

# Outcome of Conservative Treatment for Patients with Disc Displacement of Temporomandibular Joint

Kyung-Hee Kim, D.D.S.,M.S.D., Ik-Hwan Kim, D.D.S,M.S.D,  
Myung-Yun Ko, D.D.S.,M.S.D.,Ph.D., Yong-Woo Ahn, D.D.S.,M.S.D.,Ph.D.

*Department of Oral medicine, College of Dentistry, Pusan National University*

To evaluate the treatment outcome after conservative treatment in patients with TMJ disc displacement which is the most common temporomandibular joint arthropathy, the subjects were chosen among the patients who presented to the Department of Oral Medicine of Pusan National University Hospital, diagnosed as TMDs and treated with conservative methods from 1994 to 2006 for 13 years. 88 patients with diagnosis of DD/cR and 60 patients with diagnosis of DD/sR were selected as the experimental group and 74 patients with diagnosis of masticatory muscle disorder (MMD) were selected as the control group. Subjective symptoms and clinical findings were investigated to evaluate and compare the subjects' status at the first visit and the last visit. The results were as follows;

1. Pain, noise, LOM and MCO measurements of DD/cR, DD/sR and MMD groups were markedly improved after conservative treatments including behavior therapy, physical therapy, medication and splint therapy.
2. At the first visit, high score of pain in MMD group, high score of noise and large MCO measurement in DD/cR group and high LOM score in DD/sR group were observed. At the last visit, high score of noise and increased MCO measurement in DD/cR group and high score of pain and LOM in DD/sR group were observed.
3. Among the patients who complained joint sound at their first visit, about 60% showed complete loss of joint sound after conservative treatment
4. DD/cR and DD/sR groups showed satisfactory outcomes after conservative treatments such as behavior therapy, physical therapy, medication and splint therapy while MMD group showed similar treatment outcome irrespective of the treatment modality used.
5. There was no difference in treatment outcomes after conservative treatments when the subjects were classified and compared according to gender, age group and chronicity.
6. MMD showed satisfactory prognosis in 10 treatments in less than 6 months while DD showed favorable prognosis in 10-20 treatments for 6 months to 2 years.

Key words : Disc displacement, Conservative treatment

Corresponding Author : Yong-Woo Ahn

*Department of Oral Medicine, College of Dentistry,*

*Pusan National University, 1-10 Ami-Dong, Seo-ku, Pusan 602-739, Korea*

*Tel: 82-51-240-7465*

*Fax: 82-51-247-0955*

*E-mail: ahnyongw@pusan.ac.kr*

Received: 2007-05-23

Accepted: 2007-07-26

## I. INTRODUCTION

Disc displacement (DD) is the most common temporomandibular joint arthropathy and is characterized by an abnormal relation or misalignment of the articular disc and condyle. Disc displacement is subdivided into disc displacement with reduction (DD/cR) and disc displacement without reduction (DD/sR). DD/cR is characterized by the temporarily displaced or misaligned disk abruptly improving its structural relationship with the condyle during mandibular translation resulting in an opening joint sound. A reciprocal closing noise is of less magnitude and is thought to be produced by the displacement once again of the disc in usually an anterior or anteromedial position. DD/sR, also called closed-lock, is described as an altered or misaligned disk-condyle structural relationship that is maintained during mandibular translation. It is characterized by a lack of joint noise and limited jaw motion.<sup>1)</sup>

Controversy exists because of the limited knowledge regarding the etiology and natural history or course of temporomandibular disorders (TMDs). Therefore the treatment is focused on reduction of pain and adverse loading, improvement of function, and restoration of normal daily activities. The majority of patients suffering TMD achieve good relief of symptom with conservative therapy.<sup>2-4)</sup> Long-term follow-up of TMD patients shows that 50% to over 90% of the patients have few or no symptoms after conservative treatment.<sup>5)</sup> Okesson and Hayes<sup>6)</sup> reported the success rate of 85.5% on 110 TMD patients who had been treated for 2 to 8 1/2 years with conservative treatments such as medication, relaxation, appliances and selective grinding. Greene and Laskin<sup>7)</sup> reported the long-term evaluation of 135 patients with myofascial pain-dysfunction syndrome who were treated with a variety of conservative modalities like exercise, medication, physical therapy and appliance. 1/2 to 8 years follow-up results showed a long-term success rate of 76%. Hodge<sup>8)</sup> reported 75% success rate in 448 TMD patients with

conservative treatment consisting of patient education, heat, massage, non-narcotic analgesics and occlusal splints.

