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FUNCTIONAL RECOVERY BY KINETIC TREATMENT OF THE POST-TRAUMATIC ELBOW DISLOCATIONS

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Abstract

Objective. The purpose of the study is to analyze the use of kinesiologic means in the functional recovery of the post-traumatic elbow dislocations.

Methods. This paper is based on a clinical study of 40 patients (20 women and 20 men), with various conditions of the elbow. The recovery program was carried out in "Kinetomedica" Clinic – Bucharest from 2015 to 2016. The following symptoms were analyzed during this study: elbow pains, mobility limitation, swelling of elbow joint perimeter, muscle hypotrophy and hypertrophy of the arm and forearm. The real efficiency of the kinetic program was highlighted on the basis of the parameters monitored during the study, evaluated at the beginning and the end of the treatment.

Results. Generally, the success of the treatment involved not only the good coordination of the kinetic procedures but also the good collaboration and communication with the patients that followed the therapeutic recommendations closely. It was found out that all patients had improvements on different clinical levels, as shown by the general clinical score, namely: pain (at loading and mobilization), muscle hypotrophy of the arm and forearm, limitation of elbow mobility (in flexion and extension) and muscle impairment (in flexion, extension, pronation and supination).

Conclusions. In conclusion we can confirm that the creation and use of an individualized posttraumatic recovery program, associated with periodical evaluations, lead to favorable results in the shortest possible time.

Key Words: evaluation; symptoms; general clinical score; kinetic program, recovery.

Introduction

During the daily life gestures, the two upper limbs work together with well-defined spatial relations between them. These relations are mainly ensured by the integrity of the elbows. The everyday and professional life require the power, precision and strength of the arms which is not possible with an elbow with sequelae because a damaged elbow decreases very much the functions of the entire upper limb (Stănescu & Popescu, 2018).

The dislocation of the elbow is defined as a permanent separation of the upper ends of the forearm bones related to the lower end of the humerus in the elbow joint (Gornea, 2010). The elbow joint includes 3 articulations: humero-cubital, humero-radial and proximal radio-ulnar one (Papilian, 2003; Popescu, 2005; Vad, 2001). In this regard, in terms of bio-mechanics, the elbow joint makes possible the following movements: flexion-extension of the forearm upon the arm (characteristic movement of the trochlear arthrosis), lateral rotation (supination) and medial rotation (pronation)

(Buzescu, 2002; Timnea & Baican, 2018).

The improperly treated or neglected post-traumatic dislocations can have the following forms: inveterate dislocation (when the reduction is postponed), irreducible, incoercible and recurrent one. Depending on the direction of movement of the forearm bones, the dislocations can be: convergent, divergent, dislocations of radius only and dislocations of ulna only (Țapu, Gornea, Coproș et al., 2010; Brent, Brozman, Kenin, & Will, 2004; Panait, 2002).

The kinesiotherapy has well defined purposes, aiming at the relief of symptoms or at maintaining the health status. The kinesiotherapist must collaborate with the attending physician and the psychologist (Cordun, 1999; Geambașu, 2008; S Benghe, 1981).

High quality therapy requires customized kinetic treatment, continuous monitoring of the patient and periodic functional evaluations (Balint, Diaconu, & Moise, 2007; Wyss, & Patel, 2013). The feedback and the intermediate evaluations are the basis of an efficient recovery program (Nica, 2004). Thus, the kinesiotherapy has the purpose to recover the

functional independence of the patient, to diminish the unsteadiness, to reduce the helplessness, to normalize the patient's life. The well established rules are associated with some principles that guide the activity of each kinesiotherapist (Bratu, 2011; Ispas, 2005; Sidenco, 2005).

The sequelae are determined by the de inactivity to which the patient is submitted because of the type and severity of the dislocation entailing the immobilization of the limb for a certain period. In this case, the most important is the total recovery because a deficient elbow leads to negative results, reduced movement amplitude and repercussions on the adjacent joints. It is necessary to recover the flexion movement otherwise the patient will not be able to perform useful movements in daily life (Burgehele & Faur, 1997; Kiss, 2007; Slăvilă, 2016).

The traumas of the upper limb determine morphological and functional modifications that require a specialized kinetic treatment enabling a normal life (El-Bsat, 2008; Poenaru et al., 1985).

