

A Study on Symptoms and Clinical Findings of TMJ Dysfunction

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INTRODUCTION

The temporomandibular joint (TMJ) with unique anatomy and function is the most important component of the masticatory system, which regulates mandibular movement in coordination with the surrounding neuromuscular system. Hence, disorders of the TMJ can induce TMJ dysfunction in which cardinal symptoms are pain, joint sounds and impaired mandibular movement. Recently, TMJ dysfunction has been regarded as one of the four major diseases in dentistry along with dental caries, periodontal disease and malocclusion. Many investigations have been carried out actively on the etiology and symptomatology of TMJ dysfunction.

Costen (1934) was the first who mentioned about this disease. Subsequently Schwartz (1955) and Laskin (1969)¹⁵ reported and then Agerberg and Carlsson (1973, 1975)^{1),2} Butler etc. (1975)⁴, Gelb etc. (1975, 1983)^{7),11}, Weinberg etc. (1980)³¹ and Chung (1982)³⁹ also reported. These studies put emphasis on the classification and incidence of symptoms. On the other hand Helkimo (1974)¹² and Lee (1981)¹⁶ tried to evaluate and demonstrate the severity of symptoms by using dysfunction indices.

Etiologies of TMJ dysfunction are complicated and symptoms and clinical findings are also manifold. So the investigation of interrelationships of these items is thought to be helpful for understanding this disease entity correctly. Eriksson etc. (1983)⁶ reported the differences of maximum amount of mandibular movements and deviation of mouth opening path in groups of

patients with and without clicking. Marklund etc. (1972)¹⁷ reported the differences of muscle force on mandibular movements in patients with and without TMJ disorder.

However, there were few investigations about the influence of TMJ disorder on mandibular movement among the population of Korea. The purpose of this study is to furnish basic data useful for diagnosis, treatment and prognosis evaluation of TMJ dysfunction patients by investigating the symptoms and clinical findings and the influences of TMJ pain on the mandibular movement.

MATERIALS AND METHOD

In selecting patient materials, 367 TMJ dysfunction patients, who visited the department of Oral Diagnosis and Oral Medicine, Seoul National University Hospital during the period from March 1983 to July 1984, were radiographically examined by transcranial oblique lateral projection and orthopantomogram. In cases where bony change of condyle and/or articular fossa of temporal bone was suspected, tomographical examination was also incorporated. In 327 patients, most of them showed positional change of condylar head compared with articular fossa, but no bony change of condyle or articular fossa was found.

(1) Sex and age

Patients were classified by age in 5 year interval into

11 groups from under 15 years of age to over 60 years.

(2) Symptoms

All the symptoms experienced by patients were examined and recorded, as to chief complaint of pain, pain site, pain side and pain provoking factors. Pain sites were classified into TMJ area, masticatory muscles, neck and back muscles, or others. Pain side was recorded as left, right or both sides. With regard to pain provoking factors, whether pain was spontaneous, on opening or during mastication was recorded.

Clicking sounds audible at the examination were noted as to right or left side and time was recorded as early, intermediate and late. The sound provoked within 1 finger breadth was regarded as early clicking, within 2 finger breadth as intermediate, above 2 finger breadth as late. Duration of symptoms from onset to visit was categorized into groups from "no longer than 1 week" to "over 5 years".

(3) TMJ pain and mandibular movements

To identify the influences of TMJ pain on mandibular movements, the author examined the following items.

A. TMJ pain and the range of mandibular movements:

The amounts of maximum mouth opening, maximum protrusion and maximum laterotrusion were measured to 0.5 mm with the vernier calipers (Mitutoyo, Japan). Then the mean values were calculated. These values were compared between the groups with TMJ pain and without TMJ pain.

B. TMJ pain and complaints of mouth opening limitation:

Whether patient complained of mouth opening limitation or not was recorded and whether there was pain or not on mouth opening was examined. Then the relationships were investigated.

C. TMJ pain and mouth opening path:

In case of deviation of mandible at least 2 mm from the midline during mouth opening, the direction of deviation and the interrelationships between pain side

were examined.

D. TMJ pain and maximum laterotrusion:

In 2 groups of patients with unilateral TMJ pain, the amount right and left maximum laterotrusion was compared respectively.

(4) Statistical method

Chi-test was used for assessing if observed frequencies significantly differed from those expected, and t-test for assessing the difference of amount of mandibular movements.

The following levels of significance were used.

N.S.	$P > 0.05$	not significant
*	$P < 0.05$	almost significant
**	$P < 0.01$	significant
***	$P < 0.005$	highly significant

RESULTS

The patients who complained of TMJ dysfunction, but exhibited nothing but positional change of TMJ were 327 (89.1%); males 25.7%, females 74.3% (Table 1, 2).

