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Research Article

Comparison of Modified Chair and Non-Traction Kocher Reduction Techniques for Anterior Shoulder Dislocation: A Randomized Controlled Trial

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ABSTRACT

Background: Anterior shoulder dislocation is the most common large joint dislocation encountered in emergency departments. Traditional traction-based reduction techniques often require significant force, cause procedural pain, and frequently necessitate sedation. Biomechanical methods such as the modified chair technique have been proposed as less painful alternatives; however, randomized comparative evidence remains limited.

Objective: To compare the efficacy, pain levels, reduction time, patient satisfaction, and complication rates between the modified chair technique and the non-traction Kocher technique for reduction of acute anterior shoulder dislocation.

Methods: This prospective randomized controlled trial was conducted in a tertiary care emergency department between April and December 2025. Eighty adult patients with acute traumatic anterior shoulder dislocation were randomized (1:1) to reduction using either the modified chair technique or the non-traction Kocher technique. The primary outcome was first-attempt reduction success. Secondary outcomes included overall success rate, pain score using the Heft-Parker Visual Analogue Scale (HP-VAS), reduction time, patient satisfaction, and complications. Statistical analysis was performed using SPSS version 26 with significance set at $p < 0.05$.

Results: Eighty patients completed the study (mean age 35.7 ± 9.1 years; 68% male). First-attempt success was significantly higher in the modified chair group compared with the Kocher group (95% vs 75%, $p = 0.028$). Mean pain scores were lower in the modified chair group (3.2 ± 1.6 vs 5.0 ± 1.8, $p < 0.001$), and reduction time was shorter (5.9 ± 2.1 vs 8.8 ± 2.6 minutes, $p < 0.001$). Patient satisfaction was significantly higher with the modified chair technique ($p = 0.004$). Two cases of transient axillary nerve paresthesia occurred in the Kocher group, while no complications were observed in the modified chair group.

Conclusion: The modified chair technique demonstrated superior first-attempt success, reduced pain, shorter reduction time, and greater patient satisfaction compared with the non-traction Kocher technique. It represents a safe, effective, and sedation-sparing method for anterior shoulder dislocation reduction in emergency settings.

Keywords: anterior shoulder dislocation, modified chair technique, Kocher technique, randomized controlled trial, emergency medicine

INTRODUCTION

The most significant of the major joint dislocations in the field of emergency medicine is that of the traumatic anterior dislocation of the shoulder, which makes an approximation of fifty to sixty percent of all large joint dislocations. Epidemiological studies have shed some light on an incidence that ranges between 8.2 and 26.2/100,000 person-years, whereby it has been well observed that there is a bimodal age distribution in which the incidence is mostly encountered by young men who are recruited to contact or overhead sports and by the elderly who sustain a low-energy fall.[1,2] Over fifty percent of dislocated shoulders occur during a sporting event, and males have a higher number of dislocations compared to females by three times. Although it is essential to restore joint congruity, relieve acute pain, and prevent complications (rotator cuff tears, axillary nerve injury, Hill Sachs

lesions, Bankart lesions and recurrent instability) [3,4], early efficient reduction is a requirement.

The last hundred years have been covered with a variety of closed -reduction methods which have entered the literature. The Hippocratic, Kocher and Stimson methods have been the classic traction-based manoeuvres that have long been the mainstay of the treatment regimen. [5] These procedures are based on longitudinal traction, mechanical leverage and guided rotation in order to unlock the humeral head of the glenoid fossa. However, traction techniques often require a lot of muscle pressure, several helpers, and the administration of procedural sedation or painkillers to immobilize the patient and increase the risk of iatrogenic injury, like fractures or vascular trauma [6-8].

