GLENOUMERAL DISLOCATION: A PROSPECTIVE RANDOMIZED STUDY COMPARING SPAZO AND KOCHER MANEUVERS

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ABSTRACT

Objective: To evaluate and to compare the Spaso and Kocher reduction maneuvers in terms of efficiency, time of reduction, faciliteness, pain, discomfort to the patient, complications and risks, besides promoting the comparison between the two maneuvers, aiming to ground the emergency conduct.

Methods: A prospective study with 105 patients with acute shoulder dislocations were enrolled in the study between February 2011 and September 2012. The patients were randomized into two groups and they were submitted to the reduction of dislocation using the Spaso maneuver (group A) or the Kocher technique (group B) by first, second or third-year orthopedic surgery residents from our service. The results were evaluated and compared.

Results: There was no statistically significant difference between the two groups in terms of age, gender, timing of reduction, number of precedent episodes and complications after reduction. However, reduction was achieved in more cases using the Spaso method than it was among the Kocher group, as well as the mean duration of the reduction maneuver and discomfort were shorter in the group A patients.

Conclusions: Both methods presented good results in terms of dislocation reduction and low complications rates. Nevertheless, the Spaso maneuver was more efficient, fast and easily applicable in comparison with Kocher’s method. 

Level of Evidence I, Therapeutic.

Keywords: Shoulder dislocations. Shoulder joint. Manipulation, orthopedic/methods. Prospective studies.

INTRODUCTION

The glenohumeral dislocation is an extremely common event in orthopedic emergencies, corresponding to approximately 50% of all dislocations, and the knowledge of their management and treatment is the duty of every orthopedist.

It is known that there are numerous reduction techniques described, ranging from Hippocrates¹, through Milch,² Stimson, Kocher,⁴ traction and counter-traction, beyond the Spaso technique published by Miljesic and Kelly⁵, still little known in our midst, despite some good results in the few preliminary studies in the literature.⁶

All these approach options present, in turn, the most varied success and complication rates, such as: non reduction, iatrogenic fracture, neurovascular injury, soft tissue injury, medical team distress, pain and patient discomfort.

Despite the high incidence of shoulder dislocation and its importance in the orthopedic field, there are not, however, studies in the literature that compare the most diverse techniques regarding those mentioned aspects. Its indication is usually associated with experience and personal choice, unfounded on scientific evidence (most of the recommendations levels 4 and 5).

The objective of this study was to evaluate a traditional technique known by most orthopedists – Kocher’s technique - to a most recent one, the Spaso maneuver, which does not has yet many references in the literature; however, it has shown excellent results in a few isolated published studies. We also seek to compare both techniques regarding efficacy, reduction time, applicability, patient comfort and complications.

