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ELECTROMYOGRAPHIC INVESTIGATION OF DURATION OF THE MASSETERIC SILENT PERIOD*

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INTRODUCTION

Since the first report in the literature concerning the phenomena of muscle action potentials[10,51] in 1907, the method of the electromyography[2,20,22,33,46,53,54,59,64] has been used to learn more about the nature of contractile tissue, to study vaious aspects of muscle and neuromuscular pathology, and as a dynamic means of studying the function of various articulations.

The first use of electromyographic techniques in dental research had been introduced by Moyers[46] in the year of 1949, in Korea by Kim,[33] 1968. The successful use of electromyographic techniques in studying the action of muscles of the joint,[25] wrist,[14] hip,[26] and other similar studies naturally suggested the use of the method as a way of analyzing the action and function of the muscles of mastication.[20,22,46,53,59,64,67]

And the most of the knowledge concerning neuromuscular physiology has been derived from experiments and observations on the muscles of extremities. Such research has originated where the interest is remote from the clinical problems in dentistry.[53] Many previous investigations concerning the electromyography to dental research can be divide into two major trends: these are one in muscle status of the various occlusal position,[2,3,5,18,19,21,27,28,34,36,38,39,43,44,45,47,48,50,64,57,58,61,65,67,68,69,70] another in muscle relation to temporomandibular dysfunction.[2,3,4,5,6,7,11,12,15,35,37,50,52,54,55,59,66] Electrical changes accompany normal muscular activity. These electrical changes may be picked up by electrodes placed

* 本 論文의 要旨는 第15次 大韓口腔保健學會 學術大會에서 發表豫定임.

on the skin or embaded in the muscle, amplified, and recorded photographically or mechanically.[53]

Electrical changes may easily be recorded. It is desirable to relate electrical changes to other fundamental neuromuscular processes. Because of the frequency, duration and intensity of electrical potentials of muscle which may be recorded, the wave form of integratedly or directly recorded electromyogram is ordinarily quite complex. Thus individual action potential, as recorded on the oscilloscope or the ink writing recorder, possesses the following characteristics; wave form, amplitude, duration, and frequency.[53]

For the above reason, to analyze muscle conditions by means of descriptions of the electrical activities are of great importance for the purpose of muscle physiology, pathology, and clinical application. To analyze wave form, planimetric, rectified-filtered, and electrically integrated methods have been used in electromyographic research.[54] Of the several movements of the mandible studied by means of electromyography, resting position, mild occlusion, centric occlusion, jaw-jerk reflex, resistive movement, and other similar positions of the mandible have been observed by many authorities.[18,19,21,28,34,38,47,48,53,61] Griffin[19] et al had found a period of inactivity of the mandibular elevators of approximately 13 milliseconds duration in each open-close-clench cycle. This inactive phase commenced some milliseconds after initial tooth contact, and he named it as "latent period." Quantitative study[9] was made on the photographic paper to record interrelationship between the electromyographic silent period and dental occlusion. Electromyographic activity, from tooth contact to the onset of the silent period, ranged wide, but it after occlusal treatment synchrony (silent period was shortened) was observed[5,9] between the activity patterns of tooth contact and the silent period. Thus electromyographic silent period was of great significant importance in physiologic and pathologic research.[2,5,6,7,9] A measured or standardized tap to the mandibular symphysis during maximal voluntary clenching of the teeth always produces a jaw-jerk followed by a silent period in the masseteric, temporal, and medial pterygoidal electrograms, but the etiology of this syndrome is a complicated mechanism.[5,19]

The masseteric silent period cannot be shortened or abolished by voluntary clenching effort. This phenomena indicates the presence of a strong source of inhibition to the masseteric motorneuron pool.[5,6,7,8,9,19,21,23,24,29,32,41,57,60] According to Jerge's[29] hypothesis, periodontal receptors serve to initiate the jaw opening reflex during jaw movements. In the present investigation, periodontal receptor input contributes to the production of the masseteric silent period.[6] Normal range of masseteric silent period is controversal: it ranges 20 to 32 msec., and 20% of normal subjects represent no silent period. And, in contrast, abnormal subject's period fall between 33 and 150 msec.

There are two questionable aspects to the masseteric silent period which range between 22 and 32 or 36 msec.; one is the normal subjects with mean of 24 msec.; the other is abnormal prolongation of silent period without any abnormality.[5,6,7,9] This study is to cofirm normal and abnormal range of the masseteric silent period and to find the contribution of periodontal receptor to the masseteric silent period.

MATERIALS and METHODS

1) *Subjects*

The study was carried out at the Dept. of Oral Diagnosis, College of Dentistry, Seoul National University. Ninety-nine male and 80 female dental and nursing students aged 22 to 25 years with normal dentofacial structure, and 7 male and 5 female dental outpatients aged 21 to 29 years with TMJ-syndrome, and anesthetized 3 male and 3 female subjects with the TMJ-syndrome were observed. Diagnosis and selection of patients were made by reference of Bell,[4] Chung,[12] Franks,[16] Ramfjord.[55] Details of age, sex, and pertinent remarks for each of 12 TMJ-syndrome subjects and normal subjects are presented in Table 1.