On the contrary, the biomechanical reduction methods refer to patient positioning, muscle relaxation, and scapular manipulation instead of forceful traction. The modalities that are highly successful with lower rates of reported pain score and reduced sedation needs include FARES (Fast, Reliable, and Safe), scapular manipulation, Boss-Holzach-Matter, and Cunningham. [9]According to a study, the modified chair technique implies sitting the patient on a stable chair with the axilla against the backrest, and the operator presses down with the body weight but not the muscles. This second manoeuvre is observational and may imply a higher first-attempt technique compared to the classical Hippocratic manoeuvre and less pain attenuation. Similarly, recent randomized trials and systematic reviews demonstrated that FARES, Tang's approach, scapulohumeral distraction, and wrist-clamping/shoulder-lifting procedures receive positive success rates with minimal pain, and they may avoid sedation in most cases.[10]

With the ever-growing list of techniques that may be described, there are few solid, quality randomized comparisons between biomechanical methods and classical traction-based methods [11]. A meta-analysis comparing fourteen closed-reduction methods found that FARES and Boss-Holzach-Matter methods reported the highest success and the least discomfort, with a relatively lower success rate and the highest level of discomfort with the use of traction-based Kocher and Hippocratic methods. Besides, a prospective cohort study that compares the modified chair, the Kocher, Hippocratic and Stimson manoeuvre showed the highest success (93.3ª⁄₀ -17) rate and minimum pain scores with the modified chair, but the study design was non-randomized, and it invited selection bias [12,13].

Since there is a lack of rigorous randomized controlled data that juxtaposes directly between the modified chair and traction-based methods on the basis, especially that of the non-traction Kocher method, I developed a prospective randomized controlled trial that would compare first attempt success rate, procedure pain, reduction time, patient satisfaction and complication rates between the two modalities of treatment. This research hopes to provide advanced-level evidence that will be utilized in an ideal reduction strategy in the emergency environment.

METHODOLOGY

This prospective, single-center, parallel-group randomized controlled trial was conducted in the Emergency Department of Ziauddin University Hospital, Karachi, Pakistan, from April to December 2025. Ethical approval was obtained from the Institutional Review Board, and written informed consent was obtained from all participants.

To account for attrition, 80 patients of age between 18-60 years, with Acute traumatic anterior shoulder dislocation confirmed clinically and radiographically presentation within 24 hours of injury were enrolled. Patient with history of recurrent dislocation, Fracture-dislocation, Polytrauma requiring resuscitation, Neurovascular compromise, Pregnancy, Seizure disorder, non-cooperative patient were excluded. All data were recorded on structured Performa by the researcher.

The primary outcome was successful reduction on the first attempt, defined as restoration of normal shoulder contour and resolution of palpable deformity, confirmed by post-reduction radiographs.

Secondary outcomes included overall reduction success within three attempts, procedural pain assessed using the Heft–Parker Visual Analogue Scale (HP-VAS; 0–10), reduction time measured in minutes from initiation of the maneuver to successful reduction, patient satisfaction (categorized as excellent, good, fair, or poor), and procedure-related complications. Complications assessed included neurovascular injury, iatrogenic fracture, requirement for procedural sedation, or crossover to an alternative reduction technique.

The analysis of data was carried out on SPSS version 26.0. The normality of continuous variables such as, **a**ge**,** Time from injury to presentation (hours)**,** Reduction time (minutes)**,** Pain scores (HP-VAS 0–10) was assessed using the Shapiro–Wilk test. Normally distributed data are presented as mean ± standard deviation (SD), whereas non-normally distributed data are expressed as median with interquartile range (IQR).

Comparisons of continuous variables between groups were performed using the independent samples *t*-test for normally distributed data and the Mann–Whitney *U* test for non-normally distributed data. Categorical variables, such as gender, dominant limb involvement, first-attempt

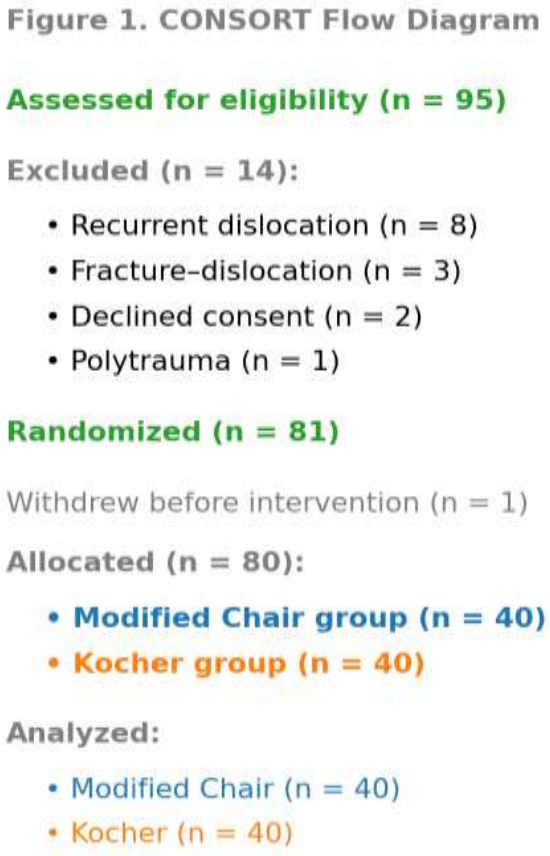
success, overall success, patient satisfaction (excellent, good, fair, poor), and presence of complications, were compared using the chi-square test or Fisher's exact test, as appropriate.

