Early mobilization for simple elbow dislocations in adults
"Simple yet effective": A systematic review

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Abstract

Background: Traditional management of elbow dislocations includes reduction followed by immobilization. However, prolonged immobilization has been linked to capsule fibrosis, limitation of extension and pain. We performed this systematic review to compare early mobilization (functional therapy) to traditional immobilization in adults with simple elbow dislocation.

Methods: We searched several electronic databases for eligible primary studies. The primary outcome was to assess functional ability/disability after intervention. Other outcomes included pain assessment and timing of return to work. Outcome data were extracted from included studies and analyzed in a qualitative approach.

Results: Our literature search retrieved five eligible studies (n= 248 Patients). The included studies used different measures for functional assessment and the majority showed a significant difference for early mobilization over plaster immobilization group. Three studies reported that return to work was significantly faster with functional therapy group than with traditional immobilization. Unlike the Plaster immobilization group, no intervention-related complications were reported with early mobilization.

Conclusion: The current evidence (although of low grade) supports the concept of early mobilization for treating simple posterior dislocated elbow in adults. Larger studies with longer follow-up periods are required to further confirm these findings.

Keywords: Dislocation; Elbow; Functional therapy; Immobilization; Meta-analysis

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INTRODUCTION

The elbow joint is the second most commonly dislocated joint in adults. The incidence of Elbow Dislocation is 6.1 to 7.9 per 10,000 adults and it mainly occurs in the non-dominant arm (1). Almost 90% of the elbow dislocations occur in a posterior or posterolateral direction (2), involving rupture of lateral ulnar collateral ligament (LUCL), resulting in posterolateral rotatory instability. Elbow dislocation can be simple or complex depending upon the associated fractures. Simple elbow dislocations account for approximately 74% of these presentations (3). Traditionally, simple elbow dislocation in adults is managed by closed reduction under sedation and plaster immobilisation. This is followed by orthopaedic review in fracture clinic, removal of plaster after three weeks and then extended physiotherapy sessions.

Several studies reported that immobilization in flexion position results in shortening and fibrosis of the anterior capsule, limitation of extension (4, 5). A multicentre observational study assessed the functional outcomes of simple and complex elbow dislocations and concluded that functional results might improve with early active movements (6). On the other hand, a cohort study by Rafai and colleagues reported no difference after one year follow up between patients with longer cast immobilization vs. patients managed with removal of cast at 3 days, post elbow reduction (7).

In this systematic review, we aimed to evaluate whether functional therapy by early mobilization is better than plaster immobilization in adult patients with simple elbow dislocation injuries.

METHODS

Literature search

An electronic literature search was conducted by accessing the National Health Service evidence interface (last accessed March 2018). Keywords were mapped to thesaurus and exploded to include MeSH terms to broaden the search. The used keywords were Elbow dislocation OR luxation AND Plaster OR POP OR immobilization AND Sling OR Collar OR cuff OR Functional OR early mobilization. Other databases were searched, including Google scholar, Cochrane Database of Systematic Reviews Library and the Grey literature. The detailed literature search strategies for each database are illustrated in supplementary file 1.

A hand search of relevant references was scrutinised for articles meriting further analysis.

