Evaluation of comparative results of rehabilitation of patients with acromioclavicular dislocation of the third degree treated by surgical techniques by Phemister and Vukov

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INTRODUCTION

In terms of access to treatment of acromioclavicular joint injuries, there are many controversies, especially after the appearance of works that promote "neglecting of injury", i.e. immediate physical treatment. About acromioclavicular joint dislocation and its treatment, Hippocrates said: "With the injury of this joint deformity remains, because the bone cannot be returned to its place." This statement is obviously accepted as a challenge, because until today a multitude of techniques and their modifications were published in order to stabilize the joint, more than any small joint of the human body.

The advantage of surgical treatment is given in cases of acromioclavicular dislocation of the third degree, in some cases also with injury of the second degree: when the pain persists despite the physical treatment, and in cases when the lateral end of clavicle is above the acromion and remains fixed in that position. Also in cases of posterior dislocation of this joint, where the intervention is necessary due to persistent radiating pain along that side of the neck, and in cases of obsolete dislocations due to pain and reduced shoulder strength and aesthetic disfigurement.

Goal: The aim of this paper is to give a comparative analysis of the results of rehabilitation of patients after acute injury of the acromioclavicular joint of the third degree, treated by two surgical techniques: by Phemister and Vukov.

MATERIAL AND METHODS

In this study, we investigated a total of 60 operated patients: 30 patients were operated by Phemister technique, and 30 by Vukov technique. In both groups, we chose 30 acute injuries of the third degree. Age range was 18 to 47 years, with predominance of the second and third decades.
The Phemister technique is well known and consists of an open joint repositioning and its stabilization transacromially with two Kirschner needles, which achieve stable acromioclavicular fixation.

In all 30 patients who underwent surgery with this technique, we only performed debridement of ruptured coracoacromial ligaments. Postoperatively, patients were immobilized for 5 weeks with triangle scarf. Kirschner needles were extracted in the sixth week. After two weeks of wearing scarves, patients were prescribed active elbow exercises and exercises for the shoulder in terms of elevation of 50 degrees, which they performed at home. After removing Kirschner needles and wound healing, we began with the outpatient physical treatment.

Technique by Vukov consists of the following: With the upper approach, following the axis of the lateral third of clavicle, we approach to the acromioclavicular joint. After detailed debridement of the joint, or joint capsules and fibrous elements of discoids, we perform a resection of the lateral end of clavicle, for 5-6 mm. Ruptured coracoacromial ligaments are debrided. On the upper surface of the outer third of the clavicle, near the front, i.e. the posterior edge, with a gap of 1 cm; both the cortex are drilled with three openings with 2.4 mm in diameter (Fig. 1). Clavicle is fixed through these openings with threadlike seams so that with the needle in the deep layer, we grab the solid structure of coracoacromial ligament (Fig. 2).

The lateral end of clavicle is resected for 5 to 6 mm. The drilled holes near anterior and posterior edges of the lateral end of clavicle.

The lateral clavicle is fixed only with a suture through the drilled holes, and the coracoacromial ligament belo.

Arm is immobilized with triangle scarf for two weeks. On the first postoperative day, we start with an early rehabilitation, which lasted until discharge from hospital. Immediately after release

At the beginning of the third week patient doesn’t use a triangle scarf anymore, and gradual active elevation up to full volume is allowed. The exercises are performed with the control of physiatrist and operators.

All collected data were analyzed with modern statistical methods with the help of the software package SPSS 17.0 in order to obtain valid conclusions.

RESULTS

Postoperative follow-up lasted one year. Patients are monitored after 2, 6 and 12 months after surgery. The tests were related to:
1) radiographic examination
2) range of motion in the shoulder (anteflexion, abduction)
3) shoulder strength
4) presence of pain

FIGURE 1
THE LATERAL END OF CLAVICLE IS RESECTED FOR 5 TO 6 MM. THE DRILLED HOLES NEAR ANTERIOR AND POSTERIOR EDGES OF THE LATERAL END OF CLAVICLE

FIGURE 2
THE LATERAL CLAVICLE IS FIXED ONLY WITH A SUTURE THROUGH THE DRILLED HOLES, AND THE CORACOACROMIAL LIGAMENT BELO

In both groups of patients, we compared:
1 - the length of immobilization and time for beginning with rehabilitation
2 - duration of rehabilitation
3 - total length of treatment

Length of immobilization and rehabilitation start: In patients who underwent the technique by Phemister, immobilization length was standard, 5 weeks. Outpatient rehabilitation began after 7 weeks, after wound healing from removing Kirschner needles.