This paper intends to reveal the therapeutic importance of the recovery of the post-traumatic elbow dislocation. In most cases, it is hard to regain the mobility of an elbow with sequelae because the elbow is the joint that is the most difficult to recover, partially or totally.

The purpose of the paper is to show the efficient use of the kinesiotherapy means in the functional recovery of the post-traumatic elbow dislocations.

The hypothesis of the paper consists of the creation and use of an individualized post-traumatic recovery program associated with periodic evaluations leading to favorable results in the shortest delay.

Methods

This paper is based on a clinical study involving 40 patients with various conditions of the elbow, who benefited by a recovery program carried out in "Kinetomedica" Clinic of Bucharest from March 2015 to March 2016.

A questionnaire for the evaluation of the clinical parameters was used in this study, analyzing the following symptoms: pain in the elbow, limitation of mobility, swelling of elbow articular perimeter, muscle hypotrophy and hypertrophy of the arm and forearm. The clinical parameters received marks from 0 to 5 points, depending on the severity of the injuries. The questionnaire was applied at the beginning and at the end of the treatment in order to highlight the clinical progress. There were used 3 classes of severity: major severity: 0 – 10 points; moderate severity: from 11 to 20 points and minor

severity: from 21 to 30 points. General clinical score = 30 points.

The evaluation of elbow functional level started with the anamnesis, inspection, palpation and tapping followed by the articular testing (elbow flexion – normal value 145° active status and 160° passive status) and the muscular evaluation (flexion of elbow – main muscles involved in flexion: brachial biceps, brachioradial muscle and anterior brachialis muscle) (Kendall Peterson, F., 1988).

The studied group was analyzed taking into account the following criteria: gender, age, life style, surgical intervention undergone or not. Regarding the gender criteria, the group was equally constituted of 20 female-subjects (5 women aged 20 – 30 years, 7 women from 30 to 40 years old and 8 women from 40 to 50 years old) and 20 male-subjects (8 men aged 20 – 30 years, 3 men aged 30 to 40 years and 9 men aged 40 to 50 years). Out of the total number of 40 patients, only 5 underwent a surgical intervention on the elbow resulting in various levels of mobility loss.

In terms of life style, a number of 5 types were identified: 1) normal one – involving normal life conditions, with basic efforts of the elbow; 2) sports type – namely an active life style, with moderate-intense effort of the elbow; 3) sedentary type – that means a slow life style, without efforts of the elbow; 4) professionally active type – involving an intense effort of the elbow ; 5) neutral professional type – a professional activity without any specific stress at elbow level. The 40 patients were identified as follows: normal type – 11, sports type – 3, sedentary type – 5, professionally active – 14, professionally neutral type – 7.

The clinical parameters were evaluated at the beginning and the end of the kinesiotherapy program for pointing out the progress of the clinical status.

The content of the kinetic program used for the recovery of the post-traumatic dislocations:

1-4 days:

- Immobilization of the elbow at 90° flexion in a posterior splint padded with cotton-wool, over a period of 3-4 days;

- Easy exercises of fist closing with a tennis ball or plasticine – Avoidance of passive mobilizations on movement amplitude at fist level (the patient can make these movements when the splint is removed and replaced by an elastic bandage) – Avoidance of elbow valgus stress;

- Cryotherapy and hydrokinesiotherapy.

4-14 days:

- The posterior splint is replaced by elbow orthosis

- Fist and fingers move freely (thanks to the passive mobilizations) on movement amplitude in all planes

- Active mobilizations of the fist, avoiding the valgus stress

- Exercises of extension-flexion, pronation-supination: - sitting down position, the arm, elbow and forearm put on the table; the forearm will slip, starting from elbow joint, on the table surface – the patient, sitting down, keeps the upper limb hanging and makes the flexion movement trying to touch the shoulder – from sitting down position, abduction of the upper limbs (90°), the subject tries to touch the shoulder keeping the same position – sitting down position, arms along the body, elbow in direct contact with the trunk, the subject makes the pronosupination movement - sitting down, hands open, the patient puts the palms together and makes rotations

- Isometric multi-angular flexions

- Isometric multi-angular extensions (avoiding valgus stress)

- Rotations of the fist

- Flexions and extensions of the forearm upon arm; thus the biceps is actuated and toned –sitting down, the upper limb supported at elbow level, full flexion-extension with a weight in the hand

- Exercises for shoulder joint: flexions, extensions, internal rotations, abductions and adductions. The external rotation must be avoided because it causes the valgus stress of the elbow

2 – 6 weeks:

- The degree of freedom of the orthosis is set on 0° to enable the flexion made with full amplitude.

