

# Comparison between traction-countertraction and modified scapular manipulation for reduction of shoulder dislocation

Mohammad-Reza Ghane, Seyed-Hamed Hoseini, Hamid-Reza Javadzadeh, Sadrollah Mahmoudi, Amin Saburi\*

**【Abstract】 Objective:** One of the most common joint dislocations presented to the emergency department (ED) is anterior shoulder dislocation (ASD). Various techniques for the treatment of this abnormality have been suggested. In this study, we evaluated the efficacy and success rate of modified scapular manipulation (MSM) as a painless procedure compared to traction-countertraction (TCT) for reduction of ASD.

**Methods:** Patients with ASD who were presented to ED of Baqiyatallah Hospital, Tehran during 2011 were included. They were randomly divided into MSM group or TCT group and then pain at reduction, time of reduction, duration of hospitalization, and success rate were compared. In TCT group, reduction was performed using sedative and antipain medications.

**Results:** Ninety seven patients (81.6% male) with a

mean age of 34.15 years±13.48 years were studied. The reduction time between both groups showed a significant difference (470.88 seconds±227.59 seconds for TCT group, 79.35 seconds±82.49 seconds for MSM group,  $P<0.001$ ). The success rate in MSM group in the first and second effort were 89% and 97% whereas 73% and 100% in the TCT group respectively ( $P<0.001$ ).

**Conclusion:** It seems that the manipulation technique can be more successful than the TCT method at the first effort whilst the second effort has the opposite results. Also MSM can be safer, cheaper and more acceptable for patients than TCT as a standard traditional method.

**Key words:** *Manipulation, orthopedic; Traction; Shoulder reduction*

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Shoulder is the most mobile joint of the body that can rotate in different directions and this characteristic causes higher likelihood of joint dislocation compared to other joints.<sup>1</sup> Prevalence of shoulder dislocation is 17 per 100 000 individuals with two age peaks: first in youths aged 20-30 years and second in elderly women.<sup>2</sup> Reduction techniques shall be performed fast and effectively with least possible pain and even without pain if possible. These techniques should not cause doctor's fatigue and induce further injury to the joint. Traditional methods of reduction include traction-countertraction

(TCT) technique and Kocher's maneuver.<sup>3-7</sup> These techniques might impose additional trauma which can induce nervous damage or vascular injury. Moreover, they are painful and application must be accompanied with prescription of sedative.

In most emergency departments (ED), intravenous narcotics and benzodiazepine are commonly used for reducing pain caused by reduction of shoulder dislocations. These drugs are often effective but also have side effects such as respiratory suppression and complications resulting from central nervous system suppression, which necessitate close and precise monitoring of patient such as cardiac and pulse monitoring, as well as oximetry.<sup>2</sup> Novel methods have been proposed and one of them is scapular manipulation technique (SMT) for anterior shoulder reduction initially reported by Bosley et al<sup>8</sup>. During the recent years, a couple of studies have been conducted on efficiency

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Trauma Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran (Ghane MR, Hoseini SH, Javadzadeh HR, Mahmoudi S)

Chemical Injuries Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran (Saburi A)

\*Corresponding author: Tel/Fax: 98-021-88600067, Email: aminsaburi@yahoo.com

of this technique mainly in the United States but it has been less investigated in Europe and Asia. Furthermore, scarce researches have been carried out to comparatively analyze this technique with the standard technique, i.e. TCT technique. In this study we compared TCT versus modified scapular manipulation (MSM) in terms of efficacy and safety to declare which method is better in ED where more rapid and accurate procedures should be done.