Eligibility Criteria

The following inclusion and exclusion criterion were applied to select the studies. Studies satisfying all the following criteria were included: 1) Patients studied should have simple elbow dislocation (without significant fracture), 2) Age of the patients should be > 16 years, 3) Studies should investigate non-operative management and 4) Studies should be published in English. Studies with any of the following characteristics were excluded: Studies on patients with complex elbow dislocation (Open fracture, comminuted fracture, Olecranon fracture and neurovascular deficit), studies on patients aged < 16 years, animal studies, case reports and studies investigating surgical intervention.
Table 1: Summary and design and findings of included studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Study Design</th>
<th>n</th>
<th>Follow up (months)</th>
<th>Intervention</th>
<th>Control</th>
<th>Follow up and Outcomes</th>
<th>Findings</th>
<th>Notes/Level of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iordens, 2014, Netherlands</td>
<td>RCT</td>
<td>100</td>
<td>12</td>
<td>FT</td>
<td>POP</td>
<td>n = 48                                                                                                       (Quick-DASH, MEPI, OES, Return to Work, Complications)</td>
<td>Early active mobilization is a safe and effective treatment for elbow dislocations in adults. Patients recovered faster and returned to work earlier without increasing the complication rate. No evidence was found supporting treatment benefit at 1 year.</td>
<td>Early mobilization can be the first choice in the management of simple dislocated elbow in adults. 1b level of evidence. Grade of recommendation A.</td>
</tr>
<tr>
<td>Maripuri, 2007, UK</td>
<td>RCS</td>
<td>47</td>
<td>24</td>
<td>EM/Sling</td>
<td>POP</td>
<td>n = 22                                                                                                       (Quick-DASH, MEPI, OES, Return to Work, Complications followed up between 24-60 months). The final functional outcome in the intervention group was better than in the control group (p&lt;0.05), Quick-DASH (p&lt;0.05) and return to work 3.2:6.6 (p&lt;0.001).</td>
<td>Early mobilization did not result in re dislocation or late instability of the elbow. The final functional outcome of the sling and early mobilization group was significantly better than in the POP immobilization group.</td>
<td>A retrospective study with an entirely doctor-dependent selection of post-reduction treatment method. High chance of selection and observation bias. Level of Evidence 3b. Grade of recommendation B.</td>
</tr>
<tr>
<td>Kesmezaca, 2010, Turkey</td>
<td>RCS</td>
<td>21</td>
<td>34</td>
<td>EM/HB</td>
<td>POP</td>
<td>n = 17                                                                                                       In both groups, comparison was made between injured and normal sides. The degrees of flexion, extension, flexion arc, and pronation were significantly decreased in dislocated elbows (p&lt;0.05). Four patients (19.1%) had residual instability and six patients (28.6%) had mild neurological complaints (primarily related to the ulnar nerve). Only four patients (19.1%) reported full recovery.</td>
<td>There was no difference in the two cohorts in the function and range of movements when compared with the normal limb. Majority of the patients did not feel fully recovered. No statistical and clinical difference among the two groups studied.</td>
<td>Small study, less power. Unequal cohorts; high chance of selection bias. The results were observer-dependent. Lack of standardization in rehabilitation. Level of Evidence 4. Grade of recommendation C.</td>
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<tr>
<td>Coulibaly, 2017, Senegal</td>
<td>PS</td>
<td>60</td>
<td>6</td>
<td>G3, n=19</td>
<td>G1, n=21</td>
<td>Patients were categorized in 3 groups. Functional evaluation using MEPI and pain assessment on the visual analogue scale were assessed on day 30, 90 and 180.</td>
<td>The study showed excellent functional results among patients in G2 and G3 but with the worst pain scores in G3. It concluded that early mobilization or functional therapy is superior to longer immobilization for the treatment of dislocated elbow in adults.</td>
<td>Small sample size, less powered leading to Type 1 error. High chance of selection and recall bias. Poor internal and external validity. Level of evidence 4. Grade of recommendation C.</td>
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<tr>
<td>Ross et al, 1999, USA</td>
<td>PS</td>
<td>20</td>
<td>12</td>
<td>EM</td>
<td>Nil</td>
<td>Each patient achieved his final range of motion within an average of 19 days after reduction of the dislocation. Arm circumference returned to normal at an average of 6.5 days.</td>
<td>Aggressive immediate motion rehabilitation allows nearly full final elbow motion and an excellent functional outcome.</td>
<td>No Control group High risk of selection bias. Cannot be generalized. Level of evidence 4. Grade of Recommendation C.</td>
</tr>
</tbody>
</table>

**Abbreviations:** RCT: Randomized Controlled Trial; RCS: Retrospective Cohort Study; PS: Prospective Study; n= sample size; FU: Follow Up; FT: Functional Therapy; EM: Early mobilization; POP: Plaster of Paris; G1: Group 1, immobilized for 21 days; G2: Group 2, immobilized for 10 days; G3: Group 3, no immobilization; VAS: Visual analogue score for pain
Data Extraction and Synthesis of Evidence

Data collected from the included studies were study characteristics (study design, arms and sample size) and the used methods, results and any additional remarks that may have affected the reported findings reliability. The primary outcome was to assess functional ability/disability after intervention. Other outcomes included pain assessment and timing of return to work. The quality of included studies was assessed and rated according to the Oxford Centre of Evidence Base Medicine. A meta-analysis was intended but unsuitable due to heterogeneity of the studies and lack of common outcome variables. Therefore, data were extracted from included studies and analyzed qualitatively. All steps in this systematic review were performed in accordance with the Cochrane handbook for systematic reviews of interventions (8) and reported according to the Preferred Reporting Items of Systematic Reviews and Meta-analysis (9).

RESULTS

Literature search results

The electronic search of medical databases retrieved 70 unique citations that were abstracted to 9 citations after title/abstract screening. Further screening of the retrieved full-texts resulted in five eligible studies (248 patients) (10-14). The results of literature search and screening are shown in PRISMA Flow Diagram (Figure 1).

Characteristics of included studies

The five eligible studies included one randomized controlled trials, two prospective and two retrospective studies. The studies were conducted in USA, Europe and Africa (Senegal) with a mean follow-up duration of 19.6 months (range 6 to 34 months). The characters of included studies, their main findings and their grade of evidence are summarized in table 1.