However there is a lack of adequate scientific evidence for soundly relates therapy to treatment effects. Although many published studies have investigated TMDs, most are methodologically flawed. The controlled, double blind, clinical trial is the standard for clinical research, and these studies are rare in the field of TMD. Different disorders respond differently to different treatments. It is only with proper diagnosis that proper therapy can be selected. In the past, many studies describe their treatment groups as "TMJ patients". To evaluate the treatment effects of a particular treatment, these therapies must be tested in patient groups with very specific common diagnosis.<sup>9)</sup>

The author selected patients with DD which was the most common TMJ arthropathy shown in our clinics as the experimental group and masticatory muscle disorder (MMD) patients as the control group and wanted to find out the characteristics and the treatment outcome of these patients after conservative treatment and therefore to suggest adequate scientific evidence to support the appropriate treatment for patients diagnosed as DD.

## II. SUBJECTS AND METHODS

### 1. Subjects

The subjects were chosen among the patients who presented to the Department of Oral Medicine of Pusan National University Hospital, diagnosed as TMD and treated with conservative methods from 1994 to 2006 for 13 years. 88 patients with DD/cR and 60 patients with DD/sR were selected as the experimental group and 74 patients with MMD were selected as the control group. The patients with TMD were diagnosed based on detailed clinical and radiographic findings in accordance with the classification and diagnostic criteria for Headache Disorders, Cranial Neuralgias and Facial Pain by International Headache Society.<sup>10)</sup> Gender,

Table 1. Gender, age and chronicity distribution of DD/cR, DD/sR and MMD groups

		DD patients		MMD
		DD/cR (n= 88)	DD/sR (n= 60)	(n= 74)
Gender	Male	n= 21	n= 7	n= 15
	Female	n= 67	n= 53	n= 59
Age	Mean age	23.8 ±11.0	27.1 ± 12.0	35.2 ± 14.7
	Range of age	13~71	15~69	13~79
Chronicity	Acute(<6months)	n= 36	n= 27	n= 55
	Chronic(>6months)	n= 52	n = 33	n= 19

DD : Disc displacement, DD/cR : Disc displacement with reduction,

DD/sR : Disc displacement without reduction, MMD: Masticatory muscle disorder

Acute : less than 6 months, Chronic : more than 6 months

age and chronicity distribution of DD/cR, DD/sR and MMD groups were shown in Table 1.

## 2. Methods

Subjective symptoms and clinical findings were investigated at the first and the last visit to evaluate and compare before and after conservative treatment. Pain intensity, joint sound and a limitation of motion (LOM) were assessed with a numerical analogue scale (NAS) consisting of a 10cm ruler with the numbers 0 to 10 in between. 0 indicated no pain, noise and limitation while 10 indicated the worst pain, noise and limitation imaginable. Patients were asked to tell the number that corresponds to their symptoms. The mandibular movement was evaluated with measurements of maximum comfortable opening (MCO) in millimeters (mm). Joint sounds were perceived by placing the finger tips over the lateral surfaces of the joint and by placing a stethoscope while having the subject open and close the mouth. Symptom duration was investigated at the first visit of patient and classified into less than 6 months (acute) and more than 6 months (chronic) groups. The modalities of conservative treatment, frequency of visits and treatment period were investigated. Normally, the patients received conservative treatment once a week. The

termination of treatment and the recurrence of symptoms were also investigated. To evaluate treatment outcome the questionnaire from Clark<sup>11)</sup>'s study was modified and used. The patients were classified into complete cure, 3/4 improvement, 1/2 improvement and no improvement with reference to the progress notes. NAS score of the symptoms less than 1 at the last visit was classified as completely cured.<sup>12)</sup>

Statistical analysis was carried out with SPSS version 11.0. P-values of less than 0.05 were interpreted as significant and the level in confidence intervals was 95%.

## III. RESULTS

1. Comparison of the symptoms at the first visit and the last visit among DD/cR, DD/sR and MMD groups

Pain, noise, LOM and MCO were compared among DD/cR, DD/sR and MMD groups at the first visit. Pain score tended to be the highest in MMD group followed by DD/sR and DD/cR. Noise score showed to be the highest in DD/cR group followed by DD/sR and MMD ( $p<0.001$ ). LOM score showed to be the highest in DD/sR group followed by DD/cR and MMD ( $p<0.001$ ). MCO measurement

Table 2. Comparison of the symptoms at the first visit among DD/cR, DD/sR and MMD groups

