

sEMG Studies of the Supra- and Infra-Hyoid Muscle Activity During Swallowing in Healthy Volunteers

Myung Woo Park^{1*}, Dongheon Lee², Byung-Mo Oh¹, Han Gil Seo¹, Tai Ryoan Han^{1†}

Seoul National University Hospital, Department of Rehabilitation Medicine¹, Seoul National University, Interdisciplinary Program, Bioengineering Major, Graduate School²

Objective

Surface electromyographic (sEMG) studies were performed on 10 healthy adults to establish normative database of suprahyoid and infrahyoid EMG activity during swallowing.

Methods

As a preliminary study, ten healthy subjects were prospectively enrolled. Parameters evaluated during swallowing include onset latency, offset latency, peak latency, amplitude and duration of the suprahyoid and infrahyoid muscle groups. And the variability of electromyographic activity was also examined. Four tests were examined: voluntary single swallows of saliva ("dry" swallow), voluntary single water swallows as normal (2ml and 5ml), and voluntary single swallows of excessive amount of water (up to 20ml).

Results

Normative data for EMG activity during swallowing were established for healthy adults. The activation of the suprahyoid muscles developed earlier than that of the infrahyoid muscles ($p=0.05$). The mean onset latency of suprahyoid muscle activity was $0.417\pm 0.273s$, and that of infrahyoid muscle was $0.491\pm 0.235s$. The mean duration of suprahyoid and infrahyoid muscle activity were $0.993\pm 0.251s$ and $1.071\pm 0.235s$. The maximal amplitude of muscle activity during swallowing showed increase with the volume ($p<0.05$) and amplitude was higher with suprahyoid muscles than infrahyoid muscles ($p<0.001$). The area under curve of the rectified EMG signal also showed increase with the volume ($p<0.001$), and infrahyoid muscle showed a tendency of larger integrated rectified EMG signal than suprahyoid muscle ($p=0.094$). The intra-individual variability of the duration was lower (less than 30%) when compared to other parameters, and showed decrease with the volume in all muscle groups.

Conclusion

Surface EMG is a simple, reliable and noninvasive tool for screening evaluation of swallowing with low level of discomfort of the examination. The normative data of surface EMG can be used for evaluation of complaints and symptoms, as well as for comparison of swallowing performance, both within and between patients.