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A comparison of the scapular manipulation and Kocher's technique for acute anterior dislocation of the shoulder

Akut öne omuz çıkığında skapular manipülasyon tekniği ile Kocher tekniğinin karşılaştırılması

Namık Şahin, M.D.,[1] Alpaslan Öztürk, M.D.,[1] Yüksel Özkan, M.D.,[1]
Teoman Atıcı, M.D.,[2] Güven Özkaya, M.D.[3]

[1]Department of Orthopedics and Traumatology, Bursa Yüksek İhtisas Training and Research Hospital, Bursa, Turkey;
[2]Department of Orthopedics and Traumatology, Medicine Faculty of Uludağ University, Bursa, Turkey;
[3]Department of Biostatistics, Graduate School of Health Science, Bursa, Turkey

Objectives: The aim of the present study was to compare the scapular manipulation technique and the Kocher's method in terms of efficacy, safety, and the intensity of pain felt by the patient in the reduction of acute anterior shoulder dislocation.

Patients and methods: Between July 2009 and January 2010, a total of 64 patients with acute traumatic anterior dislocation of the shoulder were evaluated. Of the 64 patients assessed, three patients were excluded because of cardiopulmonary problems. The remaining 61 patients (41 males, 20 females; mean age 42±18.5 years; range 17 to 87 years) were enrolled in this prospective randomized study and devided into two groups. Thirty-one patients were treated with scapular manipulation (group 1) and 30 patients were treated by the Kocher's method (group 2). A procedural sedation/analgesia was applied before the reduction to meet the target sedation score of 1 or 2 according to the Ramsay sedation scale. A visual analog scale was used to determine the intensity of the pain felt by the patients during reduction.

Results: Reduction was successfully achieved with the scapular manipulation method in 96.7% of the patients, and with the Kocher's method in 93.3% ($p>0.05$). The degree of pain experienced by group 1 was lower than group 2 ($p<0.01$).

Conclusion: Both scapular manipulation and Kocher's techniques are successful and reliable methods when procedural sedation/analgesia is used routinely. Scapular manipulation is a less painful method of reduction of an anterior shoulder dislocation in comparison with the Kocher's technique.

Key words: Closed reduction; conscious sedation; shoulder; shoulder dislocations; visual analog scale.

Amaç: Bu çalışmada akut öne omuz çıkığı redüksiyonunda skapular manipülasyon tekniği ile Kocher yöntemi etkinlik, güvenilirlik ve hastalar tarafından hissedilen ağrı açısından karşılaştırıldı.

Hastalar ve yöntemler: Temmuz 2009 ile Ocak 2010 tarihleri arasında akut travmatik öne omuz çıkıklı toplam 64 hasta değerlendirildi. Değerlendirmeye alınan 64 hastadan üçü kardiyopulmoner sorunları nedeniyle çalışma dışı bırakıldı. Kalan 61 hasta (41 erkek, 20 kadın; ort. yaş 42±18.5 yıl; dağılım 17-87 yıl) bu ileriye dönük ve randomize çalışmaya dahil edildi ve iki gruba ayrıldı. Otuz bir hasta (grup 1) skapular manipülasyon, 30 hasta ise Kocher yöntemi (grup 2) ile tedavi edildi. Redüksiyondan önce Ramsay sedasyon skalasına göre 1 ya da 2. derecede sedasyon sağlanacak şekilde bir girişimsel sedasyon/analjezi işlemi uygulandı. Redüksiyon sırasında hastalar tarafından hissedilen ağrıyı değerlendirmek için görsel analog skala kullanıldı.

Bulgular: Redüksiyon işlemi skapular manipülasyon uygulanan hastaların %96.7'sinde, Kocher yöntemi uygulanan hastaların ise %93.3'ünde başarılı oldu ($p>0.05$). Grup 1'de hissedilen ağrı derecesi grup 2'ye kıyasla daha düşüktü ($p<0.01$).

Sonuç: Hem skapular manipülasyon hem de Kocher tekniği girişimsel sedasyon ve analjezi işlemi rutin olarak uygulandığında başarılı ve güvenilir yöntemlerdir. Öne omuz çıkığının redüksiyonunda Kocher tekniği ile karşılaştırıldığında skapular manipülasyon daha az ağrılı bir yöntemdir.

Anahtar sözcükler: Kapalı redüksiyon; bilinçli sedasyon; omuz; omuz çıkığı; görsel analog skala.