- Pre-progressive exercises of fist and elbow – sitting down, with elbow and forearm on the table,

hand outside the supporting surface, the patient makes auto-passive progressive flexions and extensions

- Long term and 5-6 weeks long stretching with small size weights, helping the patient to regain extension. - sitting down, with elbow on the table, a variable weight dumbbell in the hand, the subject tries to bring the forearm close to table surface;

- Gradual progressivity by rotations with weights (e.g.: elbow extension);

- Initiation of exercises specific to certain sports (swimming, volleyball);

- Exercises involving the internal and external rotation of the shoulder, started during the weeks 6 to 8;

- Approximately during the 8th week of rehabilitation of the asymptomatic patient, the program of „throw intervals” shall be started (characterized by the increase of throw distance);

- If the patient is practicing the sports it is not recommended to let him or her go back to the sports ground without 80-90% recovery of the dislocated limb.

Results

Regarding the limitation of elbow mobility, a number of 7 subjects, namely 17.5% did not have a functional flexion, especially the post-surgery patients; this incapacity was caused by the retraction of the brachial triceps. After the treatment, only 3 patients (namely 7.5%) still had a major deficit of flexion, requiring systemized recovery procedures conducted throughout a longer period (table no 1).

Table 1. Pain at loading and mobilization

Indicators	Before treatment		After treatment	
	Patients no	%	Patients no	%
Loading	13	32.5	7	17.5
Mobilization	21	52.5	13	32.5

Almost all patients, namely 92.5%, experienced difficulties in extension. After the 10 sessions of recovery, the percentage decreased considerably until

52.5%, which means an important improvement of the functionality (table no 2).

Table 2. Differences between SKF method and NIR method

Indicators	Before treatment		After treatment	
	Patients no	%	Patients no	%
Flexion	7	17.5	3	7.5
Extension	37	92.5	21	52.5

Table 3. Hypertrophy of the arm and forearm

Segments	Before treatment		After treatment	
	Patients no	%	Patients no	%
Arm	12	30	5	12.5
Forearm	13	32.5	3	7.5

Table 4. Affection of muscle strength

Functional movements	Before treatment		After treatment	
	Patients no	%	Patients no	%
Flexion	7	17.5	3	7.5
Extension	10	25	5	12.5
Pronation	12	30	9	22.5
Supination	7	17.5	2	5

The most significant results were the ones regarding the hypotrophy: out of 12 patients with major hypotrophy of the arm and 13 patients with major hypotrophy of the forearm (namely 30% and 32% out of the total number of patients), only 5 and 3 respectively still have hypotrophies at the end of the treatment, but with a better muscular tonus. At the end of the treatment, only 12.5% and 7.5% respectively were still included in the muscles recovery program (table no 3).

As for the damage of the muscular strength, a number of 4 functional aspects were monitored (table no 4): flexion, extension, pronation and supination. Hence, in terms of flexion, 7 patients, namely 17.5%,

Discussion

The real efficiency of the kinetic program was highlighted by the studied parameters, evaluated at the beginning and the end of the treatment. In general, the success of the treatment was based not only on the good coordination of the kinetic procedures, but also on a good collaboration and communication with the patients who observed the therapeutic recommendations closely. All patients had improvements of several clinical aspects and the tables above show us the parameters of the general clinical score, namely: pain (at loading and mobilization), muscular hypotrophy of arm and forearm, limitation of elbow mobility (in flexion and in extension) and muscular affection (in flexion, extension, pronation and supination).

