THE ELECTRIC STIMULATION AND THE ISOKINETIC EXERCISE IN THE HEMIPLEGIC SHOULDER.

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Abstract

The possibility of the isokinetic exercise ,in synergic action with the electro stimulation in hemiplegic patients ,is the object of this study. The first target is the postural evaluation to prevent some articular conflict that can provoke the block of the shoulder, often irreversible most of the cases. The isokinetic systems allow this mobilitation according to the physiological principles: range of motion by the articular and muscular functional possibilities. The approach begins with a functional electric stimulation for approximately 5 hours every day; the stimulus provoke a rhythmic elevation and lowering of the shoulder; during this, we position the patient on a isokinetic system and proceed first to the execution of a passive shoulder intra – extra rotation exercise; then we begin with isokinetic test for evaluate how much and the times of the active exercise possibility reprise. This method (in about 70-80% of the cases) has given unexpected results, expecially in the autonomous movements recovery.

Introduction/Background

The shoulder owns wide movements. The sinovial recesses and the peri- articular muscles concur to all the movements on the plan of the space, with great liberty and many elevating thresholds of tolerance to the traumatism. The humeral head is large fore the glenoid fossa, allowing greater range of motion but less stability. The stability is augmented, however, by the glenoid lips, the rotator cuff (combined tendons of the subscapularis, supraspinatus, infraspinatus, and teres minor that fuse with the joint capsule), the coraco acromial arch (separated from the cuff by the subacromial bursa) and the long heads of the biceps and triceps. The posture and the group integrity concur a removal in extra rotation of 90 degrees and the main anterior and back position. The maintenance of this liberty to articulate is indispensable functional necessity to the relation life. Some events after athletic or working gestures occurs, and lasting of the pain symptoms evolve in articular degenerations or lesions of the peri-capsular muscles . In hemiplegic patients (especially on the left) the shoulder pain often manifests itself without this kind of event (NMR confirm the absence). The pain is also present, most of all without limb movement, and it seems to be imputable to forced upper limb position, often lately dynamized.

The shoulder posture often provokes the elbow and the forearm extra rotation, with the arm collected contiguously the trunk, the pending hand pale and the fingers lucid. It's very important to prevent this condition negative evolutions.

The onset has been intentionally examinee considering all that is anatomically used for the scapulohumeral posture.

In those patients is always visible an incorrect position of the spine, with curved back learning upon neck and shoulder drop.

Therefore obvious the muscles fall of tone and throfism. We find a yielding of the articular stabilizer muscles (deltoid, supraspinatus, sottospinatus), which lose the humeral head centering properties, provoking the lateral sliding of the scapula and preventing its lowering.

According to our experiences this condition, in the hemiplegic, can be considered and treated as vasomotory painful syndrome with nervous vegetative alterations (SUDECK-LERICHE).The inflammatory phase can last a few weeks; the pain go from the shoulder to the hand, but early reverts with the motor progresses(elevating and adducing the upper limb).

Our experiences have confirmed a precocity of whichever treatment: electro therapy, passive or active mobilization, minimize the pain present in some cases from months. Above all damage to articulate it is necessary to equally consider one very important limiting aspect of the resumption of the functionality; the treatment of the muscular atrophy. Obvious how much the innervations lessening and the vascular damage provoke a fast trophy and tone fallen.

The rotator cuff and the scapula elevator are the most interested.

Methods

Since 1993 our group has experimented the electro stimulation together with the isokinetic system for the spinal cord injuries and nervous peripheral syndromes, for 2 possibilities:

1) correct patient' s arm or leg positioning according to the motion and articular situation;

2) full security of exercises, always tutored according to the possible range of motion respecting the muscular insertions and force to execute.

The electric stimulation works with the muscular group all at once.

a) FIRST PHASE The rehabilitative approach has been set up with functional electric stimulation , for approximately 5 hours every day; the positioning of the electrodes provokes to a continuous rhythmical elevation and lowering (approximately 10/15 degrees) of the shoulder and the contraction doesn't provoke any muscular spasms or clone. We have positioned a triangular pillow under the armpit and, if possible, we invite him to supine the upper limb. In this way the 80% of patients has acquired a true start of the abduction movements without elevating the shoulder. At the same time the surface pulsed galvanic electro stimulation has been aimed to the rotator cuff , in free position of the limb with a negative polarity to the motor point of the supra spinatus and the positives to trapezius. If the patient begins to abduct ,also with help and without pain, it is possible the second phase.

b) SECOND PHASE Proper set-up and patient introduction to the isokinetic system instrumental in achieving successful treatment outcomes on the first, we record the pedestal height, angle of lever arm and other pertinent system settings. The electric stimulation is applied to the triceps motor point (-) and to the deltoid, sovraspinatus (+) with low frequency, without breaks and medium tolerate intensity. The system is set to the passive mode, and, in a standing position, patients are taught how to work on internal-external rotation with limits set to maintain at least 10/15 degrees of shoulder abduction (when the arm is in adduction, blood supply to the muscle is decreased). Overall, torque values are low, speed high and motion limited. To maintain properly alignment, the patient is instructed to use the forearm without pulling up on the elbow extension. Most important, we give each patient a careful explanation of the sense of exercise and its safety features, and we stress the fact that the exercise is not painful. All the exercises during this phase are performed in the passive mode, and the workout period is limited to familiarize it to the patient. Three or four days after the passive mode performance, patients are instructed to resist internal rotation and assist external rotation. After two weeks, if possible, we progress to the isokinetic mode, beginning with no resistance to internal rotation and mild resistance to external rotation. As in any rehabilitation program, a fundamental requirement in achieving success is close monitoring of test results, exercise speeds and adaption of positions to the needs of each patient. Program regimens vary from individual to individual, and their activity level, age and anticipated future activities all contribute. The stimulation as above. After few days, when possible, we execute an isokinetic evaluation : for the neurological patients testing at 360 and 450 degrees per second usually yield reliable and safe results.

Results

The results are seriously conditioned by timeliness are the limb control and the beginning of the finger slow movements. The more the rehabilitation last (even only with electro stimulation),the easier is possible to appreciate even little clinical evolution. According with methods and the hemiplegics state of gravity, we have always had good results (80%female,70%male), with vascular increase as well, active control due to the exercise and the correct posture of the trunk. This method has given unexpected results, especially in the autonomous upper limb movements recovery.
All at once is possible the evaluation of the possible lower limb functional recovery limits.

Conclusions

The isokinetic systems (whatever they are), with their possibility to control the correct execution of any exercise, are maybe unconsidered for the neurological rehabilitation.
But using a flexible rehabilitation protocol combining home exercise and electro stimulation, various modalities and regular monitored workouts on the isokinetic system, a return to acceptable condition can be expected for most patients with shoulder neurological motility problem.
Our studies and experiences in the hemiplegic patients confer to those systems a main role for the rehabilitation motor approach, for the spinal cord injuries and peripheral neurological diseases as well.
The electro functional or therapeutic stimulation is today a reality for the primary rehabilitative approach.
Their synergic action allowed a careful optimism in the matter of nervous system injuries and its functionality recovery.

We would like to add a closing reminder that the experiences presented in this work are detailed for our clinical cases, (under physician continuous control) but most of those are incorrect in others: we explain a study not a rehabilitation protocol.