TABLE 1. Symptoms, Classes for Normal and Abnormal Subjects

Subjects	Name Age	Sex	Angle Class	Remarks
99 Normal Persons	Dental Student 23.7	M	1	Normal Dentofacial Structure.
80 Normal Persons	Nursing Student 21.3	F	1	Normal Dentofacial Structure
1	Kim Y K 24	M	II Div. II	Mild Rt TMJ
2	Chung I 26	M	III	Mild Lt TMJ
3	Chung H S 29	M	1	Mild clickling sound
4	Koo Y B 21	M	1	Sharp pain both TMJ
5	Lee K H 23	M	1	Masseter M pain Lt TMJ
6	Lee C M 27	M	II Div. II	Sharp pain both TMJ
7	Choi C S 29	M	1	Inability to open the jaw
8	Park O S 21	F	1	Mild subluxation
9	Kim S H 29	F	1	Mild clickling
10	You S J 28	F	II Div. 1	Moderate clickling Lt TMJ
11	Lee O H 23	F	II Div.II	Sharp pain both TMJ
12	Lee J J 27	F	1	Severe pain Rt & Lt TMJ

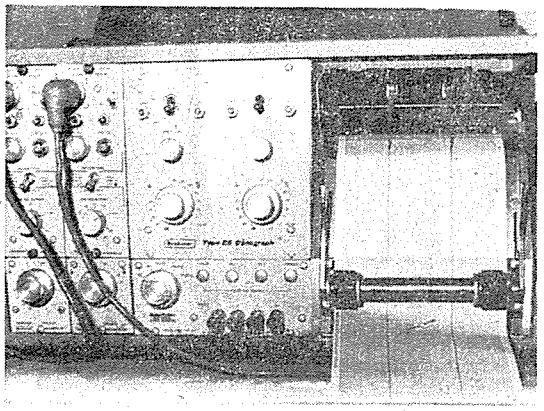

Fig. 1. Type RS-Dynograph. (9853A Beckman)

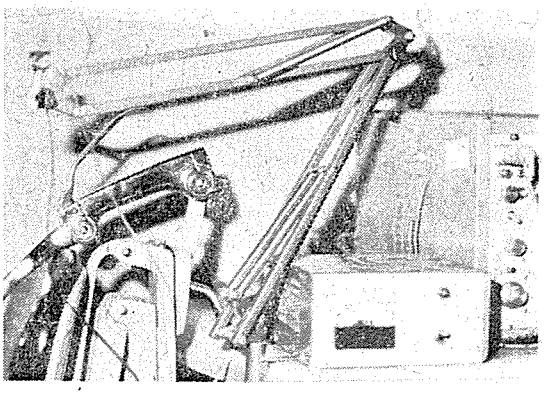

Fig. 2. Spring Triggered Tap Device. (It is connected to Functional switch assembly)

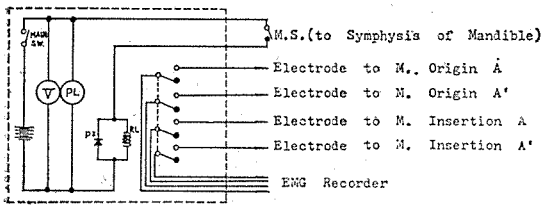

Fig. 3. Functional Switch Assembly. (Circuit Diagram)

2) *Apparatus*

Two-channel type RS Dynograph Recorder (9853A, Beckman) with type 461B Preamplifier, EMG Coupler, and Magnetic Inkwriter were used. (Fig.1) To elicit jaw-jerk reflex, specially designed Spring triggered tapping device was used. (Fig.2) For the purpose of taking exact moment of activation of the jaw-jerk reflex, the Functional switch assembly which was connected with the dynograph was also adopted. (Fig. 3)

Throughout the study, the apparatus was switched to "EMG position" which select the preamplifier and amplifiers suitable for "muscle action potentials."

1. "x 100~0.5 Switch" changes preamplification by a factor of 5.
2. "Amplifier Switch" changes amplification by a factor of 0.1.

To calculate this record, the above relationship was used as follows:

5mv/cm×0.1=0.5mv/cm=500micro v/cm.

The records were taken by the inkwriting pens on the motor driven paper, and the speed of which was controlled at 125mm/sec.

To calculate the subject's data, Computer (UNIVAC 9400 cobol complier) was used (table 2)

TABLE 2. Duration of the Silent Period in Subject

Subject		Masseteric Silent Period (msec)			
Subject/Sex		Left/Right	Mean	Mean±S.D.	Range
Normal Subject	M	21.58/21.32	21.45	20.96± 5.99	16.9—31.0
	F	20.56/20.13	20.35		
TMJ-syndrome Subject	M	39.85/39.14	39.78	39.23±13.57	33.5—50.4
	F	38.8 /38.4	38.6		
Anesthetized Subject	M	21 /21	21	19.5	19 —23
	F	18 /18	18		

3) *Eliciting Jaw-Jerk Reflex*

To elicit the reflex, a gauge measured Spring device in substitute for a Solenoid-driven plunger was used and simultaneously Functional Switch Assembly which is connected to the Dynegraph triggered the inkwriter. The spring device was mounted horizontally so that the device tip was 50mm away from the mandibular symphysis, (Fig. 4) and the electrodes are connected to Functional Switch Assembly and Dynograph.