	Pain(NAS)	Noise(NAS)	LOM(NAS)	MCO(mm)
DD/cR (n= 88)	4.05 ± 2.46*	4.49 ± 2.65 <sup>a†</sup>	3.19 ± 3.06 <sup>a†</sup>	39.12 ± 8.81 <sup>a†</sup>
DD/sR (n= 60)	4.48 ± 2.11	1.78 ± 2.28 <sup>b</sup>	5.53 ± 2.39 <sup>b</sup>	27.75 ± 6.40 <sup>b</sup>
MMD (n= 74)	4.74 ± 1.81	0.45 ± 1.30 <sup>c</sup>	2.87 ± 2.62 <sup>a</sup>	37.49 ± 9.54 <sup>a</sup>
<i>P</i>	0.123	<0.001	<0.001	<0.001
DD/cR in Male (n= 21)	3.19 ± 2.76*	4.67 ± 2.35 <sup>a†</sup>	2.88 ± 2.90 <sup>a†</sup>	39.24 ± 9.20*
DD/sR in Male (n= 7)	4.71 ± 1.11	1.86 ± 1.77 <sup>b</sup>	5.64 ± 1.49 <sup>b</sup>	29.43 ± 8.77
MMD in Male (n= 15)	5.00 ± 1.89	0.67 ± 1.50 <sup>c</sup>	2.70 ± 3.15 <sup>a</sup>	40.40 ± 12.64
<i>P</i>	0.062	<0.001	0.048	0.067
DDcR in Female (n= 67)	4.31 ± 2.31*	4.43 ± 2.76 <sup>a†</sup>	3.29 ± 3.12 <sup>a†</sup>	39.08 ± 8.76*
DDsR in Female (n= 53)	4.45 ± 2.22	1.76 ± 2.35 <sup>b</sup>	5.52 ± 2.50 <sup>b</sup>	27.53 ± 6.10
MMD in Female (n= 59)	4.67 ± 1.80	0.40 ± 1.26 <sup>c</sup>	2.92 ± 2.50 <sup>a</sup>	36.75 ± 8.56
<i>P</i>	0.643	<0.001	<0.001	<0.001
DD/cR in Acute (n= 36)	4.03 ± 2.34*	4.46 ± 2.47 <sup>a†</sup>	3.47 ± 3.02 <sup>a†</sup>	38.53 ± 10.23 <sup>a†</sup>
DD/sR in Acute (n= 27)	4.41 ± 2.10	0.82 ± 1.59 <sup>b</sup>	6.07 ± 1.76 <sup>b</sup>	27.07 ± 4.98 <sup>b</sup>
MMD in Acute (n= 55)	4.50 ± 1.85	0.23 ± 0.85 <sup>c</sup>	3.05 ± 2.60 <sup>a</sup>	37.79 ± 9.54 <sup>a</sup>
<i>P</i>	0.556	<0.001	<0.001	<0.001
DD/cR in Chronic (n= 52)	4.06 ± 2.56*	4.51 ± 2.80*	3.00 ± 3.10*	39.53 ± 7.76*
DD/sR in Chronic (n= 33)	4.55 ± 2.16	2.56 ± 2.46	5.09 ± 2.75	28.30 ± 7.40
MMD in Chronic (n= 19)	5.42 ± 1.51	1.11 ± 2.02	2.37 ± 2.67	36.63 ± 9.74
<i>P</i>	0.085	<0.001	0.001	<0.001

\* : ANOVA - test † : Kruskal-Wallis test

There was no significant difference between the same letter.

showed to be the highest in DD/cR group followed by MMD and DD/sR (p<0.001). The results appeared to be the same when the subjects were divided into both male and female groups and as well as acute and chronic groups (Table 2).

Pain, noise, LOM and MCO were compared among DD/cR, DD/sR and MMD groups at the last visit. Pain score showed to be the highest in DD/sR group followed by MMD and DD/cR (p<0.001). Noise score showed to be the highest in both DD/cR and DD/sR groups followed by MMD

(p<0.001). LOM score showed to be the highest in DD/sR group followed by MMD and DD/cR (p<0.001). MCO measurement showed to be the highest in DD/cR group followed by MMD and DD/sR (p<0.001). The results appeared to be the same when the subjects were divided into both male and female groups as well as acute and chronic groups (Table 3).

Pain, noise, LOM and MCO measured at the first visit had significantly decreased by the last visit in all three groups (Table 4, p<0.001).

Table 3. Comparison of the symptoms at the last visit among DD/cR, DD/sR and MMD groups