In patients who underwent the technique by Vukov, immobilization lasted for 2 weeks. On the first postoperative day, we began with an early rehabilitation, which lasted until discharge from hospital. Immediately after release...
The patient continues with outpatient rehabilitation. The course of rehabilitation was divided into 3 phases with the successive inclusion of passive, active-assisted and active exercises, first without and then with resistance. Due to the quick functional recovery of the operated shoulder, rehabilitation phases were rapidly alternated. The achieved result was evaluated using the Constant score. We obtained excellent results (>90 points). Significantly different between these two groups was the time when early rehabilitation started \( p < 0.01 \).

With Vukov technique, the early rehabilitation begins on the first postoperative day, and with Phemister it begins later.

**Duration of Rehabilitation:**

Rehabilitation with technique by Phemister lasted from 30-90 days, depending on the patient (on average 60 days), and with technique by Vukov from 10-70 days (average 40 days). The duration of recovery is also significantly different \( p \ 0.01 \), with technique by Vukov the duration time is shorter, and therefore the process of rehabilitation in days is shorter than with the other technique.

*The total length of treatment*

In surgical patients, we compared two subgroups in relation to years of age, for it was evident that the longer duration of rehabilitation referred only to persons older than 35 years.

In patients younger than 30 years, who underwent surgery by Phemister technique, the entire treatment lasted 70-80 days (average 75 days), and in those where we applied the technique by Vukov it lasted from 14-30 days (average 22 days).

In patients over 30 years, who underwent surgery by Phemister technique, the entire treatment lasted from 80-120 days (average 100 days), and in those where we applied the technique by Vukov it lasted from 70-110 days (average 90 days).

By analyzing radiographic images after 2, 6 and 12 months after surgery, we noticed that there was no change in any group in the position of clavicle achieved by surgery. Also, both techniques gave good stability of the lateral end of clavicle. The difference was not statistically significant \( p > 0.05 \), which means that both techniques can be applied depending on the indication and the experience of the surgeon.

Complications occurred in 2 patients with migration of Kirschner’s needles path laterally. We had no other complications.

**Discussion**

In this comparative study we analyzed 60 patients with acromioclavicular dislocation of the third degree, who were treated surgically by Phemister technique, and technique by Vukov. We chose the Phemister technique for comparison, because it is considered extremely quality and safe, and most commonly used surgical technique for this injury in our community.

The experience with technique by Vukov dates back to 1986. and represents a new way to stabilize the lateral end of clavicle with threadlike seams for coracoacromial ligament, creating an elastic fixation.

This technique has been exposed for the first time in Belgrade, in 1988., at the East and West Combined Orthopaedic Meeting. It was published in the monograph M. Post, B.F. Morrey and R. Hawkins (ed), Surgery of the Shoulder, Mosby Year Book, Chicago, 1990.

In testing the first 4 parameters (position of the lateral end of clavicle on radiographs, range of motion, shoulder strength and presence of pain) we followed the anatomical and functional recovery of the operated shoulder. Controls were carried out after 2, 6, and 12 months after surgery.

Following another 4 parameters (length of immobilization and time for starting rehabilitation, rehabilitation duration and total time of treatment) we wanted to see with which operative technique we achieve faster recovery and returning to earlier activities of patients.
The shorter treatment is particularly important for active athletes who are often susceptible to this injury.

Analyzing the results, we confirmed our long-term clinical experience that with the technique by Vukov, in young people up to age 30, we achieve very rapid recovery, which is especially important for athletes.

Treatment of this injury in patients up to 30 years of age, lasts on average about 53 days shorter with application of technique by Vukov, compared to a technique by Phemister. In older patients, over 35 years of age, no significant differences in the length of treatment, regardless of the applied technique.

