

General

Conservative and surgical management of simple elbow dislocations: SMDA-SEC consensus and guidelines

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Purpose

Proper management of simple elbow dislocations is mandatory to avoid elbow stiffness, chronic instability, heterotopic ossification, or deformity of the elbow. The aim of the present study was to perform a systematic review of the current treatments of simple elbow dislocations to identify the best non-surgical and surgical management for patients with simple elbow dislocations (SED).

Methods

A review of the literature was performed according to the PRISMA guidelines. A comprehensive search of PubMed, Medline, CINAHL, Cochrane, Embase, and Google Scholar databases was performed using the following keywords: “elbow dislocation”, “simple elbow dislocation”, “traumatic elbow dislocation”, “treatment”, “management”, “reduction”, “rehabilitation”, “functional outcome”, “range of motion”, “complications”, “recovery time” over the years 1976-2024.

Results

The literature search and cross-referencing resulted in a total of 345 references, of which 283 were rejected due to off-topic abstract and/or failure to fulfil the inclusion criteria. After reading the remaining full-text articles, we included 60 studies, investigating non-surgical management or surgical management of simple elbow dislocations.

Conclusion

The SMDA-SEC consensus panel provided recommendations to improve the management of patients with SED in clinical practice. Early mobilization is recommended for all cases of simple elbow dislocations. The CMA-EC panel was unable to advise or against the short-period (1-3-wk) immobilization, prolonged (3-wk) immobilization or operative treatment due to insufficient or conflicting evidence.

INTRODUCTION

The elbow dislocation has an incidence of 5-6/10000 each year.^{1,2} Elbow dislocations are classified as either simple or complex, based on the involvement of bony structures. A simple elbow dislocation (SED) is defined as dislocation without associated fracture.³ In some cases of SEDs, small avulsions of the medial and/or lateral collateral ligaments

or the joint capsule are observed; however, these types of bone fragments are not classified as fractures.⁴

Therapeutic approaches for SEDs have evolved over time. In the past, nonoperative treatment primarily involved immobilization and casting of the elbow, which generally yielded relatively satisfied long-term outcomes.⁵ Literature indicates that approximately 8% of patients with SEDs may result in persistent instability or stiffness following nonoperative treatment.⁵ Persistent elbow stiffness

has led to an emphasis on short-term immobilization (less than 7 days) or no immobilization, with active movement beginning immediately after closed reduction.^{6,7} Some studies reported functional outcomes of surgical intervention for elbows with gross instability after SED.⁸ Due to the sequelae of improper treatment of SED can lead to pain, persistent or recurrent instability, stiffness, posttraumatic arthritis, and the possibility for additional surgical interventions, optimizing the treatment strategy of SED is crucial. Currently, no definitive recommendation has been provided for the best evidence-based management of patients with SEDs. The aim of the present systematic review was to identify the current available evidence about non-surgical and surgical management of these injuries.

MATERIALS AND METHODS

LITERATURE SEARCH AND STUDY SCREENING

A review of the literature according to the PRISMA guidelines (Preferred Reporting Items for Systematic Meta-Analyses Guidelines) has been performed.⁹ The search algorithm is shown in Fig. 1. Three independent reviewers (Y.W., Y.S., and S.Y.) conducted a comprehensive search across PubMed, Medline, CINAHL, Cochrane, Embase, and Google Scholar databases, utilizing various combinations of keywords: “elbow dislocation”, “simple elbow dislocation”, “traumatic elbow dislocation”, “treatment”, “management”, “reduction”, “rehabilitation”, “functional outcome”, “range of motion”, “complications”, “recovery time” over the years 1976-2024. Studies were not blinded for author, affiliation, or source. Any disagreements were resolved by a third author (S.L.).

Studies involving patients with a simple elbow dislocation (SED) were eligible for inclusion. Patients were included if they had an acute or persistent total SEDs without associated injuries, preexisting elbow pathology, or previous surgery in the ipsilateral elbow. Patients with isolated radius dislocations were excluded. Articles were eligible if they were written in English, had a follow-up period of at least 12 months, and reported on a minimum of five patients. To be included, studies needed to contain at least one outcome parameter, such as patient-reported outcome measures (PROMs), range of motion (ROM), or complications. Reviews, biomechanical and cadaveric studies, expert opinions, and surgical technique articles were excluded.