4) *Electrodes*

Bipolar silver disk surface electrodes with electroencephalogram paste were taped over the right and left masseter muscles after the skin was prepared by cleansing with alcohol.

Fig. 4. Spring Triggered Tapping Device and Electrode Placement: left forehead and right forearm electrodes are served as a ground

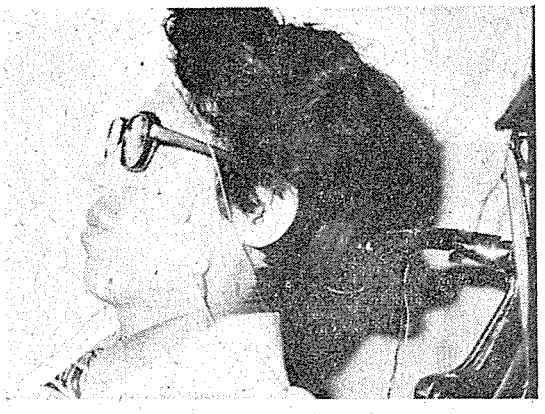

Fig. 5. Subject Posture (Front Side); the subject seat on a dental chair, in an upright posture, facing the apparatus

chair, in an upright posture, facing the apparatus. (Fig. 7) The individual was requested to relax to reduce discomfort. The tap was delivered during a postural rest position of the mandible, and the resulting EMG trace of the jaw-jerk was recorded. The subject was then requested to clench on his posterior teeth in centric occlusion as strongly as possible and tap to the symphysis of the mandible was repeated. This procedures were tested at least three times to ensure reproductibility of the EMG traces. All the apparatus were connected to the subject for obtaining

5) *Electrode Placements*

The electrode placement standardized for all recordings by placing one electrode 50mm from the tragus on a line running from the tragus to the corner of the mouth, and placing the second electrode 5mm inferior and 5mm posterior to the first. This method ensued that the electrodes were placed on a line running parallel to the fibers of the superficial masseter muscle.[20] Left forehead and right forearm electrode served as a ground. (Fig. 4, 6)

6) *Recording Protocol*

The subject was seated on a dental

Fig. 6. Electrode Placement: the method ensued on Grossman[20]

Fig. 7. Subject Posture (Rear Side)

a permanent inkwriting record.

7) *Anesthesia Procedure for the Patients with TMJ-syndrome.*

Two percent Lidocain (Xylocain) with 1 : 100,000 epinephrine was used in all the TMJ syndrome subjects. The right and left maxillary quadrant was anesthetized by infiltration at the appropriate sites so that the posterior, middle, and anterior superior alveolar nerves as well as the palatine nerves were anesthetized. The right and left mandibular quadrant was anesthetized by block and infiltration anesthesia of the inferior alveolar, lingual, and buccal nerves.[6] After 6 minutes delay, all areas on the right and left side were tested for the usual signs and symptoms of anesthesia to ensure that complete anesthesia was obtained. The jaw-jerk reflex then elicited and recorded.

8) *EMG Analysis*

Three meausrements were made from the EMG records: the latency in milliseconds; the amplitude of the negative phase of the compound spike (in millivolts); the duration of the silent period (in milliseconds) following the jaw-jerk during the strong clench of the mouth. This silent period was measured as the time from the end of the compound action potential to the reappearance in the EMG of the first asynchronous compound action potential whose amplitude was at least 0.5mv. Computer was used to determine the borderline between normal and abnormal overlapping duration by method of standard deviation and retrospective study.

RESULTS

NORMAL SUBJECTS

1) *Jaw-Jerk*

The remarks of the normal and abnormal participants are listed on Table I and durations of the masseteric silent pierods on Table 2. Jaw-jerk shows the EMG of the masseter muscle when the reflex was recorded from normal subject while his mandible was at postural rest position. (Fig. 8) The latency of 33 msec, for example, from the beginning of the trace to the compound action potential represents the time from spring tap release to moment of impact on the mandible, spindle activation time, sensory conduction time to the motor nucleus of the trigeminal nerve, central synaptic delay, masseteric nerve conduction time and excitation time of the masseter muscle.[6]

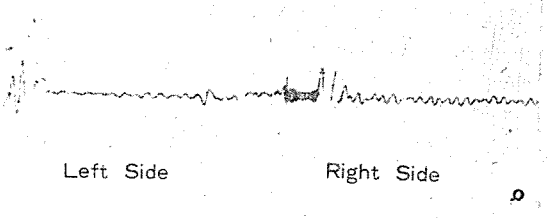

Fig. 8. EMG of Jaw Jerk Reflex in Normal Subject.

