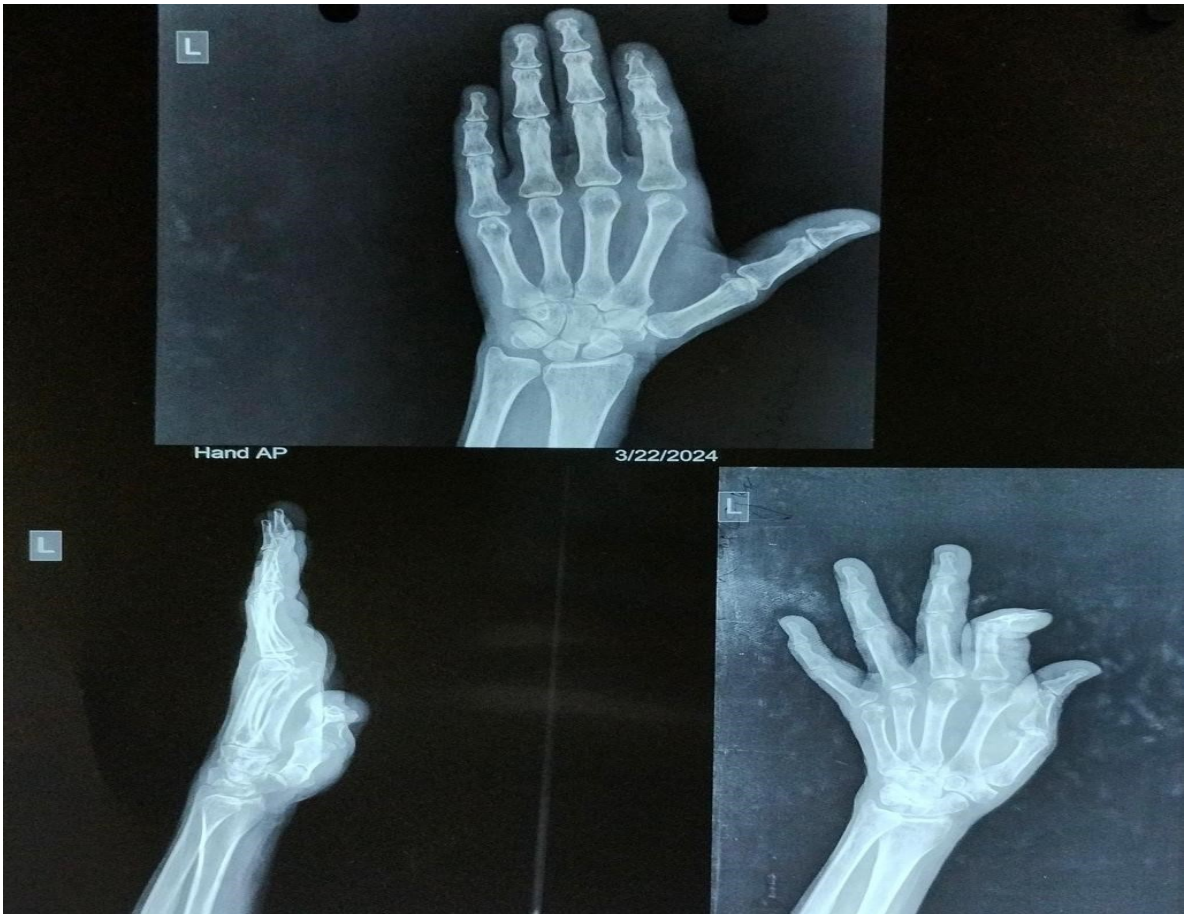

Figure 2(a): Pre-Operative X -Rays

Fig 2b, 2c, 2d: Pre-Operative Clinical Pictures

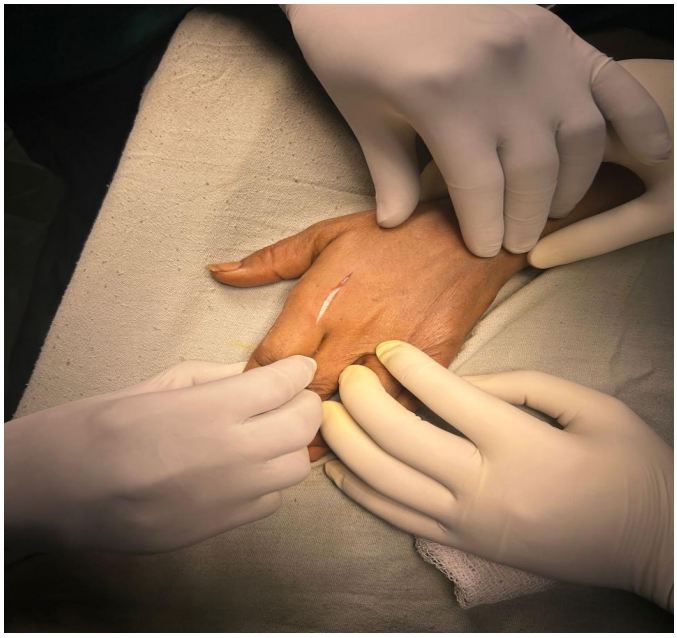

Figure 3a: Skin incision

Figure 3b: soft tissue dissection

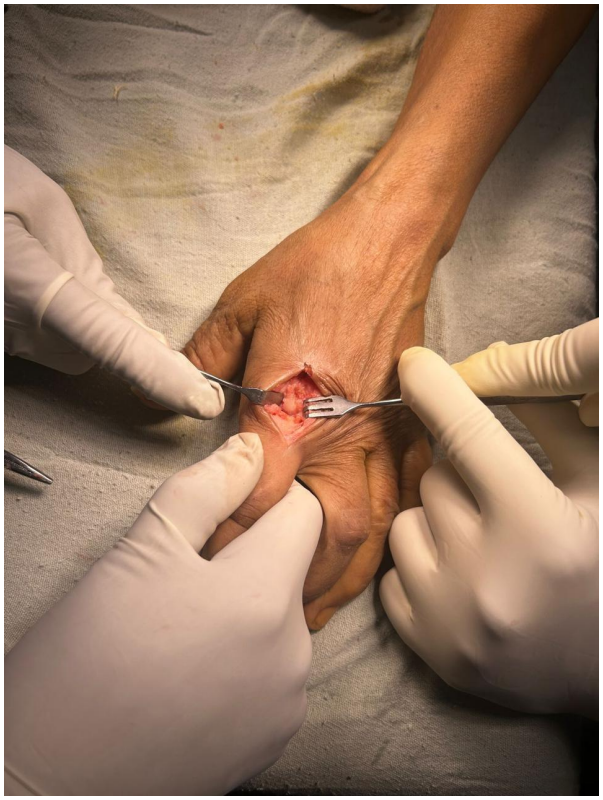

Figure 3c: Open reduction

Figure 3d: Post reduction

Figure 3e: K-wire fixation

Figure 3f: Closure

Figure 4: Post-Operative Picture and C-arm image

Figure 4: Post-Operative X-Ray

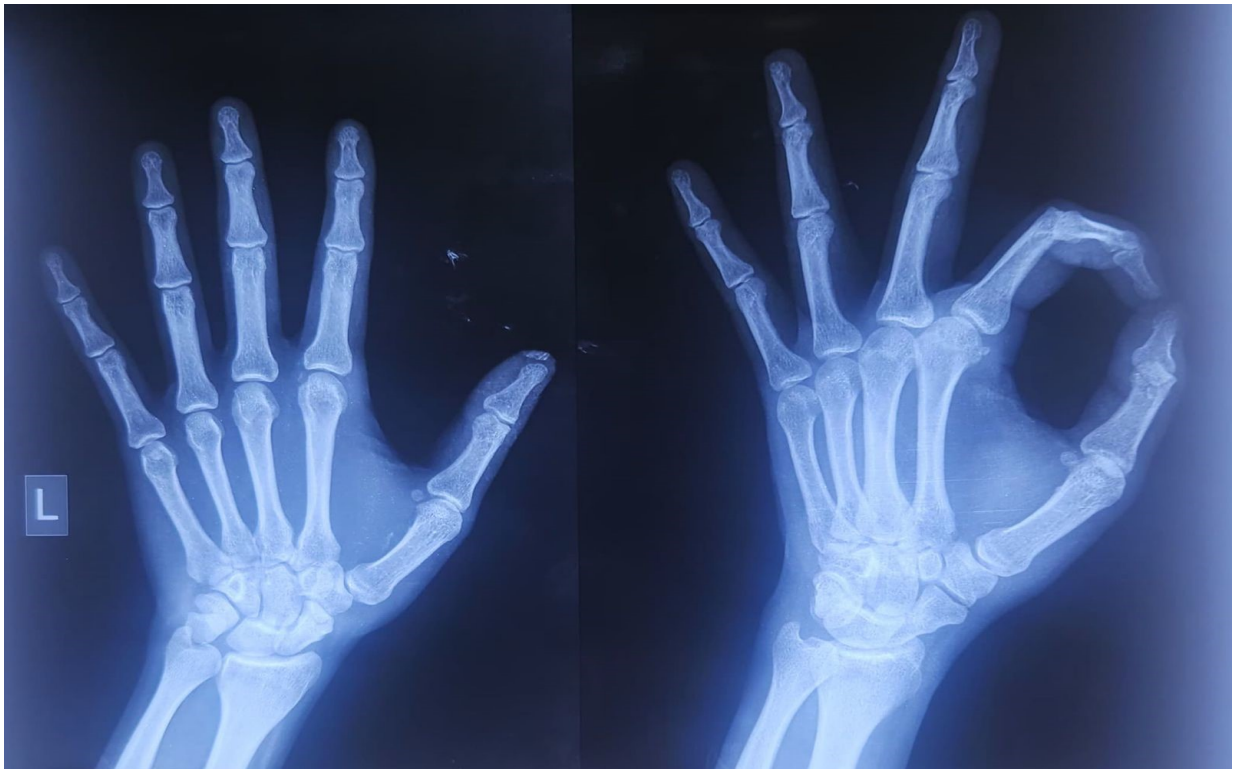

Figure 5: X Ray at 12 Weeks Post Operatively

Figure 6: Follow-Up Pictures Showing Rom at 12 Weeks Post-Operatively

Complications: No major complications were observed during the follow-up period. Specifically, there were no cases of:

- Osteonecrosis of metacarpal head
- Post-traumatic osteoarthritis development
- Infection or wound complications
- Vascular insufficiency or nerve injury
- Premature physeal closure (in younger patients)