	Pain(NAS)	Noise(NAS)	LOM(NAS)	MCO(mm)
DD/cR (n= 88)	0.40 ± 0.98 <sup>a†</sup>	0.72 ± 1.30 <sup>a†</sup>	0.24 ± 0.84 <sup>a†</sup>	44.14 ± 6.48 <sup>*</sup>
DD/sR (n= 60)	1.98 ± 2.30 <sup>b</sup>	0.72 ± 1.32 <sup>a</sup>	2.24 ± 2.59 <sup>b</sup>	37.47 ± 7.37
MMD (n= 74)	1.05 ± 1.83 <sup>c</sup>	0.28 ± 1.01 <sup>b</sup>	0.59 ± 1.45 <sup>b</sup>	42.96 ± 6.68
<i>P</i>	<0.001	<0.001	<0.001	<0.001
DD/cR in Male (n= 21)	0.26 ± 0.68 <sup>*</sup>	0.76 ± 1.22 <sup>*</sup>	0.17 ± 0.66 <sup>*</sup>	47.33 ± 7.53 <sup>*</sup>
DD/sR in Male (n= 7)	1.29 ± 1.98	0.43 ± 1.13	1.36 ± 2.32	41.57 ± 7.48
MMD in Male (n= 15)	1.37 ± 2.30	0.20 ± 0.78	1.09 ± 2.27	46.33 ± 7.49
<i>P</i>	0.059	0.304	0.171	0.222
DD/cR in Female (n= 67)	0.44 ± 1.06 <sup>a†</sup>	0.70 ± 1.33 <sup>a†</sup>	0.27 ± 0.89 <sup>a†</sup>	43.13 ± 5.82 <sup>*</sup>
DD/sR in Female (n= 53)	2.07 ± 2.34 <sup>b</sup>	0.75 ± 1.35 <sup>a</sup>	2.36 ± 2.62 <sup>b</sup>	36.92 ± 7.25
MMD in Female (n= 59)	0.97 ± 1.71 <sup>c</sup>	0.30 ± 1.07 <sup>b</sup>	0.47 ± 1.15 <sup>a</sup>	42.10 ± 6.24
<i>P</i>	<0.001	0.001	<0.001	<0.001
DD/cR in Acute (n= 36)	0.19 ± 0.48 <sup>a†</sup>	0.63 ± 1.43 <sup>*</sup>	0.21 ± 0.82 <sup>a†</sup>	44.56 ± 5.99 <sup>*</sup>
DD/sR in Acute (n= 27)	1.33 ± 1.97 <sup>b</sup>	0.28 ± 0.81	1.87 ± 2.18 <sup>b</sup>	38.56 ± 6.33
MMD in Acute (n= 55)	1.09 ± 1.80 <sup>b</sup>	0.17 ± 0.69	0.71 ± 1.63 <sup>c</sup>	42.80 ± 6.76
<i>P</i>	0.003	0.004	<0.001	0.001
DD/cR in Chronic (n= 52)	0.54 ± 1.20 <sup>a†</sup>	0.78 ± 1.21 <sup>*</sup>	0.27 ± 0.85 <sup>a†</sup>	43.85 ± 6.84 <sup>*</sup>
DD/sR in Chronic (n= 33)	2.50 ± 2.44 <sup>b</sup>	1.08 ± 1.55	2.55 ± 2.88 <sup>b</sup>	36.58 ± 8.11
MMD in Chronic (n= 19)	0.95 ± 1.98 <sup>a</sup>	0.58 ± 1.61	0.24 ± 0.65 <sup>b</sup>	43.42 ± 6.59
<i>P</i>	<0.001	0.433	<0.001	<0.001

\* : ANOVA - test † : Kruskal-Wallis test

There was no significant difference between the same letter.

## 2. Change in joint sound after treatment

Among 120 patients who complained joint sound at their first visit, 54.6% showed complete loss of joint sound after conservative treatment while 45.4% continued to have joint sound (Table 5).

## 3. Treatment outcome according to different treatment modalities

In DD/cR group, complete cure rate tended to show to be the highest (69.8%) when physical therapy, medication and stabilizing splint were

applied in combination. A combined use of physical therapy, medication and anterior repositioning splint ranked second. Physical therapy with medication and physical therapy or medication only method followed next in order.

In DD/sR group, complete cure rate tended to show to be the highest (71.4%) when physical therapy with medication was applied. A combined use of physical therapy, medication and anterior repositioning splint followed the next. Physical therapy or medication only method and a combined use of physical therapy, medication and stabilizing splint followed the next in order. However there

Table 4. Comparison of the symptoms at the first visit and the last visit among DD/cR, DD/sR and MMD groups

		Pain(NAS)	Noise(NAS)	LOM(NAS)	MCO(mm)
DD/cR (n= 88)	First visit	4.05 ± 2.46	4.49 ± 2.65	3.19 ± 3.06	39.12 ± 8.81
	Last visit	0.40 ± 0.98	0.72 ± 1.30	0.24 ± 0.84	44.14 ± 6.48
<i>P</i>		<0.001	<0.001	<0.001	<0.001
DD/sR (n= 60)	First visit	4.48 ± 2.11	1.78 ± 2.28	5.53 ± 2.39	27.75 ± 6.40
	Last visit	1.98 ± 2.30	0.72 ± 1.32	2.24 ± 2.59	37.47 ± 7.37
<i>P</i>		<0.001	0.001	<0.001	<0.001
MMD (n= 74)	First visit	4.74 ± 1.81	0.45 ± 1.30	2.87 ± 2.62	37.49 ± 9.54
	Last visit	1.05 ± 1.83	0.28 ± 1.01	0.59 ± 1.45	42.96 ± 6.68
<i>P</i>		<0.001	0.296	<0.001	<0.001

Table 5. Change in joint sound after treatment

		Last visit			<i>P</i> *
		Joint sound	No joint sound	Total	
First visit	Joint sound	55(45.4)	65(54.6)	120	<0.001
	No joint sound	14(13.7)	88(86.3)	102	
	Total	69	153	222	

\* McNemars test

was no significant difference in statistics and the number of subjects for each treatment modality showed too much deviation.