Age distribution showed a prevalence of 15 years of age to 29 years, especially females in the third and fourth decade (Table 3, Fig. 1)

Table 1. Radiographic diagnosis

	No. Patients	% (n=367)
Without bony change	327	89.1
With bony change	40	10.9
Flattening	(21)	(5.7)
Sclerosis	(11)	(3.0)
Erosion	(6)	(1.6)
Osteoarthritis	(2)	(0.5)

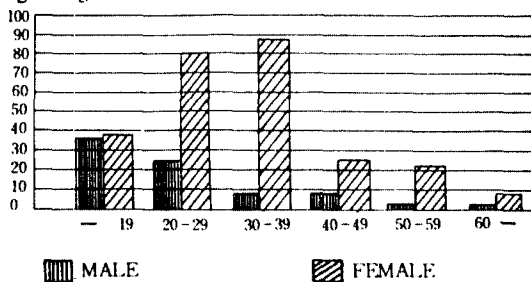
Table 2. Sex distribution

	No. Patients	% (n=327)
Male	84	25.7
Female	243	74.3

Table 3. Age distribution

Age	Male (n=84)	Female (n=243)	Total (%) (n=327)
- 14	5	7	12 (3.7)
15 - 19	33	32	65 (19.9)
20 - 24	17	48	65 (19.9)
25 - 29	8	57	65 (19.9)
30 - 34	5	31	36 (11.0)
35 - 39	4	13	17 (5.2)
40 - 44	7	15	22 (6.7)
45 - 49	2	9	11 (3.4)
50 - 54	1	13	14 (4.3)
55 - 59	1	9	10 (3.1)
60 -	1	9	10 (3.1)

Fig 1. Age distribution



1. Symptoms:

The cardinal symptoms of the subjects of this investigation experienced were pain (90.8%), clicking sound (59.3%) and limited mouth opening (48.6%) (Table 4). Pain locations were TMJ (94.3% of 297 patients who experienced pain), masticatory muscles (10.4%), neck and back muscles (3.7%) (Table 5). Pain provoking occasions were spontaneous (27.0% of patients who experienced pain), during mouth opening

(71.7%) and during mastication (50.2%). (Table 7) Pain was provoked more commonly during mandibular movements. In 30.1% of patients whose clicking sound was audible on the examination, there were clicking sounds in 30.1%, in the right side; in 33.5%, in the left side; in 36.4% in both sides. With regard to time of clicking sounds, there were early clicking sounds in 26.1%; intermediate clicking sounds in 25.0%; late clicking sounds in 43.9% which were the most prevalent (Table 8, 9) Duration of above-mentioned symptoms was no more than 1 month in 26.3% which were the most (Table 10, Figure 2).

Table 4. Experienced Symptoms

	No. Patients	% to Total (n = 327)
Pain	297	90.8
Clicking sound	194	59.3
Mouth opening limitation	159	48.6
Headache	28	8.6
Chewing difficulty	23	7.0
Habitual subluxation	9	2.8
Tinnitus	5	1.5
Muscle fatigue	4	1.2
Others	31	9.5

Table 5. Pain location

	No. Patients	% to Total (n=297)
T M J	280	94.3
Masticatory muscle	31	10.4
Neck and back muscle	11	3.7
Others	16	5.4

Table 6. Pain side

	No. Patients	% (n=297)
Right	127	42.8
Left	130	43.8
Both	40	13.5

Table 7. Pain provocation

	No. Patients	% to Total (n=297)
Mouth opening	213	71.7
Chewing	149	50.2
Spontaneous	80	27.0
Others	21	7.1

Table 8. Clicking sound

	No. Patient	% (n=173)
Right	52	30.1
Left	58	33.5
Both	63	36.4

Table 9. Clicking sound

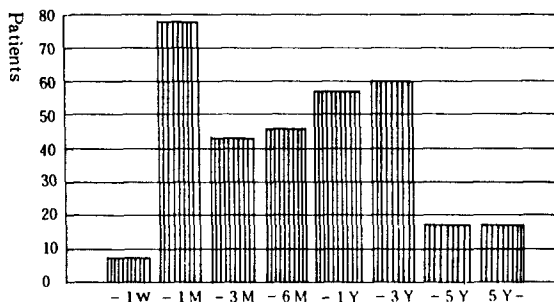
	No. Patients	% (n=136)
Early	35	25.7
Intermediate	34	25.0
Late	67	49.3

Table 10. Duration

	No. Patients	% (n=327)
Up to 1W	8	2.4
1W - 1M	78	23.9
1M - 3M	43	13.1
3M - 6M	45	13.8
6M - 1Y	59	18.8
1Y - 3Y	60	18.3
3Y - 5Y	17	5.2
Over 5Y	17	5.2