The compound action potential whose negative amplitude was 1.5 mv reprsents a synchronous firing of a number of motor units during the jaw-jerk reflex. The remainder of the EMG after the spike is flat, showing the muscle is electrically silent, and therefore, relaxed. (Fig. 8) Thirty-four out of 179 normal subjects

did not have a jaw-jerk reflex in the rest position. In all the subjects, the reflex could be elicited if the subject clenching his teeth as strongly as possible in centric occlusion during the tap. (Fig. 9)

2) ***During the maximal centric occlusion***

Typical jaw-jerk during a strong clench appears in Fig. 10. High level of asynchronous spikes which reflecting the voluntary clench produce jaw-jerk. Immediately after the voluntary spike, there is a silent period of 20 msec. in normal subjects. (Table 2) Most of all the subjects showed similar traces with respect to amplitude of jaw jerk and

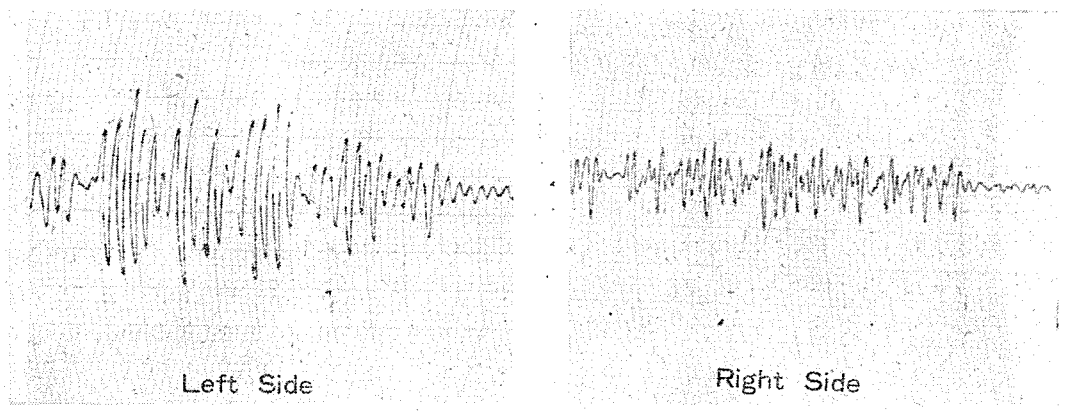

Fig. 9. Masseteric Silent Period following Jaw Jerk Reflex during Strong Clench in Normal Subject

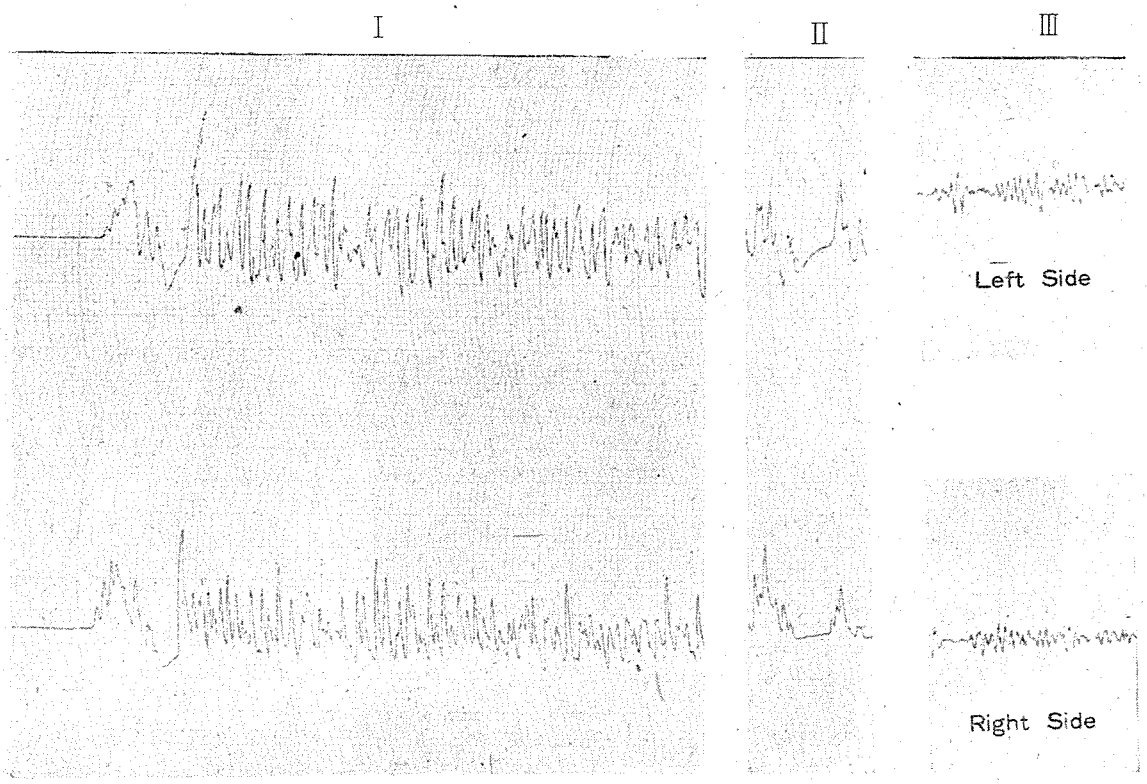

Fig. 10. Typical Jaw Jerk during a Strong Clench

duration of the silent period during clench. Durations of the masseteric silent periods for normal subjects range from 16.9 to 31.0 msec and are similar to the right and left masseter muscle. (Computed Data: Mean± 1.S.D.)

