

KINETHERAPEUTIC APPROACH IN THE REHABILITATION OF ELBOW JOINT SPRAINS IN ATHLETES

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Abstract: Continuous analysis and modification of these programmes are intended to achieve better health standards. Maintaining physical fitness and recovery differ in terms of starting points, final goals and the intensity of exercises in pursuit of these goals. The physiotherapist's objective is to return the injured athlete to competition as quickly and safely as possible, with minimal risk of recurrence. This requires an accurate diagnosis in order to provide the right care, establish an optimal recovery programme and make a responsible prognosis regarding the period in which the proposed goal can be achieved. In the kinetic chain of the upper limb, the elbow is functionally subordinate to the shoulder and, in terms of purpose, to the hand. The elbow is considered the most difficult joint for mobility recovery, not only because of its structure, but also because of the ease with which periarticular calcific deposits or muscle retractions develop, further limiting mobility. Elbow injuries themselves, but also the immobilisation of the elbow required by these injuries, often cause tight stiffness that is difficult to reduce. [12]

Introduction

Elbow dislocations are represented by a permanent displacement of the upper ends of the two bones of the forearm in relation to the humerus in the humeroulnar joint. Elbow injuries themselves, but also the immobilisation of the elbow imposed by these injuries, often cause tight stiffness that is difficult to reduce. Although regaining mobility in a sequelae elbow often remains a difficult problem, the elbow being the joint that is most difficult to recover, and although complete recovery of elbow function is often not achieved, and complete restoration of the angles or useful ranges of motion is not always possible, I decided to address this topic because

spectacular results can be achieved in the above-mentioned areas with the help of physiotherapy. [3,8]

The hypothesis we started from was whether the combined use of manual therapy techniques with classic physiotherapy techniques can restore optimal mobility for continuing sports activities in competitive athletes with elbow dislocation without fractures of the articular epiphyses. [4], [7]

The aim of the research is to show the importance of the kinetic programme in the complex rehabilitation of athletes who have suffered an injury to the elbow joint, restoring optimal mobility of the elbow joint and enabling them to resume sporting activity.

It is recommended that goniometric measurement be performed using a graduated board placed on a table of appropriate height. The patient, sitting on a chair, is placed with the arm firmly fixed to the table, on the hatched angular area of the board, with the tip of the olecranon in the centre of the board, with the forearm oriented at the zenith, holding in his hand a stick whose length exceeds the diameter of the graduated circle of the board. The amplitude of movement is monitored by looking down from above. [9,11]

The normal average range of active pronation-supination is 180°. The range of passive pronation-supination is 190°, so the difference between passive and active mobility is 10°. The arc of the circle on which the movement is performed starts from the maximum supination position, considered as the zero point (the starting goniometric position), and ends at the maximum pronation position, considered as the final goniometric position. Normally, the semicircle on which the movement is performed is not located exactly in the frontal plane, but shifted in the supination direction by 15°. The amplitude of pronation-supination varies with age, gender, training status and individual characteristics of the subjects. Advancing age leads to a decrease in the range of motion, and women have a greater range than men. [5]

In sports, force and technique is now complex, rapid, adequate to the varied game situations and with a permanent opposition, we find the situations when elbow dislocation ranks second in frequency after scapulohumeral dislocation and occurs more frequently in wrestling, skating, skiing, horse riding, football and judo. Explosive strength or muscle power plays a decisive role in the motor performance of all athletes. According to Savu V.C. (2018), sequential motor training methods increase the efficiency of the training process, an element that can be transposed into physical therapy for the progressive assessment and adaptation of therapeutic exercises in the rehabilitation of athletes' joint injuries.[10,13,14]

The symptoms of elbow dislocation are spontaneous and violent pain and a feeling of pressure inside the joint, a sensation exacerbated by attempts to move the elbow or by palpation and deformation of the elbow. [3]

On examination, the elbow appears deformed, swollen, and edematous, with the olecranon protruding posteriorly. The position and appearance of the posterior limb

are characteristic, with the patient supporting the forearm with the healthy hand, in a 130°-140° semi-flexion, the hand in pronation due to tension in the biceps and pronator teres. In posterior dislocations, viewed in profile, the forearm appears shorter, and before the onset of oedema, the olecranon protrudes below the triceps, extending posteriorly beyond the plane of the humeral head.