A p-value of <0.05 was considered statistically significant. In cases of missing data, available-case analysis was applied.

RESULTS

Participant Flow

During the study period, 95 patients presented with acute anterior shoulder dislocation. Fourteen patients were excluded (eight recurrent dislocations, three fracture–dislocations, two declined consent, and one with polytrauma). A total of 81 patients were randomized; one patient withdrew consent before intervention and was excluded from analysis. Forty patients were assigned to the modified chair group and 40 to the Kocher group. No crossovers occurred. The CONSORT flow diagram is presented in **Figure 1**.



Baseline Characteristics

Baseline demographics and injury characteristics were similar between the two groups (Table 1). The mean age was 35.4 ± 9.4 years in the modified chair group and 36.1 ± 8.9 years in the Kocher group (p = 0.68). Males constituted 70% of the modified chair group and 65% of the Kocher group. The dominant limb was affected in 60% of cases. Most injuries occurred during sports such as basketball, football, or cricket, with a mean time from injury to presentation of 2.1 ± 0.6 hours (modified chair) and 2.0 ± 0.7 hours (Kocher).

Table 1. Baseline demographics and injury characteristics

Characteristic	Modified Chair (n = 40)	Kocher (n = 40)	P value
Age, years (mean ± SD)	35.4 ± 9.4	36.1 ± 8.9	0.68
Male sex, n (%)	28 (70%)	26 (65%)	0.63
Dominant limb injured, n (%)	24 (60%)	25 (62%)	0.83
Time from injury to presentation, h (mean ± SD)	2.1 ± 0.6	2.0 ± 0.7	0.57
Mechanism (sport-related), n (%)	26 (65%)	25 (62%)	0.80
Previous dislocation, n (%)	0	0	–

Primary Outcome: First-Attempt Success

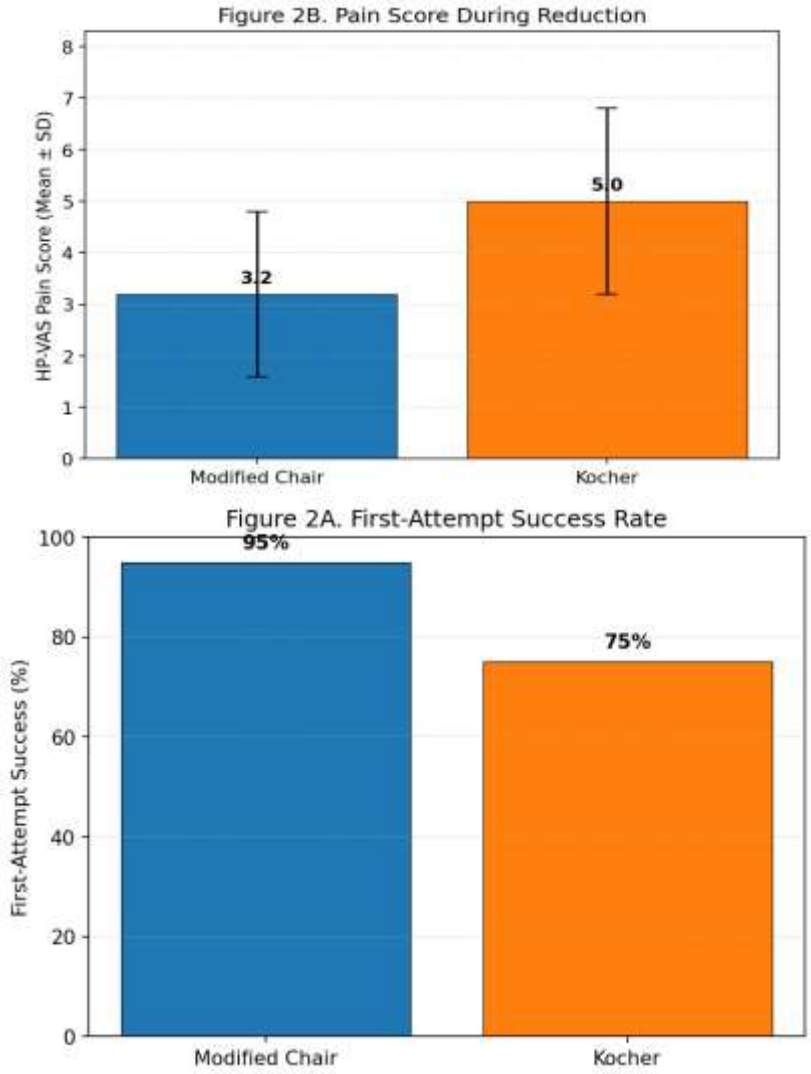
First-attempt reduction was achieved in 38 of 40 patients (95%) in the modified chair group compared with 30 of 40 patients (75%) in the Kocher group ($p = 0.028$). Two patients (5%) in the modified chair group required a second attempt, whereas 10 patients (25%) in the Kocher group required multiple attempts. Overall success within three attempts was 100% in the modified chair group and 90% in the Kocher group. Four patients in the Kocher cohort required sedation to achieve reduction.