TMJ-syndrome SUBJECTS

1) *Jaw-Jerk*

At rest position, jaw-jerk reflex of a patient with TMJ-syndrome appeared in Fig.11 Nine out of 12 patients studied failed to show a jaw-jerk at physiological rest position of mandible. The negative amplitude was 1.5 mv. But the reflex could always be elicited in the patient when the patient's maximal clenching.

2) ***During the maximal centric occlusion***

The jaw-jerk of the patient when he is clenching his mouth as strong as possible appears in Fig. 12. The duration of the silent period following the spike is 39 msec. as compared to 20 msec shown in normal subjects. Table 2 shows the durations of the silent periods measured in the patients. In those patients with severe TMJ-syndrome, there is an inability to open their jaws, a marked deviation of the mandible and severe complains of TMJ pain. The silent period is much longer than in those patients with milder symptoms. It ranges from 33.5 msec to 50.4 msec. (Table 3)

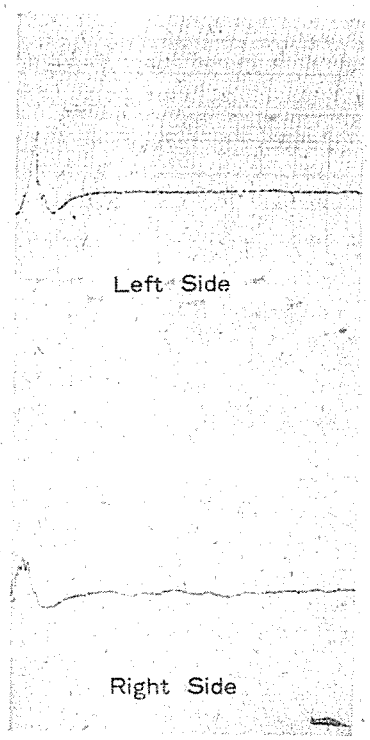

Fig. 11. Jaw Jerk Reflex of a Subject with TMJ-syndrome

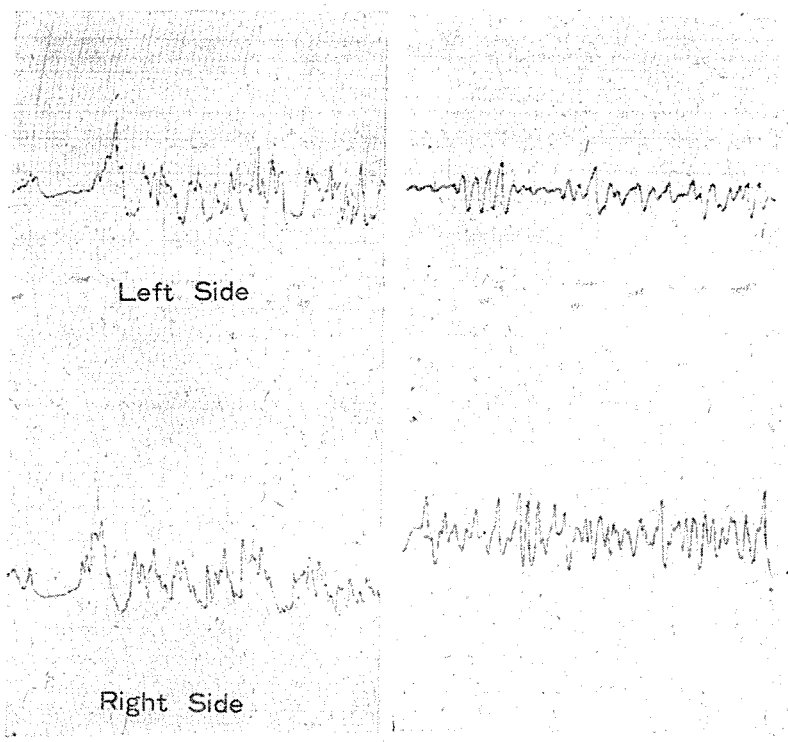

Fig. 12. Jaw Jerk in TMJ-syndrome Subjcet during Centric Occlusion

TABLE 3. Computed Duration and Borderline of the Masseteric Silent Period(msec)

Normal Subject	1/3 S.D.	12.9—35.0
	2/3 S.D. (S.D.)	14.9—33.0
	1 S.D.	16.9—31.0
TMJ-syndrome Subject	1/3 S.D.	24.5—59.4
	2/3 S.D. (S.D.)	29.0—54.9
	1 S.D.	33.5—50.4
Overlapping Range	1/3 S.D.	24.5—35.0
	2/3 S.D. (S.D.)	29.0—33.0
	1 S.D.	33.5—31.0
Borderline Between Normal & TMJ syndrome Subject	1/3 S.D.	29.7
	2/3 S.D. (S.D.)	31.0
	1 S.D.	32.2

ANESTHETIZED SUBJECTS

1) *Jaw-Jerk*

Fig. 13. shows the jaw-jerk reflex of TMJ syndrome subject. The latency is similar to the preceding traces. (Fig. 8.11.) The amplitude of the spike of the masseter muscle has been reduced from 1.5 mv to 0.5 mv. The marked reduction of the amplitude of the compound spike represents a disfacilitation of alpha-motorneurons from all the sensory