Recovery begins during immobilisation and aims to maintain the best possible mobility in the other joints and ensure lymphatic drainage. These objectives are achieved through flexion-extension movements of the hand and intermittent maintenance of certain positions of the upper limb. In order to speed up the healing process, one diaphysis session every 2-3 days is recommended.

After removing the cast, active flexion-extension and pronosupination movements are recommended, while passive or forced movements, traction, high-load movements and massage, which promote periarticular calcifications, are contraindicated. Active movements in water or with the help of pulleys are also recommended, with sports activities being resumed 6-8 weeks after the accident.

Material-method

Recovery after immobilisation suspension has several objectives: pain relief and inflammation reduction using anti-declive postures, analgesic and anti-inflammatory medication, electrotherapy using low-frequency current (iontophoresis, diadynamic therapy), radiotherapy and ultrashort waves, and the second objective is to combat vascular-trophic disorders through anti-declive postures, massage, electrotherapy, and alternating hydrotherapy. To increase joint mobility, postures are maintained for as many minutes as possible, depending on the onset of pain. Passive movements are not recommended in cases of elbow trauma. The only movements allowed are pronation-supination with the elbow flexed at 90°. Autopassive, free active and active movements with eccentric resistance (low resistance) are also used. Active movements initially target extension training because, after immobilisation in a plaster cast that keeps the elbow in flexion, the biceps brachii tendon shortens. Stretching methods are also used, which are based on stretching the tissues to maintain or increase the range of motion. Joint stability is restored through isometric contractions, stretching, pulley therapy and concentric movements. Another objective of the kinetic programme is to increase muscle strength. Isometric contractions and active movements with concentric resistance are recommended.

Muscle balance. In the case of the elbow joint, the strength values of the palmar flexors will be tested with a dynamometer (representing 50% of body weight in girls and 65% in boys).

Resting muscle tone values are 50–60 U.z. for girls and 60–70 U.z. for boys. Contraction values are 110–120 U.z. for girls and 120–150 U.z. for boys. The greater the difference, the more efficient the working capacity; at least 30 U.z. are required for girls and 40 U.z. for boys.

Elbow flexion. The muscles tested are: biceps brachii; anterior brachial; brachioradialis.

Gravity-free position: sitting with the arm at 90° on the table or supported by the examiner.

Anti-gravity position: sitting with the arm at the trunk.

Substitution: in the weightless position by the flexors of the fist, when the fist is fixed.

Elbow extension

Muscles tested: triceps

Gravity-free position: sitting with the arm at 90°, forearm flexed and supported on the table or held.

Anti-gravity position: lying prone with the forearm flexed at the edge of the bed "hanging" or sitting with the arm raised to the zenith and the forearm fully flexed.

To be stabilised: humerus

Forearm pronation

Muscles tested: pronator teres and pronator quadratus.

Non-gravity position: sitting, with the arm flexed at 90°, the forearm supinated, the fist and fingers relaxed

Anti-gravity position: sitting, with the arm at the trunk, elbow flexed at 90°, forearm supinated, fist and fingers relaxed.

Forearm supination

Muscles tested: short supinator and biceps brachii.

The positions are the same as for pronation, but the movements are in the opposite direction.

Joint testing

Joint assessment involves measuring the range of motion in the joints in all directions of movement. In general, the goniometric method is used to measure the maximum angle of a movement, using a device called a goniometer.

Elbow flexion

Flexion starts at 0°, reaching 145° - 160° (the first figure for active flexion, the second for passive flexion).

The preferred position for measurement is supine or standing with the elbow in full extension, the arm close to the body and the palm facing forward.

The fixed arm of the goniometer is placed on the midline of the outer side of the arm, facing the acromion, and the movable arm on the midline of the radial side of the forearm, facing the styloid.

