THE PATELLAR REFLEX: DOES ACTIVITY OF QUADRICEPS FEMORIS MUSCLES REFLECT LEG MOVEMENT?

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Introduction

The assessment of spinal reflexes has traditionally been performed by clinicians with minimal need for recording equipment, where doctors rely on their training and may use established subjective reflex rating scales. With advances in technology it is now possible to assess reflexes objectively. This study compared two objective methods of assessing patellar reflex magnitude, duration and latency, namely: electromyography of the quadriceps muscles and kinematic assessment of the leg movement around the knee joint.

Methods

Patellar reflexes of 24 healthy participants were assessed. These reflexes were recorded biomechanically and electromyographically. From this four biomechanical and three electromyographical objective variables were found to describe each reflex. These were the change in knee angle, the velocity of the reflex, the time to maximum knee angle, the biomechanical movement latency, the electromyographic maximum amplitude, the negative peak duration and the electromyographic latency. Spearman's rank correlation tests were run in order to compare all of the variables.

Results

The results showed that there were positive correlations between electromyographic maximum amplitude and the change in knee angle (R^2=0.75, p <0.0001) as well as the electromyographic maximum amplitude and the velocity of the reflex (R^2=0.30, p =0.0058). There was also a negative correlation between electromyographic maximum amplitude and the biomechanical movement latency (R^2=0.35, p =0.0024). No other significant relationships between kinematic movement and muscle activity were shown.

Discussion

The results show that there is a relationship between muscle activity and the actual visual movement of the leg assessed using kinematics. This relationship is closest between kinematic measurements and electromyographical measures of reflex amplitude. Reflex amplitude has been identified as an objective measure of the patellar reflex (Frijns, 1997; Yao, 2000) Previous studies have shown electromyographic reflex amplitude to display considerable interindividual and intraindividual variability, as was seen in our subjects, and these studies have shown that electromygraphic measurements are influenced by numerous factors (Frijns, 1997; Péréon, 2004; Stam, 1989). The results of this study therefore show that leg movement is related to the electromyographic reflex amplitude (currently seen as a preferred objective measurement). The utility of each of these measurements however need to be further assessed as the electromygraphic measurements have their own sources of measurement variability compared to the technical impracticalities of kinematic measurements in the clinical setting. It is possible that an objective, less technically challenging method of objectively defining leg movement (a measurement system less cumbersome than a multi-camera kinematic system, such as suitably placed planar videography) would provide a less variable objective measure and hence could be used in the clinical examination.

References

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