## METHODS

### Study design and participants

This cohort study was conducted on patients with anterior shoulder dislocation (ASD) who referred to ED of Baqiyatallah Hospital during 2011. Sampling was performed with a simple census method. According to the description and clinical examination, patients suspected to suffer ASD were enrolled into the study after imaging. The patients who had following conditions were excluded from the study: 1) dislocation together with fracture except less than 5 mm displacement of great tubercle of humerus, 2) admitting more than 24 hours after the trauma, 3) severe neurovascular trauma, 4) contraindications for sedation due to cerebral trauma, poisoning, etc, 5) being unable to lie in prone position for any reasons, 6) age below 16 and above 60 years, 7) serious multiple traumas, 8) posterior dislocation, and 9) being not content with performing this technique.

### Reduction protocol

Following confirmation of anterior dislocation, treatments procedures were explained to the patients and informed consent forms were filled by them or their family. The patients were divided into TCT (50 cases) and MSM (47 cases) groups with simple randomization. All procedures were carried out by a physician. Compared to routine manipulation technique, MSM was performed in prone position, by using a pillow under the shoulder, rotating head against the dislocated shoulder for more relaxation, hanging arm off the edge of the bed, finding the edge and spine of scapula and finally manipulating the scapular to treat the dislocation (Figure 1). The unsuccessful cases at the first MSM effort were then treated with TCT. In the case of failure in both treatments, the patient was referred to operation room for reduction. In TCT method, reduction was

performed using sedative and antipain medications (Figure 2). The sedative drugs included fentanyl with dosage of 2-2.5 mg/kg and 21 mg midazolam and morphine sulfate with dosage of 0.1 mg/kg, which were administered under cardiac monitoring.



Figure 1. MSM technique.



Figure 2. TCT technique.

### Assessments

During the procedure and following the reduction, the patients were evaluated for vital signs and likelihood of trauma to neurovascular system. Numerical visual analogue scale (VAS) was applied to assess the pain severity. Also, the patients expressed their pain severity with scores ranging 1 to 10. Satisfaction level of each reduction was also assessed by means of questions which were filled by physicians and patients with scores ranging 1 to 4 (1=poor, 2=fair, 3=good, and 4=excellent). Ethic Committee of Baqiyatallah University of Medical Sciences approved the study plan.

### Statistical analysis

The data were inserted into SPSS 16.0. The obtained continuous variables were reported as mean±standard deviation (SD). Descriptive statistics in qualitative variables were expressed in percentage. Primarily, univariate analyses were

performed. The difference between variables was evaluated by Chi-square test. And Student's *t*-test was applied for comparing the quantitative variables between groups. Repeated measurement ANOVA test was also used to analyze the data.  $P < 0.05$  was considered as the significance level.

## RESULTS

Ninety seven patients completed the study and 80 patients (81.6%) were males. The mean age of patients was (34.15±13.48) years. The average height was (170.8±8.58) cm and weight (74.38±8.91) kg. Sixty cases (61.9%) suffered ASD for the first time and 36 patients (37.1%) had formerly referred to the hospital for it. Eighty-two (84.5%) patients were dominantly right-handed. No significant differences were observed between two groups in terms of gender ( $P=0.232$ ), dislocation background (traumatic or not,  $P=0.244$ ), dislocation pattern ( $P=0.268$ ), dislocation direction ( $P=0.788$ ), neurovascular disorder before intervention ( $P=0.790$ ) and radiographic findings before intervention ( $P=0.226$ ). Shoulder dislocation was subglenoid and subcorcoid types in 86 (91.5%) and 8 (8.5%) patients, respectively. Dislocation occurred in left

side in 35 patients (60.3%). Eighteen individuals (19.8%) had subtle auxiliary neural defect. Total mean VAS scores in relaxation and moving states were 3.30±1.47 and 8.44±1.36, respectively.