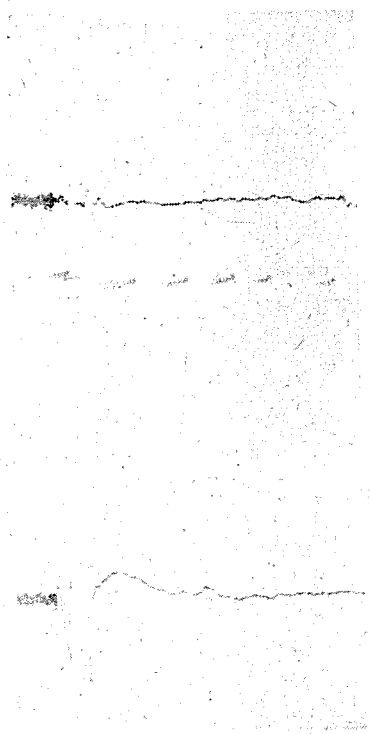

Fig. 13. Jaw-Jerk Reflex of a Subject with TMJ-syndrome after the Anesthesia (Note Reduced Amplitude)

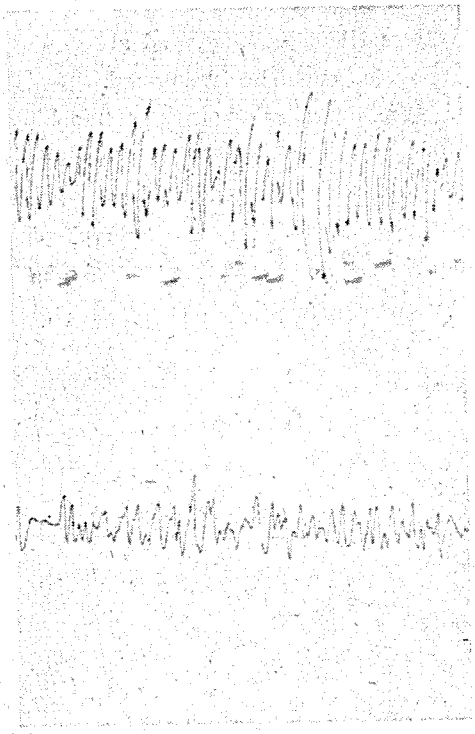

Fig. 14. Reduction of the Silent Period in anesthetised subject

inputs which have been abolished by the anesthesia.[6]

2) ***During the maximal centric occlusion***

The amplitude of the jaw-jerk is similar to that of the normal subjects. No significant change in the anesthetized subjects have occurred in the voluntary effort and hence the similar activity and jaw-jerk spike have also elicited. But the duration of the silent period following the spike is reduced from 39 to 19 msec. (Fig. 14. Table 2) In 3 out of 6 subjects total anesthesia of the four quadrants nearly abolished the silent period following the jaw-jerk reflex during maximal voluntary clench.

COMPUTED ANALYSIS OF THE OVERLAPPING PERIODS

In the complicated duration between 22 to 36 msec. of the individual data, the borderline of the normal and TMJ-syndrome subjects are intermingled. Normal range of maximal duration in one standard deviation could be 31 msec., and abnormal range over 33.5 msec., and in 2/3 S.D., 33 msec. belong to the normal range, and in 1/3 S.D., 35 msec can be normal range. And hence, it could be guessed 32.2 msec. is the borderline between normal and abnormal duration. (Table 3)

DISCUSSION

A tap to a subject's symphysis of mandible stretches the masseter muscle, and other closing muscle, thus synchronously exciting the muscle spindles. Many investigators[13,14,31,49] had been described the neural pathway for monosynaptic reflex by electrophysiologically and histologically, and accompanying with it, the mechanism of the masseteric silent period could be interpreted.

1) ***Mechanism of the Masseteric Silent Period and the Neural Pathways***

The silent period of the masseter muscle cannot be abolished by voluntary effort. It indicates the source of persistent active inhibition or a marked disfacilitation of the masseteric motoneuron pool.[5,17,23] In the active inhibition following the tap to the mandible, receptors in the periodontal ligament, Golgi tendon organs in the masticatory muscle's recurrent inhibition, and via motor axon collaterals are sources for the persistent active inhibition.[6,24,32,41,57,60] (Fig. 15) And with the inactivity of the masseteric motoneuron pool, there also indicates the possible resource of Dis facilitation which may result from the silencing of the muscle spindles during muscle twitch of the jaw-jerk.[17] Joint receptors are analogous to the receptors in the periodontal ligament and surround the teeth in anatomical distribution, and receptors take various form in it's nature.[42,56] The nerve fibers from the