DATA EXTRACTION

All investigators independently extracted data to minimize selection bias and errors. To be included in the systematic review, studies needed to provide a detailed description of conservative or surgical management for SEDs. Besides, the following data was extracted and recorded into sheets: number of elbows involved, age, sex, dominant side, etiology and follow-up time. Intervention parameters were also recorded, including the type of nonoperative treatment (type and duration of immobilization, and duration of early motion) or surgical treatment (medial collateral ligament

repair and/or lateral collateral ligament repair). Extracted outcome measurements included: pain score measured using the visual analog scale; continuous satisfaction rate; ROM of the elbow in flexion-extension and pronation-supination and patient reported outcome measures (PROMs) like: Mayo Elbow Performance Score (MEPS); Quick Disabilities of the Arm, Shoulder, and Hand (qDASH) score; rate of return to sport; complications; and information about revision surgery or surgery after initial nonoperative treatment.

Due to the variety of reported duration of immobilization and mobilization, we categorized them into different management groups. These groups included early mobilization (less than 7 days), immobilization for 1 to 3 weeks, immobilization for more than 3 weeks, and surgery. The surgery group was further divided into two subcategories: patients who underwent surgery as their initial treatment or after failed nonoperative treatment, and patients with persistent elbow dislocations (PEDs). An elbow dislocation is defined as persistent if it lasts for more than 3 weeks.¹⁰ Some studies compared different managements, and where possible, different managements in the study were analyzed separately. The range of motion (ROM) flexion-extension arc was determined by subtracting the ROM extension value from the ROM flexion values.

The category of complications was adopted from the original studies' authors. To assess the severity of complications, they were divided into as either minor or major with the assistance of three elbow specialists (C.F., J.D., and J.L.). Minor complications were defined as those that did not significantly impact daily performance, which were manageable in a timely manner, and left no lasting effects on the patient.

QUALITY ASSESSMENT OF LITERATURES

To evaluate the quality of the articles, the Coleman Methodology Score (CMS) was utilized, which assesses methodology based on ten criteria, resulting in a total score ranging from 0 to 100. A score of 100 indicates that the study largely avoids chance, various biases, and confounding factors. The CMS is derived from ten subsections of the CONSORT statement for randomized controlled trials, modified to enable a reproducible and relevant systematic review of nonsurgical and surgical treatments for acute isolated syndesmotic injuries. Each study was independently assessed in duplicate by two reviewers (B.Z. and W.W.) using the Modified Coleman Methodology Score; any disagreements were resolved through discussion.

SMDA-SEC PANEL CONSENSUS AND RECOMMENDATIONS

During a two-day consensus meeting, an expert panel from SMDA-SEC analyzed the results of this review to identify the best evidence-based conservative and surgical management for SED.

RESULTS

The literature search and cross-reference resulted in a total of 18569 references, of which 10656 were rejected due to off-topic abstract and/or failure to fulfil the inclusion criteria. After reading the remaining full-text articles, we included 39 studies, describing non-surgical and surgical management of SED (Figure 1).

A total of 1,071 patients were included in the study, with 1,074 instances of elbow dislocation. The involvement rate of the dominant extremity varied from 24% to 92%. The percentage of male participants ranged from 13% to 96%. The mean age of patients spanned from 8 to 54 years, with an overall age range of 5 to 91 years, while the mean follow-up period ranged from 12 to 70 months, with an overall range of 12 to 228 months. Twenty-nine articles, encompassing 79% of the patients, described individuals who presented at the hospital with an unreduced SED. Fourteen articles, covering 46% of the patients, diagnosed SED through radiographs taken before reduction. Four articles, accounting for 17% of the patients, did not specify whether the elbows were reduced before the initial hospital presentation or how the diagnosis was made (Table 1).