So, in the case of pain, 32.5 % of the total of 40 patients had pains at loading. After 10 therapy sessions, the pain at loading diminished up to 17.5%. Regarding the pain at mobility, this one was more frequent, registering a score of over 50%, respectively 52.5%, which means that more than half of the patients experienced rather severe pains at mobilization (their main source of discomfort).

had flexion strength of 3 and after the treatment 4 of them reached flexion strength of 4 – 5. Three of these patients, although had some improvements, underwent the treatment for a longer period of time. In the case of extension, initially 10 patients were the most affected, namely 25%, and after the treatment only 5 of them, respectively 12.5%, kept the triceps strength value of 3. Pronation was affected in 12 of the patients, which mean 30% of the total number of patients; in the end, 9 patients (22.5% respectively) continued the treatment. As for the supination, the percentage is more generous, namely from 17.5% to 5%, due to the supination strength of the brachial biceps, which recovers faster.

The following principles must be respected when preparing the kinetic program (Cordun, 1999; Dee, Mango, & Hurst, 1996; Mârza-Dănilă, 2012; Sbenghe, 1981): principle of earliness and determination of the diagnosis; principle of earliness in the establishment of the kinetic treatment; principle of treatment individualization; psychological-pedagogical principles; principle of patient's motivation; principle of treatment complexity; principle of progressivity; principle of absence of pain; principle of awareness; principle of independent activity; principle of the economy of effort; principles of hygiene; principle of treatment continuity up to the recovery.

The dislocations occur when the fall is on the hand, with the forearm in extension and supination related to the arm, mainly in young people and women, because these ones have a normal hyperextension caused by an insufficient development of the coronoid and olecranon, favoring the posterior and external dislocations mainly (Antonescu, Barbu, Niculescu, & Panait, 2001; Jianu, & Zamfir, 1995).

In all the cases of dislocation, the patient complains of pain and total functional helplessness,

which are subjective signs. From an objective point of view, the inspection will reveal a vicious attitude of the respective segment, associated with the deformation of the region (Tomoaia, 2004).

The elbow dislocation has maximum incidence from 30 to 65 years old, in men predominantly (Ispas & Cuculici, 1997). The bibliographical analysis highlighted that most of the elbow dislocations are the result of falls with the forearm in extension; the most frequent form is the posterior dislocation (80%).

Each type of dislocation has a different form (Barsotti, Cancel, & Robert, 2013): in the posterior-external dislocation, the forearm is in pronation, the humeral epitrochlea and trochlea are more obvious on the medial side of the elbow; in the posterior-internal dislocation, the forearm is in supination, while the epicondyle and the condyle are more protuberant on the external side of the elbow; in the anterior dislocation the elbow is in extension; if the dislocation is incomplete, the arm seems to be elongated; if the dislocation is complete, the elbow is in flexion and the arm seems to be shorter on the anterior side; in the sub-dislocation, the deformation is minimum if the cubitus aplasia is minor and the radial head is dislocated; in the complete dislocation, the cubital aplasia is very important, the radius is dislocated completely and can be seen even in infants or children.

The fractures associated with the dislocation affect mostly the radial head or the coronoid process; in this case, the injury is called complete dislocation. The radiographic examination is a binding and important element for diagnosis establishment. Any doubt is solved by means of a computed tomography (CT scan) or magnetic resonance imaging (MRI scan) (Crețu, 2005).

The pain is one of the symptoms violently present at the moment of the dislocation; it will decrease gradually after 2 or 3 weeks. In the unstable dislocations, the immobilization lasts about 3 or 4 weeks, entailing a limitation of the joint mobility (which can be recovered throughout a period of 6 months approximately).

The massage, as recovery method, is totally contra-indicated because it has secondary effects on the elbow joint and can lead to calcification and creation of haematoma (Drăgan, 2002).

The kinetic treatment uses specific kinetic means (physical exercise, postures, and mobilizations) but also the non-specific ones (cryotherapy, electrotherapy, hydro-thermo-therapy and paraffin wax wraps). The objectives of the recovery are systemized per durations as follows: the first 4 days, the next 10 days, the weeks 2 to 6 and 6 to 8.

The creation of an individualized program for quality recovery associated with periodical evaluations lead to favorable results in a short time. The therapeutic objective during the immobilization is to keep the normal function of the adjacent joints (shoulder, fist, fingers).

In conclusion, we can confirm that our study proved that the post-traumatic elbow dislocation can be totally recovered provided that the kinesiology means are properly used for the creation of the kinetic program.

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