MATERIALS AND METHODS

This study was a prospective, randomized clinical trial, approved by our institutional Ethics Research Committee (ERC), and it meets the standards of the National Research Ethics Com-
mission (Comissão Nacional de Ética em Pesquisa, CONEP),
being duly registered by the number 05998412.0.0000.5553.
All patients included in the study signed the Free and Informed
Consent form, having been previously informed on the nature
of the study and their participation in it.
Between February 2011 and September 2012, 105 patients
with traumatic anterior glenohumeral dislocation were seen
in the Traumatology and Orthopedics Emergency Service in
our hospital. After performing the appropriate propaedeutic-
complete physical examination (including neurovascular
evaluation) and shoulder radiographs on trauma series - all
patients with confirmed diagnosis of dislocation were included
in the study, since they did not present any exclusion criteria:
use of analgesics after dislocation or fracture of the proximal
humerus, unconsciousness, refusal to sign the consent form,
failure to fill the evaluation form.
Patients were therefore randomized into two groups arbitrar-
ily by means of previously numbered charts, being pair chart
number corresponding to group A and even chart number to
group B (zero was considered as even). The first group was
submitted to reduction by the Spaso maneuver and the second
using Kocher technique. Reductions were performed by a single
Orthopedics and Traumatology resident physician, (1st, 2nd or
3rd year), and the time required for reduction was timed with a
standard clock by an assistant who did not participate in the
maneuver. The resident had three minutes to perform the re-
duction through the chosen maneuver, which occurred without
previous administration of analgesics, anesthetics or muscle
relaxants; after this period, in case of failure, he was free to try
other methods. An evaluation form was filled, which contained
the name, registration, age, gender, affected side, dislocation
time, number of previous events, fracture or any neurovascular
alteration detected before the procedure, no reduction of the
dislocation, and the time of reduction, resident year, comments,
complications, and subjective evaluation of pain reported by the
patients using a visual analogue pain scale (VAS). All residents
had previous training - theoretical and practical - regarding the
two maneuvers used.
Statistical analysis
Determining the sample size required to reject the null hypo-
thesis with $\alpha$ value set at 0.05 was obtained from the literature
review, drawing upon the effectiveness of the two reduction
methods reported in several published and evaluated studies.
Obtaining the significant difference in efficiency ratios described
for the two maneuvers of approximately 11%, with the power
of the test for the proposed hypothesis set at 80%, and the bi-
caudal test significance level at 5%, the Lehrs simplified formula
was used to estimate the number of patients in each group,
which was 43 patients.
The descriptive analysis was performed using standard meth-
ods. Student t-test for demographic variables with significance
level $\alpha$ of 0.05 (all bicaudal tests), the Chi-square test was used
to compare the effectiveness between the two methods and the
Wilcoxon-Mann-Whitney test was used to compare pain
and time needed for reduction between the groups A and B.7
The Spaso technique, according to Miljesic and Kelly, must be
performed with the patient in supine position, with his shoulder
flexed to 90°, elbow extended and the doctor keeping longitu-
dinal traction in the affected limb to promote the elevation of
the ipsilateral scapula from the exam table. (Figure 1) Traction
is maintained until the patient can relax enough to allow his
scapula to touch the stretcher. The shoulder, right now, should
be externally gently rotated to promote the reduction. (Figure 2)
Finally, the internal rotation and extension of the already redu-
ced limb is performed. (Figure 3)
The Kocher maneuver is described with the patient in the
supine position, the affected limb adducted along the body
and the elbow flexed at 90°. (Figure 4) The shoulder is then
submitted to external rotation until resistance. (Figure 5) Sub-
sequently, the patient’s arm is gently flexed maintaining the
external rotation. (Figure 6) Then, limb adduction takes place.
Finally, we proceed to internal rotation and extension, with the
reduction of the shoulder. (Figure 7)
RESULTS
A total of 105 patients were seen by the residents of the servi-
cce, during the study period, 17 having been excluded from the
study: two were unconscious, six had concomitant fracture,
five were on previous medication (analgesic, sedative or mus-
cle relaxant) and in four cases not enough data was obtained.
Thus, 88 patients were included in the study, 75 men (85.23%) and
13 women (14.77%), with no statistical difference between
the groups. The mean age was 30.92 ± 12.32 years old;
being 30.356 ± 9.604 years in group A and 30.954 ± 10.961
years in group B, with no statistical difference between them.
The right side was affected in 55 cases (62.5%), 28 in group
A (62.2%) and 27 in group B (62.8%). Both groups were also
similar regarding the time elapsed between the dislocation
and the reduction, which averaged 1.316 ± 2.067 h in group
A and 2.081 ± 1.645 h in group B. And yet, regarding the
number of previous episodes, it was 3.156 ± 3.49 in group A
and 1.907 ± 2.234 in B.

Figure 1. Longitudinal traction.
There was thus no statistically significant difference between groups regarding to demographic variables: age, gender, affected side, time of dislocation and previous episodes. There was no complication due to the reduction in any of them. (Table 1)

Reduction was achieved in 40 patients of the Spaso group (88.9%) and 30 patients of the Kocher group (69.77%), making a statistically significant difference between them (p = 0.035). The remaining patients had their shoulders reduced by another method (4 in group A and 10 in Group B); or under anesthesia in the operating room (1 in Group A and 3 in group B). The time required for the reduction was significantly lower in group A, 46.75 sec on average (range 5-180 sec) when compared to Group B, 213.837 sec on average (range 30-180 sec), with a p-value calculated by the Mann-Whitney-Wilcoxon method lower than 0.005, as well as the discomfort reported by the patient, measured by the Visual Analogue Scale which was of 3.133 (1-5 of variance) on average in the Spaso group and 3.302 (range 2-5) in the Kocher group, reflecting a p value of 0.433. (Table 2).
DISCUSSION

Glenohumeral dislocation is a very common diagnosis in orthopedic emergencies and brings to the patient high morbidity and disability. Thus, it is of importance its knowledge and proper management by the orthopedic physician. The classic mechanism of injury is described as indirect trauma on the limb which, in general, is presented in typical attitude, facilitating clinical diagnosis. Confirmation should be obtained by radiographic evaluation with the trauma series - true AP, scapular and axillary profile, as well as the neurovascular status and the presence of previously evaluated concomitant fracture.9

Once the preliminary propaedeutic is performed, there should be emergency orthopedic intervention, aiming to relieve pain, bring comfort to the patient and, especially, minimizing damage to the noble and periarticular soft tissue structures. This is where the knowledge of various reduction techniques becomes important in order to obtain better results.