Elbow extension

Extension is the return of the forearm to the 0 position. From the anatomical position, the elbow has no extension except in special cases of hyperlaxity, when a hyperextension of 5° [1,2]

- 10° can be achieved, especially in women and children.

Elbow pronation

Pronation is the movement of the palm downwards and progresses from 0° to 90°.

The preferred position is standing or sitting, with the elbow at 90° fixed to the trunk and the hand with the thumb up. The fixed arm of the goniometer is placed on the dorsal side

of the fist, parallel to the humerus. The movable arm is placed, after performing the pronation movement, along the styloids. There is another alternative method, preferred by some (C.A. Trombly, A.D. Scott) as being simpler: from the intermediate position, a pencil is held tightly in the hand, extending well above the fist. The fixed arm of the goniometer is oriented perpendicular to the floor (the goniometer supported by the third metacarpal). Rotating the fist in pronation will bring the pencil into a horizontal position, measuring the angle achieved with the movable arm of the goniometer.

Supination of the elbow

Supination, with the same 90° range as pronation, is assessed using the same measurement technique, except that the goniometer arms are placed on the volar side of the hand.

The pronosupination movement is greatly amplified by the rotation of the humerus, reaching almost 360°: internal rotation contributes 150° and external rotation 30°.

Treatment through manual therapy – joint manipulations

Passive movement is a movement of a segment performed by another person manually or with various assistive equipment. Passive movements can be related to accessory joint movements (rolling, sliding, gliding) or physiological movements. Physiological movements are those that can be performed freely by the subject. An exaggerated increase in mobility risks causing instability – which means a lack of muscle control over certain degrees of movement. Patient examination

The elbow joint is a joint complex described above which, from a functional point of view, consists of joints belonging to two segments of the elbow itself and the forearm.

Movement is limited in flexion by the muscle mass of the triceps brachii and anconeus muscles and by the entry of the coronoid process of the ulna into the coronoid fossa of the humerus. In extension, movement is limited by the extensibility of the biceps brachii, brachialis and, in particular, the pronator teres, as well as by the entry of the olecranon process of the ulna into the olecranon fossa of the humerus.

When attempting lateral tilting of the ulna (abduction), there is a slight lowering of the radial head in the proximal radioulnar joint, which allows a movement of approximately 6°, and conversely, when attempting a medial tilting movement (adduction), this can be achieved over an arc of 6° by raising the radial head in the proximal radioulnar joint. These movements can be tested especially on the last arc of movement before full extension of the elbow, this movement being usually

associated with forearm abduction.

SPECIAL TESTS

Much has been written about the accessory movements that occur in the last degrees of extension (abduction and adduction), with Mennell being one of the first to do so. Extension through adduction and extension through abduction are two movements that must be examined when active extension becomes "normal". Similarly, the flexion movement that can be performed with either adduction or abduction should also be examined. The manoeuvres used to determine the degree of mobility are the same as those that can be used to treat the mobility problems tested.

Four manoeuvres can thus be described: two manoeuvres for testing adduction/abduction mobility from maximum extension and two manoeuvres for testing adduction/abduction mobility from flexion as movements belonging to degree IV mobility.[15]

The study was conducted at the F.E.F.S. Galați Kinetotherapy Centre. The materials used in this study consisted of instruments such as a device with graduated discs, dumbbells, a medicine ball, a ball, a stick, roller skates, elastic bands, a pulley cage, and a multi-joint table.

During this research, we had a group of 6 patients, presented in Table 1.