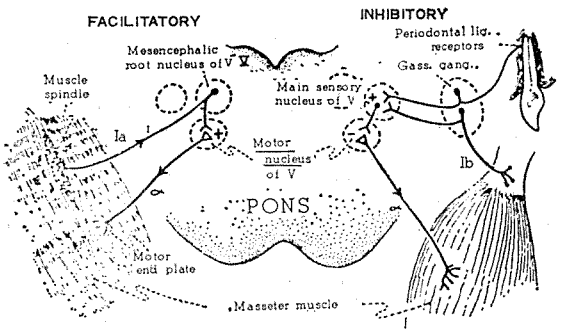

Fig. 15. Neural Pathways showing both Facilitatory and inhibitory Inputs to Motor Nucleus of V.[5]

receptors run from the apical region of the tooth root toward the gingival margin and are joined by small bundles of fibers that enter the ligament laterally through the foramina in the alveolar bone.[1,32,41,56,62,63] Fibers that enter the alveolar plate divide into two bundles of approximately equal size, one turning peripherally toward the gingival margin and the other toward the root apex.[42] The large and small nerve fiber's mode of peripheral termination is unknown,[8,32,41] but the cell bodies of these trigeminal afferent nerves from the periodontal ligament receptors lie in both the gasserian ganglion and in the Mesencephalic mucleus of V. These sensory neurons, like those in posterior root ganglia, are pseudo-unipolar, and the central branches involved in these proprioceptive modalities terminate in the brain stem in the main sensory nucleus or supratrigeminal nucleus.[5,30] Masseteric motoneurons are inhibited by the receptors of the periodontal ligament and the pathways are denoted in patients with TMJ-syndrome who are anesthetized of the periodontium. This mechanism was already found by the study that mechanical stimluation of the gingiva, teeth, and hard palate in decerebrated cats causes reflex. Jaw opening associated with an inhibition of the muscles elevating the mandible and an activation of those depressing it, and these periodontal afferents excite interneurons in the main sensory nucleus which are inhibitory to the motoneurons in the nucleus of V.[6,31,60] Reflex inhibition of the masseter muscle occurs after tooth contact during tapping in centric occlusion and during the chewing is due to in hibition evoked from the Periodontal ligament receptors.[9] (Fig. 15) Primary cell bodies of the golgi tendon organs of the muscles of mastication are located both in the gasserian ganglion and the Mesencephalic nucleus and there can be found golgi tendon organs in the masticatory attachments of the tendinous. muscle[31]

And the golgi tendon receptors of limb muscles are extremely responsible to small increases in muscle tension as a twitch of a single motor unit in the muscle may generate sufficient tension to discharge a golgi tendon organ. But the golgi tendon organ receptors in the masseter muscle is not known exactly as limb muscles concerning in it's function.[24] Extremely responsive golgi tendon receptror's impulses are connected centrally in the main sensory nucleus of V. by excitation of sensory neurons which stimulate interneurons that are inhibitory to homonymous motor neurons of the motor nucleus of V. (Fig. 15)[24,31]

Masseteric motorneuron's inhibition mechanism is an important feedback circuit contr-olling excitability of spinal alpha-motoneurons or Is a recurrent collaterals. (Inhibitory postsynaptic potential IPSP) (Fig.15) It is certain that there is a source either whether of active inhibition or of disfacilitation to the masseteric motorneuron pool, however masseteric silent period is only due to central or peripheral origin is not clear.

2) *Jaw-Jerk in Normal Subject.*

A tap to the mandible in postural rest position produces a slight displacement of the mandible which stretches masseter muscle for a few miliseconds and jaw opening muscles distorting their spindles and the jaw-jerk reflex follows in succession. The synchronous exc-itation of the spindle initiates the monosynaptic reflex via the mesencephalic root and motor

mucleus of the trigeminal nerve. (Fig.15)[21,24,30,45,60,62,63] Masseter muscle contraction which is reflected in EMG is Fig. 8. Then, there can be found compound action potentials and equal amplitude in right and left masseter muscle, and we can name it jaw-jerk reflex spike.

3) *Masseteric silent period in Normal Subject*

As explained in the mechanism of masseteric silent period and neural pathways, inhibition from periodontal receptors,[1,6,17,56,57,60,68] disfacilitation,[5,6,9,17,23,54] and autogenous inhibition from golgi tendon organ receptors[24,31] may be responsible for the messeteric silent period. But the silent period is not altered significantly by the level of the voluntary clenching during the observation. It might he thought[34] that normal subjects who had not been found the masseteric silent periods were due to slow paper speed (125mm/sec).

On the basis of my observation, the periodontal receptors are the major contributors of inhibition that produce the silent period in normal subjects. (Fig. 10)

4) *TMJ-syndrome Subject.*

In jaw-jerk reflex, recordings and calibrations are same as for normal subjects, but the main finding in this observation is the significant increase in the duration of the silent period in subjects with TMJ syndrome. Prolonged silent period is suggested by that there are persistent sources of active inhibition, disfascilitation to the masseteric motoneuron pool,[5,6,7,8,9,17,19,21,23,24,32,41,57,60] and the golgi tendon organs in the spastic muscles have a prolonged discharge which could provide a peripheral source of active inhibition causing the prolonged silent period in the subject. (Fig. 11) The source of these mechanism contributing to silent period could be peripheral or central.[6,11,12,35,50] Because the TMJ-syndrome is associated with masticatory muscle spasm. These muscles of mascation may be less relaxed in patients than in normal subjects following the muscle twitch, and there are three means of entry into the myospasm. (Fig. 16)[7,12,37] There remains questionable factors i.e. malocclusion affecting the TMJ-syndrome.