### Table 1. Demographic characteristics of patients divided in two groups.

| Method of reduction | Spaso | Kocher | p value |
|---------------------|-------|--------|---------|
| Age (years old)     | 30.356 | 9.604 | 30.954 | 10.961 | p = 0.787 |
| Gender              |       |        |        |        |         |
| Male                | 39 (86.7%) | 36 (83.7%) | p = 0.770 |
| Female              | 6 (13.3%) | 7 (16.2%) |
| Side                |       |        |        |        |         |
| Right               | 28 (62.2%) | 27 (62.8%) | p = 0.956 |
| Left                | 17 (37.8%) | 16 (38.2%) |
| Time between dislocation and care (h) | 2.07 | 1.3 | 2.08 | 1.64 | p = 0.398 |
| Number of previous dislocations | 3.156 | 3.49 | 1.907 | 2.234 | p = 0.283 |

### Table 2. Reduction results in the two groups.

| Maneuver | Spaso | Kocher | p value |
|----------|-------|--------|---------|
| Efficacy | 40 (88.9%) | 30 (69.7%) | p = 0.0035* |
| Average time of reduction (sec) | 46.750 (5-180) | 213.837 (30-180) | p < 0.005* |
| Pain (VAS) | 3.133 (1-5) | 3.302 (2-5) | p = 0.433m |

As mentioned, there is a wide range of maneuvers described, since from the most ancient techniques as Hippocrates, Kocher, Milch, Stimson, traction against traction, up to the Spaso technique, published in 1998.4

The decision on the maneuver to be carried out depends on the experience of the orthopedist and personal choice, with weak grounding in scientific evidence (evidence level 4 or 5),1 in view of the lack of comparative studies among the methods. In our work, we opted for the evaluation of a classical method, described by Kocher in 1870, known by most orthopedists, cited in most published studies, with efficacy ranging from 71% to 90%.2,3,9,12,13 Our result, however, showed 69.77% reduction through this technique, with an average time of 213.837 sec and pain level reported by the patients of 3.302 on the visual analogue scale. We compared the Kocher technique to a recent technique, described in 1998 by Miljesic and Kelly, less known by most orthopedic surgeons, but that has shown very good outcomes in the few published works on the topic.5,9,12,14

According to the average described in the literature, we obtained reduction in 88.9% of cases by Spaso maneuver, taking an average time of 46.75 seconds with pain level of 3.13 on the VAS scale, on average.

The comparative analysis was in favor of Spaso maneuver, with a p value of 0.0035 obtained by chi-square test for effectiveness of the reduction between the techniques. The same outcome was obtained regarding the time required to reduce, by the Mann-Whitney Wilcoxon method, with a p value less than 0.005. The only evaluated parameter that did not show significant difference between the groups was VAS. We can infer from the data analysis, corroborated by hypothesis testing, that the Spaso maneuver was more efficient, fast and reproducible compared to Kocher’s, showing also minimal complications and being feasible by a single performer, without previous analgesia. It is known that the reduction maneuvers vary in nature: traction, lever, scapular manipulation and combined methods.9 The Spaso technique fits in traction group; however, it has important biomechanical basis, particularly anatomical.

Adapting what was described by Milch,10,15 we can consider that the shoulder has three major vector groups acting on each other, that reflect the local muscle action and act synergistically with a resultant oriented in the medial direction: horizontal (rotator cuff) oblique (teres major, pectoralis major and latissimus dorsi) and vertical (deltoid, biceps and triceps), when in the anatomical position these groups are competing with each other. (Figure 8) The act of bending or elevating the limb promotes an alignment of these vector groups that begin to act in the same direction, minimizing muscular opposition known to play a key role in the failure of any reduction maneuver. (Figure 9) Another relevant aspect is the absence of analgesia, anesthesia or sedation in our protocol. According to some authors, analgesic medication may be omitted for the treatment of acute glenohumeral dislocations, especially when employing effective reduction technique, which is fast and presents low morbidity, especially when relying on the patient’s cooperation.16

It is worth noticing that our sample, although calculated by Lehr formula, was based on data previously published. Thus, it is not possible to rule out any bias in the number of participants. And we also cannot state that it is a completely safe and...
effective method, being necessary, therefore, a larger sample group. Furthermore, patients were not previously assessed for ligamentous shoulder instability\(^8\) – a fact that could interfere with the result of the reduction maneuver, although the groups are demographically comparable, also regarding the number of previous dislocations. Moreover, due to the nature and design of this study, it was not possible masking their participants – doctors and patients. We also believe that the results obtained from each group would tend to look alike if anesthesia or sedation would be administered prior to reduction. Finally, more research is needed on a topic of such importance, especially works that compare the techniques described, since there could be other maneuvers with are equally satisfactory results.\(^{11}\)

**CONCLUSION**

We conclude that the Spaso maneuver is efficient, fast and easily reproducible, promoting the reduction of glenohumeral dislocations in a secure manner. It can also be carried out by one single person after relatively little training or experience and without analgesic drugs, muscle relaxants, anesthetics or sedatives. It also presents better results when compared to Kocher’s maneuver regarding effectiveness and speed in reducing glenohumeral dislocations. There were no differences in pain levels during reduction for both techniques. More comparative studies are needed to compare the various existing techniques in order to develop protocols aimed at improving the quality of care provided.