Permanent joint stiffness: Minor postoperative findings included mild swelling that resolved by week 6 in all patients, and temporary sensory paresthesia along the dorsal radial aspect in 2 patients (18.2%), which fully resolved by 12 weeks without intervention.

Discussion

Kaplan's dislocation represents a complex orthopedic injury that requires simple management. The MCP joint, with its multiaxial design, is essential for coordinated hand function, permitting flexion, extension, abduction, and adduction of fingers [1].

The concave-shaped proximal phalanx articulating with the convex metacarpal head creates a design that offers minimal inherent stability [6]. Primary stabilization depends on the joint capsule, collateral ligaments, volar plate, and surrounding musculotendinous structures.

Pathophysiology and Closed Reduction Failure: In Kaplan's dislocation, the initial injury causes disruption of volar plate from its proximal attachment at metacarpal neck. The plate, along with associated soft tissues including the deep transverse metacarpal ligament, lumbricals, flexor tendons, becomes interposed in joint space [2]. This creates a mechanical obstruction that prevents spontaneous reduction and makes closed reduction impossible. Attempts at closed reduction paradoxically tighten this soft tissue "buttonhole," further entrapping the metacarpal head and potentially causing additional neurovascular compromise [4]. Our series of 11 patients represents a typical presentation where closed reduction was either attempted unsuccessfully or anticipated to fail according to clinical and radiographic findings. All patients presented with characteristic clinical signs: puckering of palmar skin, dorsally visible void, hyperextension posture, and inability to achieve joint reduction despite attempted manipulation.