Demographic and clinical findings of both groups were shown in Table 1. The duration of reduction was significantly different between two groups: (470.88±227.59) seconds for TCT group, and (79.35±82.49) seconds for MSM group ( $P < 0.001$ ). Frequencies of abnormal findings in radiography and clinical examination before and after treatment showed that no additional complication was imposed to the patient as a result of reduction. In the TCT group, initial neurovascular defects were relieved in 2 patients (20%) while 3 (37.5%) in the MSM group ( $P=0.495$ ). Also, success rate and mean level of patients and physician' satisfaction between MSM and TCT groups were significantly different (both  $P < 0.001$ ). In multivariate analysis, group successful reduction in the first time and physician assessment findings were the only factors which can finally affect the reduction duration ( $P < 0.001$ ). Also, only reduction duration was reported as an effective factor ( $P=0.017$ , 95% *CI* 1.002-1.024) on success rate.

**Table 1.** Clinical characteristics of both groups (mean±SD)

Group	Age (yrs)	Time after dislocation (h)	VAS at rest	VAS at movement	Duration of hospitalization (h)	VAS at reduction
TCT	36.20±15.37	1.38±0.49	3.36±1.69	8.56±1.43	6.01±2.21	3.65±1.46
MSM	31.97±10.89	1.36±0.48	3.23±1.19	8.32±1.28	1.54±1.17	1.38±1.23
<i>P</i> value	0.120	0.445	0.686	0.403	<0.001	0.018

## DISCUSSION

In our study, it seems that success rate of MSM group in the first attempt was greater than that of TCT group. However, final success rate was slightly higher in TCT group. Additionally, pain at reduction, and duration of reduction and presence in ED in MSM group were obviously lower than TCT group. Duration of presence in ED mainly affected by receiving sedative drugs is regarded among the important factors in assessment and effectiveness of a procedure particular in departments with high turnover. Besides, MSM is more cost-effective than TCT. Effectiveness of techniques also can be assessed in the following way: the technique in which

less sedative is administered is logically associated with less probable medication complications (vomiting, drowsiness, dizziness, hypotension, etc) and accordingly requires less cardiac and oximetry pulse monitoring. Thus, as mentioned in the results, pharmaceutical complications and follow-up of patients and their presence in the ED was less in MSM group receiving less sedative. It consequently seems that manipulation technique can be better and more frequently used in medical centers which lack of monitoring facilities, etc.

Most techniques for reduction of ASD like Kocher's maneuver and TCT have been repeatedly investigated and assessed. These techniques are

mainly implemented with intervention and movement of humerus which are painful. After SMT proposed by Basley et al<sup>8</sup>, it was rapidly used in the United States although scarcely adopted in Europe and Asia. Moreover, former conventional methods such as TCT and Kocher's maneuver are less frequently applied in these days owing to their numerous post-reduction complications.<sup>4</sup>

Besides, previous reports<sup>4,9-11</sup> demonstrated the success rate of manipulation method between 78% and 96% which is coherent with our findings although it was an operator dependent procedure. SMT is routinely performed in prone position but in the case that patient feels more pain and cannot tolerate other complications such as multiple traumas, this procedure also can be implemented in supine position as an acceptable choice for reduction treatment.<sup>4</sup> For the first time, we modified SMT technique to be more acceptable by patients and physicians.

SMT technique is mainly adopted by emergency physicians and orthopedic surgeons in the United States but less applied in Iran.<sup>8,11,12</sup> A study stated that SMT was used in 2.1% and 3% of procedures, respectively.<sup>8</sup> Nonetheless, physicians more frequently apply Kocher's maneuver (60%-71%).<sup>13</sup> Level of physician's satisfaction and also success rate were effective factors in the current research. Success rate of reduction was only affected by duration of procedure. On contrary, the research by Pishbin et al<sup>14</sup> implied that fracture of greater tubercle of the humerus is the predicting factor of success rate which is not similar to our findings.