Table 1 - Subjects included in the study

STUDY GROUP						
Patient name	G.A.	P.M.R.	A.A.	C.A.	M.I.	L.P.
Diagnosis	Posterior-external dislocation	Posterior dislocation	Postero-external dislocation	Postero-external dislocation	Postero-external dislocation	Posterior dislocation
Date of registration	January 2024	January 2024	January 2024	January 2024	February 2024	February 2024
Sport practised	Gymnastics	Football	Freestyle wrestling	Freestyle wrestling	Volleyball	Football
Recovery period	14 sessions	14 sessions	14 sessions	14 sessions	14 sessions	14 sessions
Age (years)	19	20	20	19	22	21
Gender	M	M	M	F	F	F

This study was conducted between 15 January 2024 and 15 May 2024, with the following stages:

Stage I (15 January – 15 February)

Stage I involved theoretical documentation through consultation of specialist literature. The aim was to assimilate as much knowledge as possible and to observe how specialists approach the pathology and recovery of elbow conditions in general, as well as the importance of eccentric control

in the recovery programme.

Stage II (15 February – 20 April)

In stage II, exploration and evaluation methods were applied in order to observe the evolution of patients within the investigated parameters, to make a comparison between the initial and final tests, in order to verify the effectiveness of the applied means.

Stage III (20 April – 5 May)

Recovery methods and treatment programme

Patients were monitored during the 15 sessions, focusing only on the evolution of joint mobility, thus allowing them to resume sporting activities.

Treatment stages

- functional mobility recovery stage
- stage of restoring muscle strength and joint stability
- stage of regaining controlled ability and reintegration into competitive sports activities and complementary techniques. The following techniques and procedures are performed for this purpose:
 - classic decontracting massage, slow and deep with anti-inflammatory gel ointment, focusing on the brachial biceps, pronator quadratus, often contracted with a tendency to retract, and the brachial triceps. For this, the patient was seated on a chair with the elbow and forearm resting on the bed (multi-joint table). The patient's chair was positioned so that there was a 90° angle at the elbow. During the massage, emphasis was placed on any tendon, capsular or ligament pain.
 - Cyriax massage (deep transverse) – on all points found to be painful during the classic massage. The Cyriax massage protocol was to follow up on the painful points for at least 5 sessions from the moment of discovery by performing a 3-minute session for each ligament, capsular or tendon point. The presence of painful points in the biceps, triceps or pronator quadratus tendons, as well as in the ulnar collateral ligament, is a contraindication for continuing with other techniques that involve stretching these structures.
 - passive mobilisations – throughout the entire range of motion, slow, without final tension, to prepare the joint for manual therapy techniques.
 - Manual therapy – involving a series of manoeuvres aimed at regaining physiological movements on the one hand and accessory joint movements on the other. [7]

Treatment:

1. ORTHOPEDIC-SURGICAL
 - Reduction of dislocation
 - Immobilisation in a plaster cast for 5 days,followed by an elastic bandage.
2. IMMOBILISATION PERIOD

- Classic massage
- 3. PERIOD AFTER IMMOBILISATION
 - 4 sessions – massage and manual therapy
 - 5 sessions – massage, manual therapy and passive, active and active resistance movements
 - 5 sessions – active movements
- global elbow re-education exercises
- active mobilisations (basis for elbow recovery) and active movements with resistance

STUDY GROUP

Patient name	G.A.	P.M.R.	A.A.	C.A.	M.I.	L.P.
Diagnosis	Posterior-external dislocation	Posterior dislocation	Postero-external dislocation	Postero-external dislocation	Postero-external dislocation	Posterior dislocation
Date of registration	January 2024	January 2024	January 2024	January 2024	February 2024	March 2024
Sport practised	Gymnastics	Football	Freestyle wrestling	Freestyle wrestling	Volleyball	Football
Recovery period	14 sessions	14 sessions	14 sessions	14 sessions	14 sessions	14 meetings

Age	19	20	20	19	22	21
Gender	M	M	M	F	F	F

Results

The study group is presented in the graph above – 2 men (34%) and 4 women (66%). A predominance of trauma in women can be observed. No differences were recorded in patient progress according to gender.

