ELECTROMYOGRAPHIC ANALYSIS OF THE PORTIONS OF DELTOID MUSCLE DURING SHOULDER ABDUCTION IN THE FRONTAL AND SCAPULAR PLANE

Anamaria Siriani de Oliveira, Delaine Rodrigues and Fausto Bérzin[1]
Universidade Federal de São Carlos, São Carlos, São Paulo, Brasil
[1]Faculdade de Odontologia de Piracicaba-UNICAMP, Piracicaba, São Paulo, Brasil

KEY WORDS: EMG, shoulder abduction

INTRODUCTION: The purpose of this study was to compare the amplitude of electric activity of the portions of the deltoid muscle during shoulder abduction, occurring in the frontal and scapular planes.

METHODS: The experimental sample consisted of 10 healthy female right-handed volunteers (mean 24.3 yrs, sd 3.02yrs). The institutional review board approved the study protocol, and all volunteers provided informed consent before participation. Surface myoelectric signals from the anterior, medium and posterior deltoids muscle of the dominant upper limb were detected with a double differential bipolar surface electrode. The signals were acquired with gain of 3000 and sampled at frequency of 1000 Hz. The volunteers were seated for the experiment, positioning the arm near to the trunk, with elbow extended, and arm medially rotated. Each trial was tested with the EMG signal recording while the volunteer abducted the shoulder, medially rotated it until 90º was reached, and then rotated laterally up to a maximum of 180º. The raw myoelectric signal was normalised by the average amplitude of RMS value obtained during 3 trials, maintaining the position of the upper limb, with elbow extended, shoulder 90º abducted, arm rotated medially, and with 1Kg load at the wrist.
Analysis methods. The RMS was the parameter measured. The Student *T-test* was used to obtain the significance on the difference in the plane of abduction and ANOVA was used for comparison among the three portions. The p-value of significance was set at $p < 0.05$.

RESULTS: The results of comparison of the normalised RMS values between planes revealed no significant differences (see Tables 1). When the normalised RMS values from the three portions of the deltoids muscle were compared using the ANOVA, no significant differences were noted (p= 0.186).

TABLE 1 Average Normalised RMS Values of the Portions of the Deltoids Muscle during Shoulder Abduction and p Values to Comparison between Planes of Movements

Normalised RMS Values – Shoulder Abduction (0 – 180º)			
	Plane		
Portions	Scapular	Frontal	p
Anterior	1.096	1.162	ns
Medium	1.261	1.200	ns
Posterior	1.046	1.018	ns

ns = non-significance difference at Student t-Test
p < 0.05

DISCUSSION AND CONCLUSION: The results of this study showed no difference between the myoelectric amplitude of the three portions of the deltoids muscle independently of the plane of shoulder abduction, in spite of better length-tension for deltoids muscle, observed in scapular plane. More studies are necessary to observe the influence of axial rotation of the humerus in RMS values.

Acknowledgements
To Fundação de Amparo a Pesquisa do Estado de São Paulo for the financial support by the process number 98/03310-9.