All operated athletes have achieved a full range of motion, stable joint, and painless shoulder. They were returning to sport training just after 4 weeks of surgery, and 2 weeks later they started with a full sport activities.

Parameters that we analyzed have allowed us to easily look at the causes that lead to this advantage:

1) With technique by Vukov there is an elastic fixation of the lateral end of clavicle to coracoclavicular ligament. Therefore, it is possible to quickly start with the active movements of abduction and anteflexion in the shoulder without fear of cracking these links. Also, this type of clavicle fixation does not limit the physiological rotation of clavicle during arm elevation, which is the case for transacromial fixation of clavicle with Kirschner needles.

2) The minimal resection of the lateral end of clavicle increases the joint space, and eliminating the possibility of collision of the lateral end of clavicle to the acromion, in turn significantly contributes to possible early involvement of initial exercises. It also removes the problems that arise with the possible occurrence of posttraumatic arthritis of this joint with a very narrow joint space.

With technique by Phemister, we have the following observations:

1) Rigid acromio-clavicular connection with Phemister technique conditions or complete resting for 5 weeks or only a partial elevation (due to rotational clavicle movement during elevation). The second operation, to remove the Kirschner needles, also affects the extension of the postoperative course, that is the entire treatment.

2) Partial contracture of the shoulder joint due to a period of immobilization itself, also affects the length of rehabilitation. We believe that the absence of minimal resection of the lateral end of clavicle also affects the slow progress of rehabilitation.

CONCLUSION

Based on the results and their comparative analysis we can conclude:

1) that with both techniques we achieve quality stability of the lateral end of clavicle,

2) that the average length of rehabilitation in patients up to age 30, is significantly different comparing Phemister’s technique and the technique by Vukov in favor of the latter,

3) there are no significant differences in the length of rehabilitation in patients over 35 years comparing both techniques.

4) in patients over 35 years, we prefer Phemister technique as a safe and easier to perform.

Well-chosen surgical technique and precisely aimed early rehabilitation with acromioclavicular separation, give a full and fast restitution of function of the shoulder joint and arm as a whole.

SUMMARY

EVALUACIJA UPOREDNIH REZULTATA REHABILITACIJE BOLESNIKA SA AKROMIOKLAVIKULARNOM DISLOKACIJOM III STEPENA LEĆENIH HIRURŠKIM TEHNIKAMA PO PHEMISTERU I VUKOVU

Uvod: U pogledu pristupa lečenju povreda akromioklavikularnog zgloba i danas se vode polemike, pogotovo po tome je pojavio "zanemarivanje povrede". Cilj: Data je uporedna analiza rezultata rehabilitacije bolesnika nakon akutnih povreda akromioklavikularnog zgloba III stepena rešavanim dvama hirurškim tehnikama: po Phemisteru i Vukovu. Materijal i metod: U ovoj studiji ukupno je ispitivano 60 bolesnika - 30 je operisano tehnikom po Phemisteru, a 30 tehnikom po Vukovu. Rezultati: Postoperativno praćenje bolesnika je trajalo godinu dana. Značajno je različito izmedju ove dve grupe vreme kada je rehabilitacija započela p<0.01. Kod tehnikе po Vukovu sa rehabilitacijom se počinje prvog postoperativnog dana a kod tehnikе po Phemisteru kasnije (ambulantno nakon 7 nedelja). Rehabilitacija je kod tehnikе po Phemisteru trajala u proseku 60 dana, a kod tehnikе po Vukovu u proseku 40 dana. Takođe je i značajno različito vreme dužine trajanja oporavka p< 0.01, koje je kod tehnikе po Vukovu kraće te samim tim i proces rehabilitacije u danima je kraći nego kod druge tehnikе. Obe tehnikе su dale dobru stabilnost lateralnog kraja klavikule. Značka nje statistički značajna p>0.05, što znači da se obe tehnikе mogu primjenjivati u zavisnosti od indikacija i iskustva hirurga.

Ključne reči: akromioklavikularna dislokacija, hirurški tretman, rehabilitacija.

BIBLIOGRAPHY