To increase patients' tolerability of procedure, other modified reduction techniques were recently recommended. In Jamali's study<sup>12</sup>, a comparison was made between seated shoulder reduction (SSR) technique and traditional shoulder reduction (TSR) technique. Duration of patient's presence in ED was around 1.5 hours in SSR technique and around 2.9 hours in TSR technique. These findings are different from the results of MSM technique analyzed in our study. Besides, in the research performed by Marinelli et al<sup>15</sup>, 29 out of 31 patients were successfully treated with external rotation method. Average devoted time was reported less than 2

minutes. In a study where a comparison was made between SMT and Kocher's methods, success rates of SMT and Kocher's method was reported 97.5% and 93%, respectively. These figures are much higher than the rates obtained in the present study, which can be attributed to difference in experience and specialty level of the practitioners. Pain level during reduction was also reported lower in the SMT method than Kocher's methods as confirmed in our results in which patients were more satisfied with manipulation technique.<sup>13</sup> Pishbin et al<sup>14</sup> conducted a study on 112 SMT-treated patients without sedative drugs; the procedure was successful in 97 patients (87%). Patients whose reduction procedures failed after two attempts underwent treatment using midazolam medication, which is coherent with our findings. The time interval between dislocation and reduction was much longer than the present study, which might justified the difference.

Also, success rate of Anderson et al's study<sup>16</sup> was 92% without any complication. Out of 51 patients, 34% needed administration of sedative prior to reduction intervention which is different from our study plan. Ninety six percent of patients were successfully treated with no special complication in the study by Kothari et al<sup>9</sup> in which 48 ASD patients underwent reduction with SMT; two percent of patients required sedation before intervention. Also in McNamara's study<sup>10</sup> 61 patients with ASD were treated by SMT technique, 79% of treatments were successful without complication and 64% of cases needed sedation before reduction. They introduced this technique as a fast, easy and reliable method.

Boger et al<sup>17</sup> found that 92% of 47 patients in their study were successfully treated with TCT technique and no complication was reported. All patients needed sedative administration for reduction. This is consonant with our results in terms of medication but incongruent with the success rate of the TCT technique in our study. Furthermore, two groups did not exhibit additional complication in terms of occurrence of neurovascular disorder compared to the condition before intervention. Initial defects of 2 patients in the traction group were alleviated while 3 in the manipulation group.

Patients' dissatisfaction of lying in prone

position was mentioned as the major problem in SMT technique<sup>18</sup>, in agreement with our findings. Schubert<sup>3</sup> recognized SMT as the fastest and simplest method to reduce ASD, which completely is in alignment with our results where duration of procedure is very shorter than that of the traditional technique. Goh et al<sup>11</sup> recommended SMT as a method with high chance of success and simple instruction requiring no prescription of intravenous sedative and without any complication. Singh et al<sup>19</sup> demonstrated that in comparison to TCT, modified Milch technique had less pain at procedure while the success rate of TCT was greater than that of Milch procedure. These assertions also corroborate our study. Recently, most recommended methods are focused on those which do not require sedation.<sup>20-22</sup> What distinguishes this study is that the new method (SMT) as a modified method evaluated in this study is not previously studied.

In conclusion, duration of reduction and presence in ED in manipulation group is evidently shorter than that in traction group. This finding, especially duration of hospitalization in ED which is mainly affected by administration of sedative drugs, is regarded as the essential factor in assessment and effectiveness of a procedure particularly in departments with high turnover. This confirms favorability and suitability of MSM technique. Furthermore, the effectiveness of technique can also be assessed in the following way: the technique in which less sedative is administered logically pertains to less probable medication complications (vomiting, drowsiness, dizziness, hypotension, etc) and accordingly requires less cardiac and pulse oximetry. It seems that MSM technique can be more favorably used in medical centers which lack monitoring facilities.

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## News

# Chinese Journal of Traumatology won the financial aid from "Global Influence Promotion Project for Chinese Scientific and Technical Journals"

The assessment result of the "Global Influence Promotion Project for Chinese Scientific and Technical Journals" was announced recently and our journal (Chinese Journal of Traumatology, CJT) won the financial aid, which implies that CJT will receive from our nation an annual amount of up to 1 000 000 yuan for three consecutive years since 2014.

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