Surgical Approach Selection: Four surgical approaches had been advocated for complex dorsal MCP dislocations: volar, modified volar, dorsal, and lateral [5]. Each approach has distinct merits and limitations. The volar approach offers excellent visualization of volar plate and flexor structures but carries a higher risk of neurovascular injury due to superficial displacement of neurovascular bundle with metacarpal head dislocation [5]. The modified volar approach addresses this through A1 pulley

release, reducing flexor tendon tension, but still carries relative neurovascular risk.

The dorsal approach, employed in our series, offers several advantages:

1. **Lower neurovascular risk:** The approach respects the volar neurovascular structures, reducing injury risk[5]
2. **Adequate exposure:** The technique provides sufficient exposure for managing associated osteochondral fractures
3. **Direct visualization:** Allows direct visualization of the joint capsule and interposed soft tissues
4. **Simplicity:** Technically less complex than volar approaches, requiring pulley release

A primary limitation of the dorsal approach is limited direct visualization of volar plate, which may necessitate a longitudinal split of plate for optimal reduction [5]. However, this trade-off appears acceptable given the neurovascular safety benefits and consistent successful outcomes achieved.

Clinical Outcomes Comparison: Our results demonstrate excellent pain relief and functional recovery. Mean VAS pain scores improved from 7.72 ± 0.65 preoperatively to 1.45 ± 0.69 at 12 weeks ($p < 0.001$), representing 81.2% pain reduction.

This improvement was consistent across all patients, with all postoperative VAS scores ≤ 3. Functional recovery, assessed by TAM scores, showed a mean recovery of 90.4% ± 9.2% compared to the contralateral unaffected hand. TAM scores exceeding 300° are generally considered excellent functional outcomes in hand surgery literature [7]. Our series achieved a mean TAM of 316.5° ± 32.8°, with 8 of 11 patients (72.7%) achieving excellent outcomes (≥ 90% recovery).

Surgical Technique Considerations: Success with the open dorsal approach in our series depended on meticulous surgical technique:

Soft Tissue Management: Careful identification and preservation of dorsal neurovascular structures and extensor apparatus prevented unnecessary tissue damage. The single-layer elevation of subcutaneous tissue reduced postoperative swelling and skin necrosis risk.

Joint Exposure: The longitudinal capsulotomy provided adequate visualization of MCP joint and interposed structures. Identification of volar plate as a "taut, shiny, glistening white structure" facilitated its mobilization.

Reduction Technique: Gentle elevation of the metacarpal head with volar mobilization of the plate, sometimes combined with collateral ligament release, allowed anatomical reduction in all cases. Reduction was verified clinically with a full ROM assessment before stabilization.

Stabilization: K-wire fixation across MCP joint in reduced position provided stable fixation without additional fixation methods (plates, screws) that might limit early ROM rehabilitation. K-wire removal at 3 weeks allowed early ROM restoration.

Postoperative Rehabilitation Protocol: Early active ROM exercises were crucial for achieving the high functional recovery rates observed. Our protocol allowed immobilization for only 3 weeks, followed by immediate active ROM exercises in a protective splint. This early ROM approach is supported by contemporary hand surgery literature emphasizing that early controlled motion prevents stiffness while maintaining reduction stability [8]. Graduated progression from extension block splinting to protection during functional activities and ultimately unsplinted ROM by week 6 facilitated rapid functional recovery. The absence of joint stiffness in our series corroborates the effectiveness of this aggressive rehabilitation protocol.

Complication Profile: The complete absence of major complications in our series contrasts favorably with literature reports of osteonecrosis (variable incidence), post-traumatic osteoarthritis, and joint stiffness associated with Kaplan's dislocation management [4,6]. Several factors likely contributed to our favorable complication profile:

1. **Early surgical intervention:** All patients underwent surgery within 3 days of injury, minimizing soft tissue edema and allowing more pristine surgical planes
2. **Judicious surgical technique:** Preservation of soft tissue attachments and careful handling of the joint capsule minimized additional iatrogenic injury
3. **Appropriate fixation:** K-wire fixation alone, without overly rigid fixation that might limit early ROM
4. **Early ROM rehabilitation:** Early active motion rehabilitation prevented joint stiffness development

