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学位論文の題目	Study on masseter muscle activity during awake and sleep in relation to history of orofacial pain (口腔顔面痛の既往の有無と昼夜咬筋筋活動の関係に関する研究)
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学位論文内容の要旨

Background

The relationship between mandibular parafunction and orofacial pain has not been established yet. To investigate the mechanism of clenching leads to orofacial pain, most of the previous studies conducted experimental clenching task to evoke pain and fatigue in healthy subject. However, this task may not be representative of patient behavior in normal environment. Moreover, the elimination of cross contamination from others facial activities especially speech activity to the masseter muscle EMG activity has not been performed so far. Therefore, the purpose of the present study was to perform a quantitative EMG examination during wakefulness and sleep to determine whether subjects with history of orofacial pain exhibited more tonic episodes (TEs) than the subjects without history of orofacial pain, using the analyzing system which eliminates the speech activity.

Methods

Thirty-three students (11 men and 22 women; mean age, 23.9 ± 4.2 years) participated in this study. All subjects completed the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) questionnaire. The subjects were divided into two groups which were the pain history group (PG) and non-pain history group (non-PG) based on the results of the RDC/TMD questionnaire. The study protocol was approved by the ethics committee of Okayama University (Ken 1508-003).

EMG recordings of the left masseter muscle were performed using a portable EMG device. A voice-operated trigger switch (VOX) was used to distinguish EMG activity during speech. During data analysis, EMG signals regarded as speech activities, mastication during meals, and calibration were excluded from subsequent analysis. A TE of the masseter muscle was defined as continuous EMG activity higher than the threshold with a duration at least 2.0 s. The mean %MVC was calculated for each TE categories into <7.5% MVC, 7.5%–10% MVC, 10%–15% MVC, 15%–25% MVC, 25%–40% MVC, and >40% MVC. The incidence and total duration of sustained TE and short TE in two groups (PG and non-PG) then analyzed.

Results

The mean duration of TEs observed in non-PG awake and sleep was (mean \pm SD) 4.64 ± 4.50 and 5.10 ± 5.62 , respectively. According to this value, the cutoff for sustained TEs was defined as mean in non-PG + 2SD resulted the cutoff for sustained TE was 13.65 for awake, and 15.01 s for sleep. Subsequent analysis adopted 15 s as a cutoff for sustained TE, which was rounded-up value for wakefulness and sleep. We found that during awake, the incidence of sustained TEs was significantly higher in the PG compared with the non-PG. However, no significant difference observed between two groups during sleep.

Comparing the incidence and total duration of short and sustained TEs classified according to intensity level observed in PG and non-PG. During awake, no significant different observed for the incidence and total duration of short TE in two groups (PG and non-PG). However, the incidence and total duration of sustained TE were significantly higher and longer in PG than in non-PG for intensities of 7.5%–10% MVC, 10%–15% MVC, and 15%–25%MVC. No significant difference was observed during sleep between two groups with respect to the incidence and total duration of short TEs or sustained TEs.

Discussion

Low-level clenching has been an issue of interest in relation to the etiology of TMD. However, study which investigate the properties of low-level clenching is limited. We found that sustained TE was predominantly in group with pain. These finding suggest that the longer duration of clenching may have a responsible to leads orofacial pain than clenching with shorter duration.

Our study analysis revealed that sustained TEs in the intensity range of 7.5%–25% MVC in the PG was observed significantly higher than in the non-PG. The influential range of the intensity of masseter muscle activity during wakefulness observed in this study is consistent with the previous study which were reported a shorted range of intensity (10%–15% MVC). These findings suggest that the intensity range of 7.5%–25% MVC would be suggested as an important range of interest in future low-level clenching studies.

Most of the low-level masseter muscle activity was observed during waking hours, which was consistent with our previous data. These findings on low-level muscle contraction could be explained if most of the parafunctional masticatory muscle activity was performed during waking hours.

Conclusion

Our study revealed that sustained low-level TE of surface masseter muscle EMG activity may have a correlation with orofacial pain and we also suggest that a 15-s duration could work as cutoff for detecting sustained low-level tonic masseter muscle activity.

論文審査結果の要旨

ブラキシズム等に代表される下顎異常機能は、顎関節症あるいは口腔顔面痛の発症において重要な役割を担っている可能性があることが長く指摘されている。しかしその一方で、どのような咀嚼筋活動が発現しているかということはこれまで明らかになっていない。今回、口腔顔面痛の既往のある健常被験者（疼痛既往群）および同既往のない健康被験者（非既往群）を対象とし、携帯型の高精度筋電計を用いて覚醒時および睡眠時の筋活動を継続的に記録・検討した。

研究結果として以下の成果が得られた。

- 1) 覚醒時においては、疼痛既往群の方が非既往群よりも持続時間の長い低強度持続咬みしめの発現頻度が高いことが明らかになった。また、その持続時間については 15 秒が低強度持続咬みしめの閾値となる可能性が示唆された。
- 2) 1 時間あたりの低強度持続咬みしめの発現頻度については、覚醒時には疼痛既往群の方が非既往群よりも有意に発現頻度が高かったが、睡眠時には両群間に有意な差は存在しないことが明らかになった。
- 3) 低強度持続咬みしめの強度は自発最大咬みしめを指標として標準化（以下、%MVC）した場合には、7.5%-10%MVC、10%-15%MVC、および 15%-25%MVC の強度を有する事象が、非既往群よりも疼痛既往群において有意に発現頻度が高いことが示された。

上記の結果より、口腔顔面痛の既往のない被験者と比較して、口腔顔面痛の既往のある被験者における方が、咬筋表面筋電図を用いて計測した低強度持続咬みしめの発現頻度が有意に多く、その持続時間も有意に長いことが示された。さらに、15 秒という持続時間が低強度持続咬みしめのカットオフ値になりうることが示唆された。

よって、審査委員会は本論文に博士（歯学）の学位論文としての価値を認める。