An overview of the functional outcomes as well as PROMs is presented in Table 1 for non-surgical and surgical treatment of SED. The study included 21 investigations on non-surgical treatment and 20 investigations on surgical treatment (3 studies compared surgical with non-surgical treatment of SED). The complications are categorized as major and minor in Table 3. Based on the types of treatment, all studies involving either surgical or non-surgical approaches were further categorized as follows: Early mobilization (less than 7 days); Immobilization for 1-3 weeks; Immobilization for more than 3 weeks; Primary surgery for ligament repair; Surgery for persistent elbow dislocations (PEDs) after SED; Surgery for ligament repair within 30 days of trauma; Surgery for ligament repair more than 30 days after trauma; Primary surgery for ligament repair combined with external fixation (EF) and immobilization for more than 3 weeks.

The early mobilization (less than 7 days) group achieved highest ROM of flexion to extension of 138° (176/198 elbows). ROM of flexion to extension in other groups were as follows: 135° (79/287 elbows) in 1-3 wk immobilization treatment, 131° (44/145 elbows) in >3 wk immobilization treatment, 126° (157/197 elbows) in primary surgery of ligament repair treatment, 90° (143/143 elbows) in surgery for PED after SED treatment, 119° (25/25 elbows) in surgery of ligament repair < 30 days after trauma treatment, 119° (23/23 elbows) in surgery of ligament repair > 30 days after trauma treatment and 113° (15/15 elbows) in surgery of Primary surgery for ligament repair + EF + >3wk treatment (Table 2).

ROM of pronation to supination was reported to be best for the 1-3 wk immobilization group, at 172° (55/287 elbows), and worst for the surgery for PED after SED treatment, at 126° (38/143 elbows). Primary surgery of ligament repair treatment and >3 wk immobilization treatment reported same ROM of pronation to supination of 163° (100/

197 elbows and 44/145 elbows, respectively). In cases applying 1-3 wk immobilization, the ROM of pronation to supination was 168 across 80 elbows. ROM of pronation to supination was not reported in other groups (Table 2).

MEPS was also noteworthy: 95.1 (140/198 elbows) in early mobilization (less than 7 days) group, 91.3 (64/145 elbows) in 1-3 wk immobilization treatment, 96.9 (62/145 elbows) in >3 wk immobilization treatment, 90.8 (130/197 elbows) in primary surgery of ligament repair treatment, 89.6 (107/143 elbows) in surgery for PED after SED treatment, 92.8 (25/25 elbows) in surgery of ligament repair < 30 days after trauma treatment and 92.1 (23/23 elbows) in surgery of ligament repair > 30 days after trauma treatment (Table 2).

Major complication rates among SED were notably high, with >3 wk immobilization treatment leading at 39.7% (127/145 elbows), followed by surgery for PED after SED treatment at 15% (80/143 elbows). Primary surgery for ligament repair + EF + >3wk immobilization treatment reported a major complication rate of 13% (15/15 elbows). Primary surgery of ligament repair and 1-3 wk immobilization had a similar major complication rate of 9.2% (175/197 elbows) and 10.4% (242/287 elbows) (Table 2).

There were 11 studies (119 elbows) described outcomes of non-surgical treatment in children (Table 3). The mean age was 11 years (overall range, 5-17 years) and the mean follow-up was 43 months (overall range, 12-192 months). The mean ROM flexion to extension, MEPS, as well as complication rates per treatment group are presented in Table 3. Complication classification are presented in Table 4.

DISCUSSION

The mean findings of this literature review are the following: 1. Early mobilization (less than 7 days) should be employed in conservative treatment, as it results in superior clinical outcomes regarding the range of motion (ROM) from flexion to extension and lower major complication rates. When compared to prolonged immobilization (1-3 weeks or more than 3 weeks), early mobilization yields similar functional results. 2. Primary surgery of ligament repair, even with early mobilization, didn't showed superior functional results (ROM of flexion to extension and MEPS) than conservative treatment. 3. Early diagnosis of simple elbow dislocations (SED) is crucial because surgery for persistent elbow dislocations (PEDs) following SED yields relatively poorer outcomes compared to primary conservative or surgical treatment of SED.