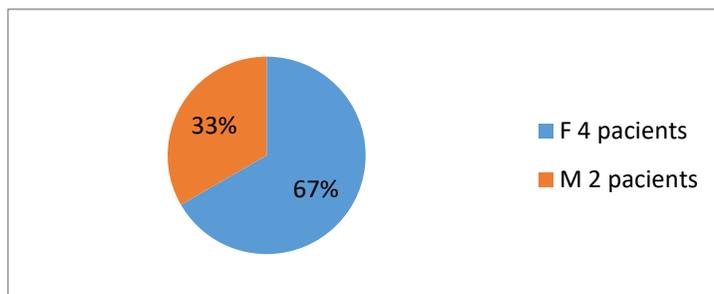


Fig. 1 Distribution of the sample by gender

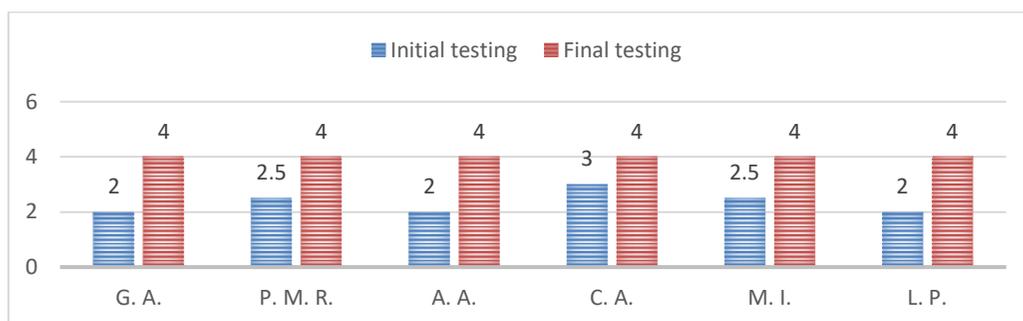


Fig. 2. Graph showing the degree of Maitland mobility in the range of motion of the elbow joint

The graph above shows an improvement in elbow joint mobility in all six patients, demonstrating the effectiveness of physiotherapy treatment for these types of trauma.

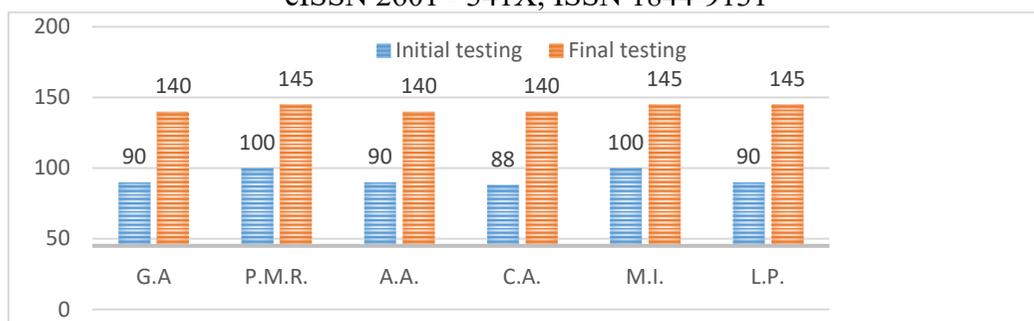


Fig. 3. Graph showing the maximum angle of flexion at the elbow joint

The goniometric method was used to measure the maximum angle of active flexion movement in the elbow joint, with the results shown in the graph above. A considerable and almost perfect improvement in the range of motion in the elbow joint can be seen, thus demonstrating the objective of the research.

Conclusions and proposals

The kinetic programme was particularly important in the complex rehabilitation of athletes who had suffered an injury to the elbow joint, restoring optimal joint mobility and enabling them to resume sporting activity. The physiotherapist and doctor must convince those who are not informed (coach, club management, teammates) not to insist on reintroducing the athlete into competition before the deadline set by the athlete.

The athlete will be advised to avoid, as much as possible, direct and violent contact with opponents, the ground or other equipment, in order to prevent another accident. The athlete should be instructed to perform physiotherapy exercises for the injured area for 15-20 minutes during training (after being declared healed). The athlete will be instructed on the risks they take when resuming training and competitions, as the injury may recur or destructive injuries may occur, and will be instructed to report any changes in pain or decrease in muscle strength felt in the injured area.

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