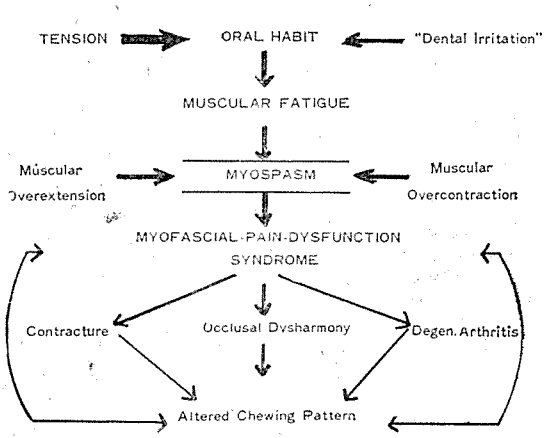

Fig. 16. Common Pathways of Entry into MPD-syndrome[37]

5) *Anesthetized Subject*

The major finding of my investigation is the gradual abolition of the duration of the silent period following the jaw-jerk by anesthesia of the four dental quadrants. As described before, the impulses from the receptors are inhibitory to the masseteric motor neuron pool of the trigeminal nerve. The result of this continual source of inhibition to the

motorneuron pool appears as a silent period following a synchronous contraction of a large number of motor units in the jaw-jerk reflex.[5,6,9,17,21,24,32,41,54,57,61]

Anesthesia of the periodontal receptors eliminates this continual source of inhibition to the motorneuron pool during a clench, thereby reduces the silent period following the jaw-jerk. (Fig. 14) There are quantitative relationship between the strength of the periodontal inhibition and the duration of the silent period. And the problem remains questionable study subject.

6) *Borderline of Normal and Abnormal Period*

The duration of the normal mean is controversal and is different from Bessette et al.[5,6,7,9] Yet calculated it with retrospective method, and standard deviation between normal mean and abnormal mean, borderline of 32 msec.[5,6,7,9] in the normal American is not different from 32.2 msec. in normal Korean. Then, there arise different mean of the normal subject, and it should he studied futher into the difference.

CONCLUSION

Masseteric silent periods were checked in 179 normal subjects, 12 TMJ-syndrome patients, and 6 anesthetized patients. The electromyogram was taken on a 2 channel type RS-Dynograph (9853A. 461B Preamplifier, Beckman) for EMG couplar. Two pairs of Surface electrodes were used exclusively, and specially designed Functional switch assembly with Spring triggered tapping device. The recordings were taken by the inkwriting pens on the motor driven paper in substitution to oscilloscope. The records of durations of masseteric silent periods were subjected to statistical analysis, by the Computer (Univac 9400 Cobol complier) to determine the mean, the standard deviation, and to confirm the borderline between normal and abnormal range. The results were discussed as related to the durations of masseteric silent periods.

The obtained findings were as follows:

1. Normal Subjects: It was 21 msec. in male, 20 msec. in female, and mean of 20 msec $\pm$5.99 (S.D.)
2. Subjects: TMJ-syndrome It was 39 msec. in male, 38 msec. in female, and mean of 39 msec $\pm$13.57 (S.D.)
3. Anesthetized Subjects: It was 21 msec. in male, 18 msec. in female and mean of 19 msec.
4. Thirty-four of 179 subjects were not found the masseteric silent period that could be found on the inkwriting recorder.
5. The overlapping duration of the normal and abnormal subject could be analysed as 31 msec. in normal, and over 33.5 msec. in abnormal by means of computed standard deviation.
6. The borderline between normal and abnormal subject is 32.2 msec.

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Masseteric Silent Period의 持續時間에 關한 筋電圖學的 硏究

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>國文抄錄<

正常咬合人 179名과, 顎關節異狀患者 12名, 그리고 顎關節異狀患者中 局所麻酔를 한 6名, 總 197例의 對象에 咬筋의 Jaw-Jerk Reflex를 惹起시키기 爲하여 Spring Triggered Tapping Device를 下顎骨癒着部에 裝置하고, 咬筋에 雙極銀板電極을 附着하여 Functional Switch Assembly를 通하여 Preamplifier (461 B型, Beckman)에서 增幅된 活動電壓을 Dynograph (RS型 9853A, Beckman)에서 直接 記錄하였다. 記錄된 筋電圖는 Computer (Univac 9400 Cobol Complier)로 分析하여 다음과 같은 結論을 얻어 이에 報告하는 바이다.

(1) 正常咬合人 : 男子平均 21msec., 女子 20msec., 男女平均 20±5.99msec (S.D.)였다.

(2) 顎關節異狀患者 : 男子平均 39msec., 女子 38msec., 男女平均 39±13.57 (S.D.)

(3) 局所麻酔를 施行한 顎關節異狀患者 : 男子平均 21msec., 女子 18msec., 男女平均 19 msec

(4) 179名의 正常咬合人中 34名은 Masseteric Silent period가 나타나지 않았다.

(5) 正常咬合人과 顎關節異狀患者가 重複될 수 있는 期間은 31~33.5 msec. 였다.

(6) 正常咬合人과 顎關節異狀患者와의 境界는 32.2msec 였다.