Secondary Outcomes

Pain Scores

Patients in the modified chair group reported significantly lower pain during reduction, with a mean HP-VAS score of 3.2 ± 1.6, compared with 5.0 ± 1.8 in the Kocher group ($p < 0.001$) (**Figure 2**).

Figure 2. Comparative outcomes: success rate, mean pain score and mean reduction time for modified chair and Kocher techniques.



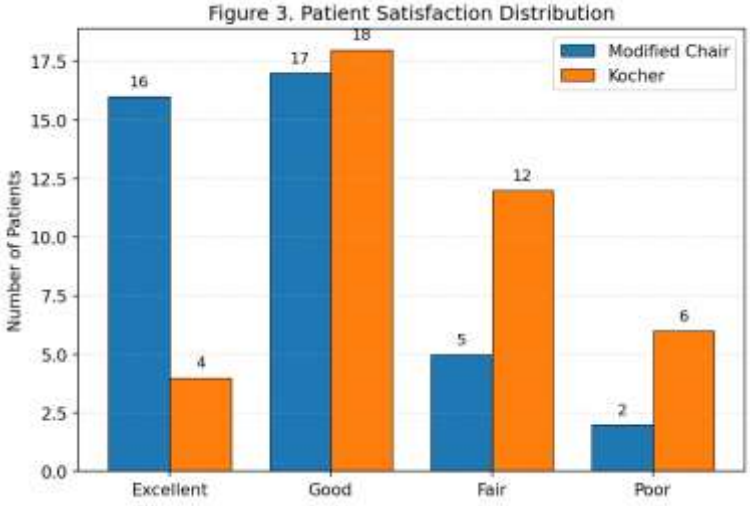
Reduction Time

Mean reduction time was shorter in the modified chair group (5.9 ± 2.1 minutes) compared with the Kocher group (8.8 ± 2.6 minutes, $p < 0.001$). The fastest reduction in the modified chair group took 2 minutes, while the slowest in the Kocher group took 14 minutes. No sedation was used during the first attempt in either group.

Patient Satisfaction

Satisfaction rates were higher in the modified chair group: 16/40 (40%) rated their experience as excellent and 17/40 (42.5%) as good, compared with 4/40 (10%) and 18/40 (45%) in the Kocher group, respectively. Within the Kocher cohort, 12/40 (30%) rated the experience as fair and 6/40 (15%) as poor ($p = 0.004$) (**Figure 3**).

Figure 3. Patient satisfaction distribution in the modified chair versus the Kocher groups.



Complications

No fractures or glenohumeral instability occurred in either group. Two patients in the Kocher cohort developed transient axillary nerve paresthesia, which resolved spontaneously within 24 hours. No neurovascular injuries or sedation-related adverse events were observed in the modified chair group.