The collateral ligament complexes, as the primary stabilizers of the elbow, are the main focus in the evaluated studies. The degree of instability largely depends on the extent of soft tissue damage and the loss of secondary dynamic stabilizers, which enhance elbow stability. Hackl et al. concluded that data on the impact of severe soft tissue injury on clinical outcomes after elbow dislocation are limited.¹ However, Schnetzke et al. demonstrated that patients with moderate instability (joint angulation $\geq 10^\circ$) had worse clinical results compared to those with slight instability (joint angulation < 10°).⁸ Therefore, the severity of liga-

Table 1. Studies using different treating strategy for SED

Author/year	No. SED elbows	Mean age (years)	Mean follow-up (months)	Treatment options	Mean functional outcomes (ROM,°)		Mean PROMS					Major Complications, n(%)	Minor Complications, n(%)
					ROM F/E	ROM P/S	MEPS	DASH/qDASH	ESAS	OES	other		
¹⁰ Krishnamoorthy et al., 1976	8	27.5	31.5	Surgery for PED	93								
¹¹ Borris et al., 1987	63	22.2	84	1-3 wk immobilization								17 (27)	52 (83)
¹² Josefsson et al., 1987	34	39	84	1-3 wk immobilization								5 (15)	3 (9)
	28	36	36	Primary surgery of ligament repair								2 (7)	4 (14)
¹³ Schippinger et al., 1999	45	44.5	62	1-3 wk immobilization							Morrey scores(% Good+excellent): <2 wk:100%; 2-3wk: 95% 0.65		
			62	> 3 wk immobilization									
¹⁴ Eyendaal et al., 2000	31	33	108	> 3 wk immobilization								45 (145)	25 (80)
¹⁵ Devnani et al., 2004	7	30.1		Surgery for PED	83							2 (29)	7 (100)
¹⁶ Mahaisavariya et al., 2005	21	25.9	50.3	Surgery for PED	84							0 (0)	1 (5)
¹⁷ Maripuri et al., 2007	22	41		Early mobilization < 7days			96.5	2.7				0 (0)	0 (0)
	20	44.4		1-3 wk immobilization			90.5	7.5				1 (2)	0 (0)
¹⁸ Mehta et al., 2007	6	25.2	18	Surgery for PED	92	150	81.7						
¹⁹ Duckworth et al., 2008	15	54	27	Primary surgery of ligament repair+EF+ > 3wk immobilization	113						Broberg and Morrey score 88	2(13)	6(40)
²⁰ Jeon et al., 2008	12	36.2	27.8	Primary surgery of ligament repair			94.2						
²¹ Micic et al., 2009	14	34.1	32.6	Primary surgery of ligament repair	130		95.4					4 (29)	8 (57)
²² Kim et al., 2013	19	46	9	Primary surgery of ligament repair +Early mobilization < 7days	107	150	86.9					0(0)	6(31)
²³ Kapukaya et al., 2013	20	20	39.1	Surgery for PED	85		79.3					10 (50)	0 (0)
²⁴ O'Brien et al., 2014	7	30	30	Surgery of ligament repair < 30 days after trauma	129.4		100						
	7			Surgery of ligament repair >	124.9		99.3						