MMD group showed no difference in complete cure rate according to different treatment modalities (Table 6).

#### 4. Treatment outcome according to gender

In DD/cR group, male and female showed complete cure rate of 66.7% and 65.7% respectively. In DD/sR group, male and female showed complete cure rate of 57.1% and 44.7% respectively. In MMD group, male and female showed complete cure rate of 40.0% and 52.5% respectively. However there was no significant difference in p-value of male and female in the three groups (Table 7).

#### 5. Treatment outcome according to age group

In DD/cR and DD/sR groups 5<sup>th</sup> decade of life tended to show the highest complete cure rate but the number of subjects in each age group showed too much deviation therefore there was no significant difference in statistics (Table 8).

#### 6. Treatment outcome according to the duration of symptoms before treatment

In DD/cR group, acute and chronic groups showed complete cure rate of 72.2% and 61.5% respectively. In DD/sR group, acute and chronic groups showed complete cure rate of 47.8% and 45.5% respectively. In MMD group, acute and chronic groups showed complete cure rate of 45.5%

Table 6. Treatment outcome according to different treatment modalities

	Complete cure (%)	3/4 improvment (%)	1/2 improvment (%)	No improvment (%)	<i>P</i> *	
DD/cR	PT + M + SS (n= 53)	37(69.8)	11(20.8)	4(7.5)	1(1.9)	0.569
	PT + M + ARS (n= 6)	4(66.7)	1(16.7)	1(16.7)	0	
	PT + M (n= 22)	13(59.1)	7(31.8)	1(4.5)	1(4.5)	
	PT / M (n= 7)	4(57.1)	1(14.3)	1(14.3)	1(14.3)	
DD/sR	PT + M + SS (n= 33)	13(39.4)	9(27.3)	4(12.1)	7(21.2)	0.171
	PT + M +ARS (n= 5)	3(60.0)	0	2(40.0)	0	
	PT + M (n= 7)	5(71.4)	0	0	2(28.6)	
	PT / M (n= 45)	21(46.7)	9(20.0)	6(13.3)	9(20.0)	
MMD	PT + M + SS (n= 14)	6(42.9)	4(28.6)	2(14.3)	2(14.3)	0.832
	PT + M (n= 60)	31(51.7)	16(26.7)	6(10.0)	7(11.7)	
	PT / M (n= 74)	37(50.0)	20(27.0)	8(10.8)	9(12.2)	

\* Fisher’s exact test

- PT: Physical therapy, M: Medication, SS: Stabilizing splint, ARS: Anterior repositioning splint

and 63.2% respectively. However there was no significant difference in p-value of acute and chronic in the three groups (Table 9).

7. Treatment outcome according to treatment period

When treatment period groups with small numbers of subjects were excluded, MMD group tended to show 50% complete cure rate in less than 6 months. DD/cR group tended to show 66.7% complete cure rate in more than 6 months and 75% complete cure rate in more than a year. DD/sR

group tended to show 77.8% complete cure rate in more than a year (Table 10).

8. Treatment outcome according to treatment frequency

When treatment period groups with small number of subjects were excluded, MMD group tended to show 48.3% complete cure rate in less than 10 times of treatment while DD/cR and DD/sR groups tended to show 73% and 56.5% complete cure rate in 10-20 treatments respectively (Table 11).

Table 7. Treatment outcome according to gender

		Complete cure (%)	3/4 improvment (%)	1/2 improvment (%)	No improvment (%)	<i>P</i> *
DD/cR	Male (n= 21)	14(66.7)	5(23.8)	2(9.5)	0	1.000
	Female (n= 67)	44(65.7)	15(22.4)	5(7.5)	3(4.5)	
DD/sR	Male (n= 7)	4(57.1)	1(14.3)	0	2(28.6)	0.822
	Female (n= 38)	17(44.7)	8(21.1)	6(15.8)	7(18.4)	
MMD	Male (n= 15)	6(40.0)	3(20.0)	3(20.0)	3(20.0)	0.333
	Female (n= 59)	31(52.5)	17(28.8)	5(8.5)	6(10.2)	