W: Week, M: Month, Y: Year

Fig. 2. Duration



2. Relationships between TMJ pain and mandibular movements:

The average amount of maximum mouth opening was 39.2mm. In the group of patients who complained of TMJ pain, the average was 36.3mm, in the group of patients without pain, the average was 44.8mm. Maximum opening in the group of patients with pain differed very significantly from that of the group without pain ($P < 0.005$). The mean value of maximum protrusion was 7.0mm; in the group of patients with pain, 6.8mm and in the group of patients without pain, 7.3mm. There was significant difference between these two values ($P < 0.05$). The mean value of maximum laterotrusion was 7.1mm in the right side, 7.2mm in the left side, but there wasn't any significant difference between the amounts of maximum laterotrusion in the groups with and without pain ($p > 0.05$) (Table 11). In the group of patients who reported TMJ pain on mouth opening, 126 complained of limited opening and 19 didn't; therefore there was very significant difference between the presence of pain and the subjective mouth opening limitation ($p < 0.005$) (Table 12). With regard to mandibular opening path, the cases of linear pattern with no deviation were 33.6%; those with deviation to right side, 23.2%; those with deviation to the left side, 36.1% and those with such a complicated deviation pattern that the direction of deviation couldn't be determined, 7.0% (Table 13). In case of deviation to the right or left side, the deviation was toward the same side that experienced pain in 85 cases. It was toward the opposite side from the painful side in 35 cases. There was a significant difference ($X^2 = 53.02$, $df = 1$, $P < 0.005$) (Table 14).

On the other hand, the difference between the amounts of laterotrusion in connection with pain side couldn't be identified ($p > 0.05$). (Table 15).

Table 11. Maximum movements

		Mean	S.D.	t-value	p
Maximum mouth opening		39.19	8.00		
	Pain +	36.26	8.57	9.15	***
	Pain -	44.76	6.77		
Maximum protrusion		6.96	2.26		
	Pain +	6.77	2.36	2.05	*
	Pain -	7.31	2.05		
Maximum laterotrusion (Right)		7.07	2.26		
	Pain +	7.02	2.24	0.61	N.S.
	Pain -	7.18	2.31		
Maximum laterotrusion (left)		7.15	2.25		
	Pain +	7.05	2.48	1.01	N.S.
	Pain -	7.35	2.69		

(mm) (mm) Total = 327
Pain + = 214
Pain - = 113

Table 12. Mouth opening limitation

	-	+	Total	
Pain in Mouth opening	-	94	88	182
	+	19	126	145
	Total	113	214	327

$$\chi^2 = 21.37 \quad df = 1 \quad p < 0.005$$

Table 13. Opening path

	No. Patients	% (n=327)
Straight	110	33.6
Right	76	23.2
Left	118	36.1
Complex	23	7.0

Table 14. Opening path

	Straight	Deviation		Complex	Total
		Right	Left		
Pain on right	32	34	24	7	97
Pain on left	27	11	51	6	95
Pain on both	12	3	6	1	22
Total	71	48	81	14	214

Table 15. Maximum laterotrusion

		Mean	S.D.	t-value	P
Pain on Right	Right	7.27	2.25	0.29	N.S.
	Left	7.17	2.52		
Pain on Left	Right	6.81	2.19	0.71	N.S.
	Left	7.06	2.67		

Pain on right = 97
Pain on left = 95

DISCUSSION

About the sex distribution of TMJ dysfunction patients, Butler etc. (1975)⁴ reported that the ratio of male to female was 1:5; Sheppard etc. (1977)²⁴, 1:6; Chung (1975)³⁹, 1:5; Weinberg etc. (1980)³¹, 1:2.7; Reider etc. (1983)²⁰, 1:1.7; Gelb etc. (1983)⁷, 1:2.7. In this study the ratio was 1:3 which was practically the same as those of Weinberg's and Gelb's study. Concerning the age distribution, Reider etc. (1983)²⁰ reported that patients were evenly distributed from fourth to sixth decade; Sheppard etc. (1977)²⁴ reported that the average age was 35.1 years; Butler etc. (1975)⁴ said that the distribution showed a prevalence of the third decade; Weinberg etc. (1980) said that 57% of patients were of age from the third to fifth decade.

Green etc. (1969)¹⁰ reported that the cardinal symptoms of TMJ dysfunction were pain (87%), noise in the TMJ (66%) and limitation of mandibular movements; Posselt (1971)¹⁹, joint sounds, headache, pain on movement; Gross etc. (1983)¹¹, mouth opening limitation, deviation of mouth opening path, joint

sounds, pain on palpation in the area of TMJ and masticatory muscles. Weinberg etc. (1980)³¹ reported that 76% of the patients who experienced pain complained pain in the TMJ. Incidence of unilateral and bilateral pain were similar and 67% of the patients said pain was exacerbated during mandibular movements. Weinberg etc. (1980)³¹ reported that 68% of TMJ dysfunction patients had joint sounds; Gross etc. (1983)¹¹ reported 34.7%. Besides Chung (1975)³⁸ reported that unilateral joint sounds were found in 74% of the patients; bilateral joint sounds 26%. In about 30% of patients, the duration of symptoms was over 1 year. According to these studies and this study, it can be said that TMJ dysfunction progresses for several years without bony change.