Study Limitations: Several limitations merit acknowledgment:

1. **Small sample size:** The 11-patient series, while representing a substantial case series for a rare injury, limits statistical power for subgroup analyses
2. **Single-center design:** Results from a single institution may not fully represent broader practice variations

3. **Follow-up duration:** While a 12-week follow-up demonstrates short-term outcomes, longer-term assessment (≥ 2 years) would better evaluate late complications such as post-traumatic osteoarthritis
4. **Lack of control group:** Comparison with other surgical approaches (volar, lateral) was not possible in this case series
5. **Operator-dependent technique:** Results represent the experience of a specific surgical team; reproducibility at other centers requires evaluation

Clinical Implications and Future Directions: The results of this series support the open dorsal approach as a reliable, safe, and elective surgical option for Kaplan's dislocation management. The method shall be considered first line treatment for complex dorsal MCP dislocations when closed reduction fails or is anticipated to fail. Surgeon familiarity with technique, careful operative execution, and implementation of early ROM rehabilitation are critical for optimal outcomes.

Future investigations would benefit from:

- Prospective comparative studies of dorsal versus volar approaches.
- Long-term follow-up studies assessing late complications (2-5 years)
- Larger multi-center case series to improve statistical power.
- Functional outcome assessment using validated hand function questionnaires.
- Biomechanical studies investigating joint stability and early ROM rehabilitation safety.

Conclusion

This prospective case series of 11 patients demonstrates that the open dorsal approach for Kaplan's dislocation provides a reliable surgical technique for achieving anatomical reduction and stable joint fixation. The technique successfully manages complex dorsal MCP dislocations when closed reduction has failed or is anticipated to fail.

Key findings include: (1) 100% successful reduction rate with no secondary displacement; (2) significant pain relief with VAS reduction from 7.72 to 1.45 ($p < 0.001$); (3) excellent functional outcomes with 90.4% mean recovery percentage and TAM scores averaging 316.5°; (4) absence of major complications including osteonecrosis, post-traumatic arthritis, or permanent sti ness; and (5) superior outcomes with early ROM rehabilitation protocol. The open dorsal approach minimizes complications associated with repeated closed reduction attempts while facilitating early functional recovery. This technique is a viable and recommended surgical option for Orthopaedic surgeons managing Kaplan's dislocation. Based on current evidence, further research with larger cohorts and longer follow-up periods is advised to validate and extend these outcomes to broader populations.

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References

1. Rozmaryn LM. The collateral ligament of the digits of the hand: anatomy, physiology, biomechanics, injury, and treatment. J Hand Surg Am. 2017;42(11):904-915. doi: 10.101 6/j.jhsa.2017.05.001
2. Dinh P, Franklin A, Hutchinson B, Schnall SB, Fassola I. Metacarpophalangeal joint dislocation. J Am Acad Orthop Surg. 2009;1 7(5):318-324.
3. Barry K, McGee H, Curtin J. Complex dislocation of the metacarpo-phalangeal joint ofthe index nger: a comparison of the surgical approaches. J Hand Surg Br. 1988;13(4): 466468.
4. Al-Qattan MM, Robertson GA. An anatomical study of the deep transverse metacarpal ligament. J Anat. 1993;182(Pt 3):443-446.
5. Sreeranga N, Lakshmeesha T, Shankara K, Vishanth K. Kaplan's lesion treated with openreduction by dorsal approach. Indian J Orthop Surg. 2015;1(4):273-280.
6. Rubin G, Orbach H, Rinott M, Rozen N. Complex dorsal metacarpophalangeal dislocation: long-term follow-up. J Hand Surg Am. 2016;41(8):e229-e233. doi: 10.1016/ j.jhsa.2016.05.009
7. Strickland JW. The scienti c basis for advances in hand surgery. J Hand Surg Am. 2005;30(6):1089-1098.
8. Feehan LM, Beaumont E. Biopsychosocial factors in upper extremity musculoskeletal disorders and instrumental activities of daily living. Hand Clin. 2011;27(4):495-505. doi: 10.1016/j.hcl.2011.07.002