\* Fishers exact test

Table 8. Treatment outcome according to age group

		Complete cure (%)	3/4 improvment (%)	1/2 improvment (%)	No improvment (%)	<i>P</i> *
DD/cR (n=88)	2nd decade(n= 42)	28(66.7)	10(23.8)	2(4.8)	2(4.8)	0.619
	3rd decade(n= 28)	18(64.3)	7(25.0)	3(10.7)	0	
	4th decade(n= 9)	6(66.7)	2(22.2)	0	1(11.1)	
	5th decade(n= 7)	5(71.4)	1(14.3)	1(14.3)	0	
	Over 6th decade(n= 2)	1(50.0)	0	1(50.0)	0	
DD/sR (n=45)	2nd decade (n= 14)	5(35.7)	2(14.3)	2(14.3)	5(35.7)	0.810
	3rd decade (n= 19)	10(52.6)	4(21.1)	3(15.8)	2(10.5)	
	4th decade (n= 8)	3(37.5)	3(37.5)	1(12.5)	1(12.5)	
	5th decade (n= 2)	2(100.0)	0	0	0	
	Over 6th decade(n= 2)	1(50.0)	0	0	1(50.0)	
MMD (n=74)	2nd decade (n= 11)	4(36.4)	3(27.3)	2(18.2)	2(18.2)	0.716
	3rd decade (n= 18)	7(38.9)	6(33.3)	2(11.1)	3(16.7)	
	4th decade (n= 13)	11(84.6)	2(15.4)	0	0	
	5th decade (n= 20)	9(45.0)	6(30.0)	3(15.0)	2(10.0)	
	Over 6thdecade(n=12)	6(50.0)	3(25.0)	1(8.3)	2(16.7)	

\* Fishers exact test



Table 9. Treatment outcome according to the duration of symptoms before treatment

		Complete cure (%)	3/4 improvement (%)	1/2 improvement (%)	No improvement (%)	<i>P</i> *
DD/cR (n= 88)	Acute (n= 36)	26(72.2)	7(19.4)	2(5.6)	1(2.8)	0.825
	Chronic (n= 52)	32(61.5)	13(25.0)	5(9.6)	2(3.8)	
DD/sR (n= 45)	Acute (n= 23)	11(47.8)	5(21.7)	3(13.0)	4(17.4)	1.000
	Chronic (n= 22)	10(45.5)	4(18.2)	3(13.6)	5(22.7)	
MMD (n= 74)	Acute (n= 55)	25(45.5)	16(29.1)	7(12.7)	7(12.7)	0.649
	Chronic (n= 19)	12(63.2)	4(21.2)	1(5.3)	2(10.5)	

\* Fishers exact test

Table 10. Treatment outcome according to treatment period

		Complete cure (%)	3/4 improvement (%)	1/2 improvement (%)	No improvement (%)	<i>P</i> *
DD/cR (n=87)	<6mns(n= 47)	30(63.8)	11(23.4)	4(8.5)	2(4.3)	0.843
	1yr> ≥6mns(n= 21)	14(66.7)	5(23.8)	2(9.5)	0	
	2yrs> ≥1yr(n= 12)	9(75.0)	3(25.0)	0	0	
	≥2yrs(n= 7)	4(57.1)	1(14.3)	1(14.3)	1(14.3)	
DD/sR (n=44)	<6mns(n= 20)	8(40.0)	4(20.0)	3(15.0)	5(25.0)	0.524
	1yr> ≥6mns(n= 12)	4(33.3)	4(33.3)	2(16.7)	2(16.7)	
	2yrs> 1 ≥yr(n= 9)	7(77.8)	1(11.1)	1(11.1)	0	
	≥2yrs(n= 3)	1(33.3)	0	0	2(66.7)	
MMD (n=74)	<6mns(n= 62)	31(50.0)	17(27.4)	6(9.7)	8(12.9)	0.950
	1yr> ≥6mns(n= 9)	4(44.4)	2(22)	2(22.2)	1(11.1)	
	2yrs> ≥1yr(n= 2)	1(50.0)	1(50.0)	0	0	
	≥2yrs(n= 1)	1(100.0)	0	0	0	

\* Fishers exact test

Table 11. Treatment outcome according to treatment frequency

		Complete cure (%)	3/4 improvment (%)	1/2 improvment (%)	No improvment (%)	<i>P</i> *
DD/cR (n= 88)	<10 times (n= 40)	22(55.0)	13(32.5)	2(5.0)	3(7.5)	0.180
	10-20 times (n= 37)	27(73.0)	6(16.2)	4(10.8)	0	
	>20 times (n= 11)	9(81.8)	1(9.1)	1(9.1)	0	
DD/sR (n= 45)	<10 times (n= 14)	4(28.6)	2(14.3)	3(21.4)	5(35.7)	0.318
	10-20 times (n= 23)	13(56.5)	5(21.7)	3(13.0)	2(8.7)	
	>20 times (n= 8)	4(50.0)	2(25.0)	0	2(25.0)	
MMD (n= 74)	<10 times (n= 58)	28(48.3)	17(29.3)	7(12.1)	6(10.3)	0.444
	10-20 times (n= 15)	9(60.0)	2(13.3)	1(6.7)	3(20.0)	
	>20 times (n= 1)	0	1(100.0)	0	0	