Outcomes

Two studies by Coulibaly et al. (14) and Maripuri et al. (11) used the Mayo clinic Elbow Performance index where a score of “excellent” was achieved by 100% and 85.5% of patients who underwent early immobilization, respectively. Conversely, Iordens et al. (10) and Maripuri et al. (11) used the QUICK-DASH score for functional assessment of patients. In the early mobilization group of each study, a score of 4 and 27 was achieved respectively versus 4.2 and 12.8 in the corresponding plaster immobilization group. This indicated a favorable response in patients of the early mobilization group. The Oxford Functional score was used by Iordens et al. (10) alone where a score of 93 was achieved in the early mobilization group versus 95 in the plaster immobilization group. Further, Kesmezacar et al. (12) was the only study to use Broberg-Morrey Functional Rating Index, in which the plaster immobilization score was 97.7.

Evolution of the range of motion and resumption of work and daily activities occurred earlier among patients of the early mobilization group compared to those of plaster immobilization in the studies by Iordens et al. (10), Coulibaly et al. (14) and Maripuri et al. (11) where resumption of work occurred at day 10, 45, 22 among early mobilization group respectively versus 18, 180 and 46 among plaster immobilization group respectively. Coulibaly et al. (14) also reported the less number of rehabilitation sessions needed by patients who underwent early mobilization compared to the other group (5 versus 12 sessions).

Iordens et al. (10), Coulibaly et al. (14) and Maripuri et al. (11) did not report any
complications related to the intervention. However, Coulibaly et al. (14) and Kesmezacar et al. (12) reported some radiological changes in follow up images showing formation of heterotrophic ossifications and mild degenerative changes in both groups. Kesmezacar et al. (12) also reported multiple complications in patients of the plaster immobilization group of which he mentioned valgus deformity, crepitation, pain at rest, permanent varus-valgus deformity, tingling and numbness.

Ross et al. (13) concluded that a rapid and full recovery with a successful outcome can be attained every time if a highly structured rehabilitation program is followed. Patients must be fully compliant to the suggested protocol. Out of these five studies, only one study by Iordens et al. can be rated as of high quality with a level of evidence of Ib according to the Oxford Centre of Evidence Based Medicine (15).

The secondary outcomes in the included trials were expulsion time and complication rates. Most studies showed reduce expulsion time in the Tamsulosin group. Some authors showed no difference in the expulsion time (14). In the study done by Hermanns et al, the exact time of passing the stone was missing in a significant number of patients (12). In terms of pain and complications, most included studies showed reduce use of analgesia in the tamsulosin group and no significant side effects which would warrant stopping tamsulosin. The reported adverse events were dizziness, hypotension and retrograde ejaculation.

The size of the calculi was <10 mm in all studies, but the size limit varied, as well as the radiological methods used to measure it. Some studies enrolled patients with intermediate stone size of 4-7 mm (17, 22), while others enrolled patients with stone sizes between 5 and 10 mm (10, 15). The X-ray of kidney, ureter and bladder (KUB) was used to measure the size of the calculus in the study by Lojanapiwat et al. (9), while others used a combination of X-ray and CT (22) or USS only (17). There had been no mention of Kappa scoring for these measurements. Subgroup analysis of different calculi sizes was done in a study by Al-Ansari et al. (13) and showed more benefit with stone size <5 mm.

**DISCUSSION**

The current evidence though small but supports the concept of early mobilization (functional therapy) for the treatment of simple posterior dislocated elbow in adults. The evidence suggests that this treatment is simple, cost effective and enhances early recovery. The patients can return to their work and normal life pattern earlier than if treated by immobilization with plaster.

Although long term outcomes may not be significantly different from that of the conventional plaster immobilization approach, it still gains superiority for allowing patients to rapidly restore their normal life activities with similar or even less complications and eventually reaching better functional levels. We noted that there was not a single redislocation among any patient treated by early mobilization/ functional therapy. Patients may experience more pain during initial days when no immobilization is applied.
Figure 1: PRISMA flow diagram of study selection and screening processes

Figure 2: Emergency management of adult patients with elbow dislocation.
Figure 3: Emergency management of adult patients with simple elbow dislocation.

**Recommendations**
In adult patients treated for dislocated elbow, early mobilization has been proven more effective than Plaster immobilization; therefore, it may be considered as primary option for treating such an injury. At our hospital, we developed an Emergency Department pathway for the management of adult patients presenting with simple dislocated elbow as shown in Figures 2 and 3.

**Conclusion**
This systematic review concludes that in adult patients with simple dislocated elbow, treatment can be kept “simple yet effective” by adopting early mobilization/functional therapy. Larger studies with longer follow-up periods are required to further confirm these findings.

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**References**