Acute anterior dislocation of the shoulder is a common injury accounting for approximately 95% of all shoulder dislocations.[1] Many manoeuvres for the reduction of the humeral head have been described with varying rates of success and complications.[2-5] The ideal reduction method should be quick, effective, painless, and

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• Correspondence: Namık Şahin, M.D. Bursa Yüksek İhtisas Eğitim ve Araştırma Hastanesi Ortopedi ve Travmatoloji Kliniği, 16330 Yıldırım, Bursa. Turkey. Tel: +90 224 - 360 50 50 Fax: +90 224 - 360 50 55 e-mail: sahinnamik@yahoo.com

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not cause further injury. Despite the considerable pain associated with this injury there has been a trend for reducing dislocations without any analgesia. Although analgesia and sedation may not be necessary to achive reduction[3,4] the relief of acute pain which occurs during the reduction manoeuvre must be regarded as an ethical issue and a legal right.[6,7]

The aim of the present study was to obtain an objective comparison of the scapular manipulation technique with the Kocher method in terms of efficacy, safety, and the intensity of pain felt by the patient during the reduction manoeuvre when a standard sedation level was provided.

PATIENTS AND METHODS

Between July 2009 and January 2010, 64 consecutive patients with a traumatic anterior dislocation of the shoulder were enrolled in this prospective randomized study comparing Kocher and scapular manipulation techniques. The inclusion criterion was the anterior dislocation of the shoulder associated with or without fracture of the greater tuberosity. Patients were excluded if there was polytrauma, dislocation associated with a three or four-part fracture of the proximal part of the humerus, a duration of dislocation of more than 24 hours, severe cardiovascular or pulmonary disease.

Following diagnosis, all patients were randomized to undergo reduction of the dislocation with one of the two methods used in the study. The randomization was done with random permuted blocks of a predefined size. The random numbers were blocked in groups of four to ensure study groups of approximately the same size. The actual randomization was performed by drawing envelopes. An orthopaedic resident carried out the allocation process. A total of 64 patients with an anterior dislocation of the shoulder were assessed for eligibility. The patients were devided into two groups. One patient in group 1 and two patients in group 2 were excluded because of cardiopulmonary problems. The 31 patients (25 males and 6 females) treated with scapular manipulation (group 1), were compared with 30 patients (23 males and 7 females) treated by the Kocher method, (group 2). The visual analogue scale (VAS) scores were evaluated by the same orthopaedic surgeon or resident who had performed the reduction. All patients gave informed consent to participate in the study, which had been approved by the local ethics committee.

Standard anteroposterior view and transthoracic radiographs of the shoulder were taken of all patients to confirm the clinical diagnosis of a dislocation. All reductions were performed with sedation and pain control by one orthopedic surgeon or two resident orthopaedic surgeons who had attended a brief instructional course prior to involvement in the study.

Before reduction, a regular neurological and vascular investigation of the upper extremity was performed. After sedation, one but no more than two attempts to reduce the dislocation were made in the emergency department, and if unsuccessful, the patient was transferred to the operating room for reduction under general anesthesia.

Before each reduction, the physician completed a standard detailed history concerning the demographic data of the patient and a brief medical history. The mechanism of injury, the time interval between the injury and the first attempt at reduction, the duration of the reduction, and the existence of complications after the reduction were all registered. Following successful reduction of the dislocation, the patients were asked to rate their comfort level using a ten-point VAS.[8]

Analgesia and sedation technique: All patients were given an intramuscular injection of 1 mg/kg of meperidine (pethidine) (B. Braun, Melsungen AG, Germany) for analgesia 15 minutes before the attempted reduction. A nurse intravenously administered midazolam (Solupharm GmbH, Melsungen Germany) to the subjects at total doses of 2-5 mg for sedation. The initial intravenous dose was 0.02-0.03 mg/kg given slowly over at least 2 mins, titrating to the desired level of sedation. An intravenous dose of 0.02-0.03 mg/kg was repeated at 2 mins intervals while the appropriate level of sedation was continuously monitored. All subjects remained verbally responsive throughout. Reduction was performed when stage I or II of the Ramsay sedation scale[9] was reached. During and after administration of midazolam, the presence of any complications or side-effects were also closely monitored, including respiratory depression, apnea, oxygen desaturation, depression of the central nervous system, autonomic movement, chest pain, arrythmia, injection site pain and phlebitis. The subjects were discharged once they had fully recovered orientation of time and space with vital signs within the normal range.