\* Fishers exact test

#### IV. DISCUSSION

The majority of TMD patients achieve good relief of symptoms with a conservative model of noninvasive management.<sup>2,3,6,8,13,14</sup> Because little is known about the natural course of TMD or which signs and symptoms will progress to more serious conditions, a special effort should be made to avoid aggressive, irreversible therapy.<sup>15</sup> This is supported by the reports of de Leeuw *et al.*<sup>16</sup> which stated that both internal derangements and osteoarthritis of the TMJ follow a natural course. They concluded that nonsurgical treatment was as effective as surgical treatment over the long term. Okeson<sup>17</sup> also showed the results of 42 long-term studies for the treatment of various TMDs and found that conservative and nonconservative therapies seemed to report similar success rates on

a long-term basis (70% to 85%) although the patients population between these groups was quite different. Therefore it would appear that a logical approach to patient management is to attempt conservative therapy first and to consider nonconservative therapy only when the reversible treatment has failed to resolve the disorder adequately.<sup>17</sup>

To confidently select an appropriate treatment, the clinician should demand adequate scientific evidence to support its use. This support should be found in evidence-based literature that documents the success and failure of a described treatment.<sup>17</sup> There are numerous published articles suggesting the success of a variety of treatment options but they may not be soundly substantiated with scientific evidence. Therefore the author selected patients with ADD which was the most common

TMJ arthropathy shown in our clinics as the subjects and wanted to find out the characteristics and the treatment outcome of these patients after conservative treatment and to suggest adequate scientific evidence to support the appropriate treatment for patients with the diagnosis of ADD.

At the first visit the main symptom of DD/cR patients is mostly joint sound and therefore noise score in DD/cR group was the highest compared to other groups. The main symptom of DD/sR patients is mostly LOM and therefore the LOM score was the highest in DD/sR group compared to other groups and MCO, the data which is able to evaluate LOM objectively also showed the least measurement. MCO in DD/cR group was larger than MMD group but LOM score was higher than MMD group. This tells us that the discomfort which patients feel and express as LOM is determined by whether they can open and close their mouths freely without any catching sensation, not by MCO measurements. In MMD group pain score was a little bit higher than other groups' so severe pain could be the main symptom of MMD patients.

All of the patient groups showed their symptoms markedly reduced after conservative treatments in our study. However we could assume that the prognosis of DD/sR group is the worst among those groups because the highest pain and LOM score and the lowest MCO measurement were still remained at their last visit. On the other side DD/cR group showed the best prognosis. We also observed that DD patients showed favorable prognosis in 10–20 treatments for 6 months to 2 years while MMD patients showed satisfactory prognosis in 10 treatments in less than 6 months. Ko<sup>18)</sup> studied treatment outcome of 127 Patients with closed lock after conservative treatment and showed both acute and chronic patients improved their symptoms in 6 months period. The treatment period of our study seemed to be longer than Ko's study. In the presence of acute or chronic internal derangement, the muscles that support and move the joints can be secondarily affected.<sup>19)</sup> Therefore

DD/cR and DD/sR patients in our study might have muscle problem as well as joint problem. From Park and Ko<sup>11)</sup>'s study on long-term evaluation of conservative treatment for craniomandibular disorders, they classified the patients into myogenic, arthrogenic and both myogenic and arthrogenic group and compared the prognosis. They concluded that patients with multiple diagnosis, especially more related to muscle problems, complained much more discomfort than single diagnosis patients and MCO decreased in these patients. Lee *at al.*<sup>20)</sup> also agreed with this result and presented that the prognosis of multiple diagnosis was worse than single diagnosis. Treatment period of DD patients with possible muscle problem might cause the extension of treatment period.

The multiplicity of causes of TMDs is evidenced by the strong clinical opinion that a combination of treatments is more effective than a single treatment.<sup>21)</sup> Therefore for optimal success treatment modalities are best used in combination, depending on the patient's needs. The author's previous study<sup>22)</sup> also supports this opinion. The author randomly assigned 54 TMD patients into two treatment groups (EAST applied group and EAST and ultrasound applied group) and compared the results after two weeks treatment. The study concluded that a combination of physical therapy modalities in treatment of TMD patients was more effective than using just a single physical therapy modality. In this study the author applied different groups of treatment modalities to the subjects and tried to find the best treatment modalities for each diagnosis. However there was no significant difference in statistics and the overall results showed satisfactory outcome after conservative treatment, irrespective of the groups of treatment modalities applied. Therefore depending on the patient's need we can conclude that DD/cR and DD/sR groups showed satisfactory outcomes after conservative treatments such as behavior therapy, physical therapy, medication and splint therapy.