Table 2. Outcomes of Modified Chair vs Kocher Reduction Techniques

Outcome	Modified Chair (n = 40)	Kocher (n = 40)	P value
First-attempt success, n (%)	38 (95%)	30 (75%)	0.028
Overall success (≤3 attempts), n (%)	40 (100%)	36 (90%)	0.04
HP-VAS pain (mean ± SD)	3.2 ± 1.6	5.0 ± 1.8	<0.001
Reduction time, min (mean ± SD)	5.9 ± 2.1	8.8 ± 2.6	<0.001
Satisfaction (Excellent), n (%)	16 (40%)	4 (10%)	–
Satisfaction (Good), n (%)	17 (42.5%)	18 (45%)	–
Satisfaction (Fair), n (%)	5 (12.5%)	12 (30%)	–
Satisfaction (Poor), n (%)	2 (5%)	6 (15%)	–
Complications, n (%)	0	2 (5%)	–

DISCUSSION

This randomized controlled trial is the first to directly compare the modified chair technique with the non-traction Kocher method for anterior shoulder dislocation in an emergency department setting. Our results demonstrate a significantly higher first-attempt success rate with the modified chair method (95% vs 75%), accompanied by lower pain scores, shorter reduction times, and greater patient satisfaction compared with the Kocher technique. These findings support our hypothesis that the modified chair method provides superior efficacy and comfort for patients.

Previous observational and cohort studies have suggested advantages of biomechanical techniques over traction-based methods. Ge et al. reported a 96.5% success rate for the modified chair technique with lower pain scores compared with the Hippocratic method. Another prospective cohort comparing modified chair, Kocher, Hippocratic, and Stimson techniques found the modified chair method to achieve the highest success rate (93.3%) and lowest pain levels. Our randomized trial confirms these findings within a rigorous experimental framework, further establishing the superiority of the modified chair method for first-attempt reduction and patient satisfaction.

The success rate observed for the modified chair technique is consistent with other biomechanical approaches. Tang's method achieved 100% success with minimal pain, while scapulohumeral distraction also showed over 95% success with reduced procedural pain and shorter reduction times. Similarly, wrist-clamping and shoulder-lifting techniques reported complete success in small patient series. Systematic reviews and network meta-analyses consistently demonstrate that biomechanical methods such as FARES and Boss-Holzach-Matter yield higher success rates and lower pain compared with traction-based Kocher and Hippocratic maneuvers. Our data add further evidence that biomechanical approaches offer effective and comfortable alternatives to traditional traction techniques.

The overall success rate of the Kocher technique in our study (75% first attempt, 90% within three attempts) aligns with previously reported rates ranging from 72% to 97.5%. However, patients

experienced higher pain levels and longer reduction times compared with the modified chair method, consistent with the understanding that traction and leverage can exacerbate muscle spasm and discomfort. Complications were uncommon in both groups; two patients in the Kocher cohort experienced transient axillary nerve paresthesia, which resolved spontaneously. No serious adverse events were observed, corroborating prior studies indicating that meticulous closed reduction techniques rarely result in significant neurovascular injury.

The modified chair technique is simple to learn, requires minimal equipment, and can be performed by a single clinician without sedation. Our findings confirm that this method not only increases reduction success but also reduces pain, leading to improved patient satisfaction and potentially shorter emergency department stays. These characteristics make the modified chair technique particularly valuable in resource-limited settings where multiple assistants or sedation may not be feasible. Given its safety, efficacy, and ease of use, the modified chair method should be considered a first-line approach for anterior shoulder dislocation reduction in emergency care.

CONCLUSION

The modified chair technique is superior to the non-traction Kocher technique for reduction of acute anterior shoulder dislocation, demonstrating higher first-attempt success, lower pain scores, shorter reduction time, and improved patient satisfaction without the need for sedation. It should be considered a preferred first-line reduction method in emergency department practice.

Strengths

- Randomized controlled design
- Concealed allocation
- Standardized outcome assessment
- Intention-to-treat analysis

Limitations

- Single-center study
- Operator blinding not feasible
- No long-term follow-up outcomes
- Subjective satisfaction assessment

Future multicenter trials comparing multiple biomechanical techniques and assessing recurrence and functional outcomes are warranted.

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