Reduction techniques

Scapular manipulation method: The patient was placed prone on the examining table with the shoulder in a position of 90° forward flexion and external rotation and downward traction was applied.[10] After the application of traction, the scapula was than manipulated to complete the reduction. When placing the patient in the prone position it was important to place the injured shoulder over the edge of the bed to allow the arm to hang in a perpendicular manner for the application of traction. Regardless of the means of arm traction,

a slight external rotation of the humerus may facilitate reduction by releasing the superior glenohumeral ligament and presenting a favourable profile of the humeral head to the glenoid fossa. The elbow was flexed to relax the biceps tendon. When the patient began to relax, the surgeon pushed on the tip of the scapula medially, while simultaneously rotating the superior aspect of the scapula laterally. The thumb of the hand stabilizing the superior aspect of the scapula can be placed along the lateral border of the scapula and used to assist the pressure applied by the thumb of the other hand.[4]

Kocher method: Kocher's technique was performed as described by Watson-Jones.[11] The patient was placed supine on the examining table with the surgeon standing at his/her side. For a dislocated right shoulder, the surgeon took the elbow in his right hand and the wrist in his left. Gentle firm traction was applied to the humerus by the right hand, and while traction was maintained, the humerus was gently and smoothly rotated laterally by moving the forearm out until the normal limit of about 60° of rotation was reached. While the limb was held in lateral rotation, the elbow was brought forwards to the front of the chest. Finally, it was rotated medially and the hand was brought over the opposite shoulder.

Statistical analysis

Statistical analyses were performed on SPSS (SPSS Inc., Chicago, Illinois, USA) 13.0 version statistical package program for Windows. The Shapiro-Wilk test was used to test the normality of the variables and the Mann-Whitney U-test was used to compare the two groups. The chi-square test and Fisher's exact test (contingency table analysis) were used for categorical data analysis. Pearson correlation coefficient was used to analyze the correlation between variables. Significance level was defined as $\alpha=0.05$.

RESULTS

There were no statistically significant differences between the two groups in terms of age, male-to-female ratio, primary-to-recurrent dislocations ratio, the mechanism of dislocation, the presence or absence of a coexisting fracture of the greater tuberosity, the mean time interval between the injury and the first attempt at reduction, and the reduction time (Table I).

Twenty-nine (47.5%) of 61 patients had a history of recurrent shoulder dislocations. Four patients (6.5%) had an anterior dislocation of the shoulder that was accompanied by a greater tubercle fracture. The dominant arm was involved in 38 patients (62.2%). There was no clinically detectable neurological deficits before the reduction manoeuvre.

All the fractures of the tuberculum majus were reduced after shoulder joint reduction. The reduction procedure was unsuccessful in three patients (1 from group 1, 2 from group 2) and they underwent closed reduction of the dislocation under general anesthesia in the operating room. There were no complications noted as a consequence of the joint reduction procedure.

Forty-five (73.8%) of the 61 patients required 2-3 mg midazolam and 16 patients required 3-5 mg to achieve a Ramsay I or II sedation level. The same amount of drugs was administered to the two groups. None of the aforementioned side-effects of midazolam were detected in patients of either group. Mild headache and nausea which spontaneously disappeared without treatment were noted in some patients.

The degree of pain experienced by group 1 was lower than group 2 ($p<0.01$; Table II). The degree of pain was comparable in male and female patients. The mean duration of hospitalization in the Emergency Department for the 58 patients who were treated successfully was 75±16.5 mins (range 50-120 mins).

DISCUSSION

To the best of our knowledge this is the first prospective study comparing scapular manipulation and Kocher techniques in terms of efficacy, safety, and the intensity of pain felt by the patient. In the current study, both scapular manipulation and the Kocher technique were found to be successful and reliable methods when procedural sedation/analgesia is used routinely. The results showed that the pain felt by patients undergoing scapular manipulation was lower than from the Kocher method when mild sedation was provided.

The success rate associated with the scapular manipulation manoeuvre has been reported to be as high as 96 percent.[4,11-13] Scapular manipulation technique has been shown to be a safe, easy, and rapid method for the reduction of anterior shoulder dislocation even without analgesia and sedation.[4] No data was found in the literature about complications resulting from scapular manipulation. However, this technique has the disadvantage of being difficult to perform on obese individuals and of requiring the patients to be prone. This position can pose difficulties for certain patients if they require sedation.

