

Electromyographic analysis of the sternocleidomastoideus muscle during head dynamic movements

Silva, DCO.¹, Bérzin, F.², Aranha, MF.² and Forti, F.²

¹Centro Universitário de Patos de Minas

²Faculdade de Odontologia de Piracicaba

The sternocleidomastoideus muscle (SCM) presents two clearly distinct parts in its thoracic origin: a sternal part and another clavicular part. Considering the sternum and the clavícula as a fixed point, the SCM acts on the head performing anterior flexion, inclination to the same side and rotation to the opposite side. It has been reported that each part of the SCM may present a single contraction. The aim of this work was to determine the action of the belly, the sternal and clavicular parts of the SCM during voluntary dynamic movements of the head and respiratory movements using a digital system of surface electromyography. Methods and Results: Ten volunteers (5 male and 5 female) aged 18-40 years were selected for this study. Three pairs of electrodes were positioned on the muscle belly, the sternal and clavicular parts of both SCM (right and left sides). Each volunteer performed head dynamic movements (flexion, extension, rotation, inclination, rotation combined with inclination) and respiratory movements (normal and forced inspiration). EMG signs were captured using active differential surface electrodes and recordings were made on 12-channel equipment of simultaneous EMG signal acquisition. The analog EMG signal was digitized using a 12 bit A/D converter at a sampling rate of 4 kHz. After digitalization, the signal was filtered by a digital pass-band of 10-500 Hz and specific software was used to visualize and to process the EMG signal. Statistical analysis was performed using the Kruskal-Wallis and the Dunn post-hoc tests to compare among the three parts of the SCM in the same side and the Mann-Whitney test to compare between the two sides in the same part of the muscle. A value of $p < 0.05$ was considered significant. The results show that the SCM sternal and clavicular parts presented significantly higher electric activity than its muscle belly in the flexion movement for both sides while the clavicular part was the most active in the extension movement. In single rotation movement, the muscle belly and the sternal part showed the greatest activity, while in inclination movement, the three SCM parts act equally. In combined movement (rotation with inclination) toward the right side, the SCM muscle belly and the sternal part of the left side showed significantly higher EMG activity than its clavicular part. The same was observed for the movement toward the left side. In normal inspiration movement, the SCM sternal and clavicular parts had significantly higher electric activity than the muscle belly while in forced inspiration the clavicular part was the most active and the muscle belly was the least active. This study showed that there is individual contraction of the SCM muscle belly, the sternal and clavicular parts. Also, the SCM sternal part presents a rotation component higher than the clavicular part, and this latter is more active than the muscle belly and the sternal part in inspiration movements.