Author/year	No. SED elbows	Mean age (years)	Mean follow-up (months)	Treatment options	Mean functional outcomes (ROM,°)		Mean PROMS					Major Complications, n(%)	Minor Complications, n(%)
					ROM F/E	ROM P/S	MEPS	DASH/qDASH	ESAS	OES	other		
²⁵ Daluiski et al., 2014	18	50	42	30 days after trauma	115		90						
	16	43		Surgery of ligament repair < 30 days after trauma	116		89						
²⁶ Adas et al., 2014	11	9.8	24.3	> 3 wk immobilization	129	150	96.8					0 (0)	0 (0)
²⁷ Hopf et al., 2015	22	53.1	59.6	Early mobilization < 7days	146	165	94.1	6.1				3 (4)	0 (0)
²⁸ Sofu et al., 2016	12	8	46	> 3 wk immobilization	120	146	91.6					4 (33)	0 (0)
²⁹ Jordens et al., 2017	48	43	12	Early mobilization < 7days	142	169		4		93			5(10)
	52	47	12	1-3 wk immobilization	138	174		4.2		95			7(13)
⁸ Schnetzke et al., 2017	68	37.2	40.8	Early mobilization < 7days	135		94.2				VAS 0.8	4 (6)	0 (0)
³⁰ Ataoglu et al., 2017	14		12	1-3 wk immobilization	118			5		91		0 (0)	2 (14)
³¹ Kerschbaum et al., 2017	10	38	54	1-3 wk immobilization	145		90	2		45		0 (0)	7 (70)
³² Adolfsson et al., 2017	8	54		Primary surgery of ligament repair	136							0 (0)	4 (50)
³³ Krticka et al., 2018	28	48	32	Early mobilization < 7days	132		97	2.5		46.2		0 (0)	14 (50)
³⁴ Beirer et al., 2018	10	44	44	Early mobilization < 7days	140	176			91.8			1 (10)	0 (0)
	10	43	44	Primary surgery of ligament repair	131	173			91.6			3 (30)	0 (0)
³⁵ Cho et al., 2018	17	49.5	57.5	Primary surgery of ligament repair	121	153	86.5	8.4				0 (0)	5 (29)
	3	61.7	48	1-3 wk immobilization	130	146	81.7	22				0 (0)	1 (33)
³³ Krticka et al., 2018	26	50	26	Primary surgery of ligament repair	117		87.7	8.3		42.5		0 (0)	29 (112)
³⁶ Anderson et al., 2018	32	25	22	Surgery for PED	101	121	93				SOD 9	0 (0)	1 (3)
³⁷ Lee et al., 2019	21	45.1	43.3	Primary surgery of ligament repair	138	163		4.3				1 (5)	16 (76)
³⁸ Jung et al., 2019	10	30.5	29	Primary surgery of ligament repair	130	161	85	11.4			NRS2		

Author/year	No. SED elbows	Mean age (years)	Mean follow-up (months)	Treatment options	Mean functional outcomes (ROM,°)		Mean PROMS					Major Complications, n(%)	Minor Complications, n(%)
					ROM F/E	ROM P/S	MEPS	DASH/qDASH	ESAS	OES	other		
⁵ Calderazzi et al., 2020	26	43	40	1-3 wk immobilization			93.8	12.8				0 (0)	6 (23)
³⁹ Willin et al., 2020	5	46.4	27	1-3 wk immobilization			90	20.9		55.8	SEV 82 Bromberg-Morrey 94	2 (40)	1 (20)
	9	57.3	36	Primary surgery of ligament repair			91	9.8		54.7	Bromberg-Morrey 94 SEV 85	1 (11)	0 (0)
⁴⁰ Van Lieshout, 2020	52	47	12	> 3 wk immobilization				4		95	EQ-5D 0.89 SF36-PCS 53	2 (4)	29 (56)
⁴¹ Salihu et al., 2021	49	31.9	12	Surgery for PED	87		92.6				PSFS 9.1		43 (89)
⁴² Bua et al., 2022	10	11		1-3 wk immobilization							Kim 87.5	1 (10)	0 (0)
⁴³ Geyer et al., 2023	21	37.4	72.8	> 3 wk immobilization	139	180	97.3	7.8	99.4			5 (24)	2 (10)
	23	21	58.7	Primary surgery of ligament repair	135	177	98.7	6.3	99.8			6 (26)	4 (17)
⁴⁴ Pincin et al., 2022	18			> 3 wk immobilization			100	0.25		47.8			
⁴⁵ Bettuzzi et al., 2023	5	11	67.2	1-3 wk immobilization								2 (40)	2 (40)

mentous ruptures should be a key consideration in decision making. Kim et al. investigated eight patients who sustained injuries to both the medial collateral ligament (MCL) and lateral collateral ligament (LCL) following elbow dislocation and acute posterolateral rotatory instability (PLRI).⁴⁶ These patients were treated with isolated LCL repair. Residual medial instability was observed in two patients, though neither required further surgical intervention. Based on these findings, Kim et al. suggest that LCL repair alone may be sufficient to prevent chronic PLRI and valgus instability in such cases.⁴⁶ Additionally, Kim et al. found that patients with isolated LCL injuries had better clinical outcomes, although there was no difference in postoperative ROM compared to patients with combined LCL and MCL injuries.⁴⁶ Conversely, Micic et al. conducted additional MCL repairs in cases of combined injuries and reported no significant difference in clinical outcomes or ROM between patients with isolated LCL injuries and those with combined MCL and LCL injuries after surgical repair.⁴⁷ No consensus has been established on the indications for surgical treatment or on the postoperative procedures regarding immobilization and early functional treatment. The role of surgical repairment of ligaments following simple elbow dislocation is a topic of ongoing debate in the current literature. The primary consideration when deciding between conservative and surgical treatment strategies is the prevention of recurrent instability. Thus, a definitive treatment recommendation cannot be made. A randomized controlled trial comparing isolated lateral repair to combined medial and lateral repair is necessary to provide a conclusive answer.