The Kocher technique is probably much older[14] than its initial description and also has high success rates of up to 90 percent.[3,6,15,16] However, it has been labelled as being unphysiological, brutal, and dangerous because of its association with fractures of the surgical neck of the humerus and neurovascular complications.[2,6,17] Fractures will only occur when using

TABLE I

Baseline characteristics of patients

	Method of reduction					
	Scapular manipulation (n=31)			Kocher (n=30)		
	n	%	Mean±SD	n	%	Mean±SD
Age			39.1±19.2			45±17.5
Sex						
Male	25	80.7		23	76.7	
Female	6	19.3		7	23.3	
Dislocation						
Primary	15	48.4		16	53.3	
Recurrent	16	51.6		14	46.7	
Mechanism						
Fall	25	80.7		23	76.7	
Sports activity	5	16.1		5	16.6	
Traffic accident	1	3.2		2	6.7	
Time interval			97.8±83.9			102.2±106.8

SD: Standard deviation.

this technique, however, if the operator forcibly tries to overcome muscle spasm, the elderly osteoporotic patient being at most risk. No difference was found in the success rates between two manouevres. As all the patients had been sedated, no excessive force was applied during the reduction procedure. None of the patients encountered any complications due to the reduction manoeuvres.

Various methods of pain control are available for reduction. Regional anesthesia such as the suprascapular[18] and interscalene brachial plexus block[19] and intra-articular lignocaine[20] have been used with good results. Intravenous agents such as meperidine, morphine, fentanyl, midazolam, and diazepam ensure good analgesia and relaxation.[21,22] The procedural sedation/analgesia that we carried out gave rapid and adequate sedation and analgesia while maintaining patient responsiveness. This allowed the shoulder reduction procedure to be performed with a minimal level of patient discomfort. There were no respiratory or circulatory complications that required treatment, but monitoring of the respiratory and circulatory parameters of the patient was critically important.

Sedation/analgesia have usually been recommended when the procedure has been unsuccessful.[3,4,11,17]Studies which rate pain scores, have demonstrated that patients sometimes feel severe pain while the reduction manouevre is being performed.[3,15,16] It must be considered that acute pain is a worldwide phenomenon. Brennan et al.[6] considered the medical, ethical and legal aspects of pain management and emphasised that the unreasonable failure to treat pain is an unethical breach of human rights. We think that pain control must be achieved during all reduction manoeuvres. It must be stressed, however, that all patients given intravenous sedation must be monitored in an area where resuscitation equipment is at hand. In the current study it was assumed that all the patients had recently eaten, therefore mild sedation was provided before the procedure in order to perform an immediate reduction. If a patient is not well sedated or has not received adequate analgesia, they

TABLE II

Efficacy, time needed for reduction, and pain felt during reduction

	Method of reduction						
	Scapular manipulation (n=31)			Kocher (n=30)			
	n	%	Mean±SD	n	%	Mean±SD	*p*
Reduction result							
Success	30	96.7		28	93.3		
Failure	1	3.3		2	6.7		
Reduction time			2.4±1.8			2.7±2.3	0.828
VAS pain score			1.6±0.9			3.1±1.2	<0.01

SD: Standard deviation; VAS: Visual analog scale.

are more likely to forcefully resist the reduction and the risk of complications may be high.[5]

The VAS is a widely used, validated scale for measuring pain and a very effective instrument for surgical investigations. No statistically significant difference was found in success rates, but the use of the VAS suggested that the scapular manipulation method was reported to be significantly less painful.

In this prospective study patients were entered consecutively, and randomly assigned to one of the two study groups. On the other hand, the most important limitation is the fact that the study was unblinded, which was however, more or less unavoidable considering the nature of the study. Another limitation is that, because midazolam produces the immediate onset of anterograde amnesia in patients, the validity of some of the patients' responses may be open to doubt. Though the same procedural sedation/analgesia was administered to both groups, the lower doses of midazolam may have affected the results.

In conclusion, when the patients were sedated, both the scapular manipulation and the Kocher technique were found to be effective, fast, and safe. The scapular manipulation was less painful for the reduction of an anterior shoulder dislocation in comparison with the Kocher technique.

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