EMG FEEDBACK THERAPY IN HEMIPLEGIA; THE EFFECT IN FOREARM MUSCLES.

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Introduction

EMG feedback seems to be a successful method to decrease spastic muscle activity in antagonists and in muscles at some distance of the primary contraction (Brudny et al., 1974, Mroczek et al., 1979). In our preliminary reports we found a specific effectiveness of EMG feedback in spastic muscle activity compared to conventional physical therapy (Prevo et al., 1987 and 1980). In these studies we accomplished the influence of the reciprocal activity in the upper arm at the affected side in hemiplegic patients. Up till now it is not yet clear whether there is a difference in effectiveness of EMG feedback in reciprocal activity between proximal and distal antagonists. At the forearm, for instance, the anatomy and kinesiology is quite different. A greater number of small and separate muscles, with different functions, are situated in the forearm and the capacity to produce speed, agility, and fractionation of movements is more evoluted (Lawrence and Kuypers, 1968, Lawrence and Hopkins, 1976). On the other hand, spastic paresis is more severe, and motor function is more disturbed in distal parts of the affected arm (Bard and Hirschberg, 1965 Held and Pierrot-Desseilligny, 1966, Twitchell, 1951). So there is a real indication for improvement of function in distal parts of the arm, and particularly in the hand. According to these data it may be assumed that the effectiveness of EMG feedback on reciprocal activity will probably be different at the forearm as compared to the effect of EMG feedback on the upper arm. In this sequel study the conscious control of reciprocal activity in forearm muscles is evaluated by EMG feedback in 17 hemiplegic patients. Results at the forearm are discussed together with the conclusions of our previous studies about the upper arm.

Method

Seventeen hemiplegic patients, with a hemisphere lesion in the area of the middle cerebral artery, were selected. Hemiparesis existed for at least one year. All patients received audio-visual EMG feedback of the reciprocal activity in the flexor digitorum superficialis during dorsiflexion of the fingers, or during an attemt to move the fingers in the direction of dorsiflexion in cases in which the patients were not able to voluntarily execute an extension of the fingers. Surface electrodes were placed over the site of the flexor digitorum superficialis, where a maximal response was obtained during flexion of the fingers. The localization of the electrodes was marked on the skin. The difference between the median of 25 trials at the beginning and the median of 25 trials at the end of EMG feedback treatment was taken as a measure for the effect

of feedback during training. Before anad after treatment the mean integrated amplitude of the electrical activity derived above the extensor digitorum communis and the flexor digitorum superficialis was determined simultaneously during half maximal insometric dorsiflexion of the fingers during 60 seconds. The patient was seated in a specially constructed chair. Strain gauges were attached to the chair. The deflection of a voltmeter in front of the patients indicated the value of the force. The arm was positioned in flexion and pronation. The wrist was fixed in a slight dorsiflexion and the fingers were placed in a midflexed position. The ratio between the activity of the flexor digitorum and extensor digitorum during standardized contractions were determined before and after EMG feedback and were related to the executed force.

Results

At the end of the feedback training, with the feedback still on, all patients obtainded a decrease of reciprocal activity in the flexor digitorum superficialis during activation of the extensor digitorum communis. *A*fter treatment the decrease,achived at the end of the treatment, could not be demonstrated anymore, when compared to the values before training. The distribution of the absolute values of the integrated amplitude of the flexor and extensor muscles at the forearm during extension was rather great. The ratio between the activity of flexor and extensor muscles of the forearm before and after treatment also showed a considerable variation and no indication for an improvement of reciprocal activity after therapy could be detected in our study. Compared to the specific effect of EMG feedback on reciprocal activity at the upper arm, it seems that the effect of EMG feedback on reciprocal activity at the forearm is less prominrnt, or at least more difficult to detect.

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