Josefsson et al. demonstrated that conservative treatment of SED is linked to a marginally lower incidence of chronic elbow instability.¹² Their 24-year follow-up results revealed that patients treated conservatively had better long-term functionality compared to those who underwent surgical procedures, with no cases of recurrent dislocation or instability.¹² However, this difference was not statistically significant. The study also noted a reduction in range of motion (ROM) in the conservatively treated group. Given that Josefsson's study was conducted in 1987, it's important to consider that surgical techniques have significantly advanced in recent years. Minimally invasive approaches and improved implants for ligament repair may now lead to better clinical outcomes and reduced recurrent instability following primary surgical procedures. Nonetheless, a study by Eygendaal et al. reported residual valgus instability in up to 48% of patients treated conservatively, indicating that conservative treatment may still have limitations.¹⁴ There are also conflicting results regarding ROM. Josefsson et al. observed greater short-term extension deficits in surgically treated patients, although no significant difference was found in the long term.¹² Conversely, Wu et al. reported superior elbow flexion and clinical outcomes following surgical treatment.⁴⁸ Additionally, patients treated conservatively often report more pain in the short term, which could lead to reduced ROM as they may avoid exercising their elbow due to discomfort. Prolonged immobilization can exacerbate pain and further decrease ROM. Therefore,

early mobilization may benefit patients by improving ROM and reducing pain. The significant variability in outcomes underscores the need for further research, including more high-level clinical trials, to reduce this inconsistency.

Persistent elbow dislocations (PEDs) are uncommon in developed countries but occur more frequently in regions with less advanced medical systems.⁴¹ The ROM flexion-extension arc and supination-pronation arc in PEDs after surgery in this study were 90° (range, 83-101°) and 126° (range, 85-150°), respectively. Schnetzke et al. found that significantly higher incidence of major complication and revision surgery were noted for patients with initially moderate elbow instability. This highlights the critical importance of ruling out SED in all suspected cases of elbow dislocation. Typically, a patient with a posterior dislocation presents with a shortened forearm, the elbow flexed at 45 degrees, and a prominent olecranon. Standard radiographs should be used for diagnosis, and if SED is confirmed, an appropriate reduction and treatment should be performed.

Our review findings corroborate previous studies, highlighting the critical importance of early functional treatment for the elbow after trauma or surgery.⁴⁹ Anakwe et al. also conducted a review examining the long-term functional and patient-reported outcomes following SED.⁵⁰ The patients received similar intervention in our review, which included early elbow motion with splinting, immobilization for 1 to 3 weeks, or immobilization for 4 to 6 weeks. The study reported outcomes for the overall patient cohort rather than specific treatment groups. After a mean follow-up period of 88 months, the average Oxford Elbow Score (OES) was 90 points. In our review, mean OES scores were noted: 70 for the early mobilization group, 64 for the 1-3 wk immobilization group and 71 for the >3-wk immobilization group.

GUIDELINES FOR MANAGEMENT OF SED

The SMDA-SEC consensus panel recommends that simple elbow dislocations (SED) should be managed non-operatively with early mobilization within 7 days. Current literature indicates that SED patients who undergo early mobilization achieve better ROM in flexion to extension and experience fewer major complications compared to those receiving other interventions.

The SMDA-SEC consensus panel also recommends using standard radiographs in all suspected cases of elbow dislocation to rule out SED. The literature indicates that patients with neglected primary diagnosis of SED exhibit poorer functional outcomes, especially for children ([Table 3](#)).