The temporomandibular joint not only makes possible opening and closing movement, protrusion and laterotrusion of mandible, but also exerts an influence on the path and the range of above-mentioned mandibular movements. Therefore disorders of TMJ can cause a change in the range or the path of mandibular movements. Eriksson (1983)⁶ studied about the differences in the presence of joint sound and absence of it. He reported that in the group without joint sounds the incidence of pain was higher than that of the group with joint sounds. The amount of maximum mouth opening was smaller in the first group than the latter ($p < 0.001$). The tendency of deviation toward the affected side was larger in the first group than the latter. Laterotrusion toward the affected side provoked more pain ($p < 0.05$) than did laterotrusion toward the non-affected side ($p < 0.001$). Protrusion provoked more pain in the first group ($p < 0.001$). Marklund etc. (1971)¹⁷ investigated the difference of maximum muscle force during anterior, posterior and lateral movement between the groups with joint disorder and without joint disorder and in the presence of joint disorder, the maximum muscle force during laterotrusion to the affected side and to the non-affected side. He reported that in the presence of joint disorder muscle force during each movement decreased. Weinberg etc. (1980)³¹, reported that in 17% of TMJ dysfunction patients there was deviation of mouth opening path; Gross etc. (1983)¹¹ in 17.8%, in which deviation to the left side was 85.9%. Kang

(1984)⁴⁰ reported there was deviation to the right side in 3.2%, on the other hand there was deviation to the left side in 62.3% in a group of persons without TMJ dysfunction. In this study left side deviation was more common, but was less than the difference in above two studies.

Anterior translation of condylar head is associated with mouth opening, and protrusion. It is thought that pain in TMJ restricts anterior translation of condyle, which may limit mouth opening and protrusion, and deviate mandible to the affected side during mouth opening.

If the path and the range of mandibular movement can be recorded by kinesiological study and the severity of pain experienced by patients can be examined also, it will be possible to acquire more informations about the relationships between them. And the information will be a useful criteria for the diagnosis and treatment of TMJ dysfunction.

CONCLUSION

The author investigated the symptoms and clinical findings of TMJ dysfunction in the group of TMJ dysfunction patients who visited the department of Oral Diagnosis and Oral Medicine, Seoul National University Hospital and came to the following conclusions:

1. In this study of TMJ dysfunction patients, the distribution according to sex showed a prevalence of female; the ratio of female to male was about 3:1. The age distribution of patients showed a prevalence of 15 to 29 years of age.
2. The cardinal symptoms that TMJ dysfunction patients experienced were pain, clicking sound, and mouth opening limitation.
3. Unilateral clicking sounds were more common. The incidences of clicking sounds in the left and right side were similar. Late clicking sounds were more prevalent.
4. Duration of TMJ dysfunction was no longer 1 month in most cases.
5. TMJ pain is presumed to limit mouth opening and mandibular protrusion.
6. TMJ pain is presumed to cause the deviation of the opening path toward the pain side.

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국 문 초 록

악관절 기능장애증의 증상 및 임상소견에 관한 연구

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김 연 중 · 이 승 우

악관절 기능장애증의 증상 및 임상소견에 관해 많은 연구가 보고되었으나 국내에서는 이에 대한 연구가 미비한 편이며, 이들간의 상호 관련성을 조사한 연구는 별무하였다. 이에 저자는 1983년 3월부터 1984년 7월 사이에 서울대학교 병원 구강진단과에 내원한 악관절 기능장애증 환자 367명 중 방사선 사진상으로 기질적인 변화를 보이지 않는 327명을 대상으로, 증상 및 임상소견에 관한 조사와 아울러 악관절 동통이 하악 운동에 미치는 영향에 관해 연구한 결과 다음과 같은 결론을 얻었다.

1. 악관절 기능장애증은 약 3:1의 비율로 여자에서 빈발하였고, 15세에서 29세까지의 청장년 층에 많았다.
2. 악관절 기능장애증 환자가 경험한 주 증상은 동통, 관절잡음, 개구장애 등이었다.
3. 관절잡음은 편측성인 경우가 많았고, 좌우 발현 빈도는 비슷하였으며 말기의 관절잡음이 많았다.
4. 악관절 기능장애증의 발병 기간은 1개월 이하인 경우가 많았다.
5. 악관절 동통은 개구와 하악 전방운동을 제한하는 것으로 추정된다.
6. 악관절 동통은 동통이 있는 쪽으로 하악 개구로의 편위를 일으키는 것으로 추정된다.