The SMDA-SEC unable to advise or against the secondary surgery of ligament repair before or after 30 days after trauma due to the inconsistency in the literature regarding the treatment outcomes. Further in-depth evaluation and additional experience are needed to accurately interpret the results of secondary surgery of ligament repair.

The SMDA-SEC also unable to recommend or against the use of external fixation after surgery of ligament repairment of SED. Further studies were required to confirm the functional results and major complication rates of EF.

Table 2. Various treatment options compared

Treatment options*	Number of studies	No. SED elbows	Mean follow-up (months)	Mean functional outcomes (ROM F/E, degree)	Mean functional outcomes (ROM P/S, degree)	Mean PROMs (MEPS)	Major complication rate (%)
Non-surgical treatment							
Early mobilization (< 7 days)	6	198	34.1	138	168	95.1	5.3
1-3 wk immobilization	9	287	50.2	135	172	91.3	10.4
> 3 wk immobilization	6	145	65.8	131	163	96.9	39.7
Surgical treatment							
Primary surgery of ligament repair	8	197	36.7	126	163	90.8	9.2
Surgery for PED after SED	7	143	25.7	90	126	89.6	15
Surgery of ligament repair < 30 days after trauma	2	25	38.6	119	-	92.8	-
Surgery of ligament repair > 30 days after trauma	2	23	38.3	119	-	92.1	-
Primary surgery for ligament repair + EF + >3wk immobilization	1	15	27	113	-	-	13

There are substantial limitations to this study. First, there is lack of high evidence level studies due to paucity of SED cases. Second, none of the studies in this review utilized validated outcome measures, making comparisons between studies problematic. In the future, further investigations into treatment strategies are needed to implement evidence-based guidelines for simple elbow dislocation treatment and classification systems for simple elbow dislocations.

CONCLUSION

The SMDA-SEC consensus panel provided recommendations to improve the management of patients with SED in clinical practice. Early mobilization is recommended for all cases of simple elbow dislocations. The CMA-EC panel was unable to advise or against the short-period (1-3-wk) immobilization, prolonged (3-wk) immobilization or operative treatment due to insufficient or conflicting evidence.

CORRESPONDENCE AND REPRINTS REQUESTED TO

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Data sharing is not applicable to this article.

Table 3. Various treatment options compared for children with SED

Treatment options*	Number of studies	No. SED elbows	Mean age (years)	Mean follow-up (months)	Mean functional outcomes (ROM F/E, degree)	Mean functional outcomes (ROM P/S, degree)	Mean PROMs*	Major complication rate (%)
Non-surgical treatment	5							
1-3 wk immobilization	3							
Borris et al., 1987		43	10	84				26
Bua et al., 2022		10	11				87.5 (Kim)	10
Bettuzzi et al., 2023		5	11	67.2			88.3 (MEPS)	40
> 3 wk immobilization	2							
Adas et al., 2014		11	9.8	24.3	129	150	96.8	0
Sofu et al., 2016		12	8	46	120		91.6 (MEPS)	33
Neglected	6							
Krishnamoorthy et al., 1976		3	12	20	85			
Devnani et al., 2004		3	11.7	58	28			
Mahaisavariya et al., 2005		6	10.8	59.5	72			
Mehta et al., 2007		2	14.5	12	110	145	90 (MEPS)	
Kapukaya et al., 2013		16	12.1	37.3	92	81.3		
Anderson et al., 2018		8	13.3	24.9	100	106	93 (MEPS)	

*MEPS: Mayo Elbow Performance Score; Kim: Kim's elbow performance score

Table 4. Complication classification

Classification	Complications	Occurrence (%)
Minor	Mild to moderate Contracture	8.5
	Heterotopic ossification	31.4
	Transient nerve injury	5.2
	Calcifications of tendon or muscle	3.4
	Superficial wound infections	0
Major	Degenerative changes with arthritis	23.5
	Persistent pain	6.2
	Persistent instability	18.8
	Permanent nerve injury	0
	Muscle or tendon rupture	0
	Deep wound infections	0

AUTHOR CONTRIBUTION

Shengdi Lu, Writing – original draft, Formal analysis, Methodology.

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