It is known that asymptomatic joint sounds are

very common and are detected in 25% to 35% of the general population.<sup>17)</sup> Therefore all TMJ sounds are not required to be treated and only joint sounds associated with pain and decreased joint mobility are considered for treatment nowadays. If patients have joint sounds associated with pain and LOM, the treatment goal should be on reducing painful symptoms not focused on reestablishing a normal condyle-disc relationship. It is known that joint sounds don't be eliminated generally but amplitude and frequency can be reduced after treatment. Our study showed that among 120 patients who complained joint sound at their first visit, 54.6% reported complete loss of joint sound after conservative treatment. This result is similar to the other previous studies'. Ko *et al.*<sup>23)</sup> studied on the prognosis of conservative therapy on 144 TMD patients with painful joint sound and reported that 42.11% of TMD patients with click had reported no joint sound after stabilization appliance with physical therapy. Chung *et al.*<sup>24)</sup> also reported the effect of conservative treatment including patient education, relaxation procedures, physical therapy, occlusal splint therapy and selective grinding on 94 TMD patients and reported that of the 70 patients who previously complained jaw joint sound, 34 patients which are 48.6%, no longer reported of it after treatment.

Although the numbers of each diagnostic group showed to be enough, sample size of male patients and patients who were grouped in both treatment modalities and age was too small for comparison. Long-term study on the symptoms changed after their last visit is also needed to find out more reliable treatment outcome. The patients' symptoms and clinical findings were compared mostly with subjective data so more objective evaluation method is required for further studies.

## V. CONCLUSION

To evaluate the treatment outcome after conservative treatment in patients with TMJ disc displacement which is the most common tempo-

romandibular joint arthropathy, the subjects were chosen among the patients who presented to the Department of Oral Medicine of Pusan National University Hospital, diagnosed as TMDs and treated with conservative methods from 1994 to 2006 for 13 years. 88 patients with diagnosis of DD/cR and 60 patients with diagnosis of DD/sR were selected as the experimental group and 74 patients with diagnosis of masticatory muscle disorder (MMD) were selected as the control group. Subjective symptoms and clinical findings were investigated to evaluate and compare the subjects' status at the first visit and the last visit. The results were as follows:

1. Pain, noise, LOM and MCO measurements of DD/cR, DD/sR and MMD groups were markedly improved after conservative treatments including behavior therapy, physical therapy, medication and splint therapy.
2. At the first visit, high score of pain in MMD group, high score of noise and large MCO measurement in DD/cR group and high LOM score in DD/sR group were observed. At the last visit, high score of noise and increased MCO measurement in DD/cR group and high score of pain and LOM in DD/sR group were observed.
3. Among the patients who complained joint sound at their first visit, about 60% showed complete loss of joint sound after conservative treatment
4. DD/cR and DD/sR groups showed satisfactory outcomes after conservative treatments such as behavior therapy, physical therapy, medication and splint therapy while MMD group showed similar treatment outcome irrespective of the treatment modality used.
5. There was no difference in treatment outcomes after conservative treatments when the subjects were classified and compared according to gender, age group and chronicity.
6. MMD showed satisfactory prognosis in 10 treatments in less than 6 months while DD showed favorable prognosis in 10-20 treatments for 6 months to 2 years.

REFERENCES

1. McNeill C. Management of temporomandibular disorders: Concepts and controversies. *J Prosthet Dent* 1997;77:510-522.
2. Carlsson GE. Long-term effects of treatment of craniomandibular disorders. *J Craniomand Pract* 1985;3:337-342.
3. Randolph CS, Greene CS, Moretti R et al. Conservative management of temporomandibular disorders: a posttreatment comparison between patients from a university clinic and from private practice. *Am J Orthod Dentofacial Orthop* 1990;98(1):77-82.
4. Skeppar J, Nilner M. Treatment of craniomandibular disorders in children and young adults. *J Orofac Pain* 1993;7:362-369.
5. Okeson JP. Orofacial Pain : guidelines for assessment, diagnosis, and management. Illinois, 1996, Quintessence Publishing Co Inc., pp.142.
6. Okeson JP, Hayes DK. Long-term results of treatment for temporomandibular disorders: an evaluation by patients. *J Am Dent Assoc* 1986;112: 473-478.
7. Greene CS, Laskin DM. Long-term evaluation of conservative treatment for myofascial pain-dysfunction syndrome. *J Am Dent Assoc* 197 ;89(6):1365-1368.
8. Hodges JM. Managing temporomandibular joint syndrome. *Laryngoscope* 1990;100:60-66.
9. Albino JEN. The Institutes of Health Technology Assessment Conference Statement on the management of temporomandibular disorders. *J Oral Rehabil* 1996;127:1595-1599.
10. McNeill C. Temporomandibular disorders : Guidelines for classification, assessment, and management. 2nd ed., Illinois, 1993, Quintessence Publishing Co, Inc., pp 43.
11. Clark GT, Lanham, Flack V. Treatment outcome results for consecutive TMJ clinic. *J Craniomand Pract* 1988;2:87-95.
12. Park JS, Ko MY. Long-term evaluation of conservative treatment for craniomandibular disorders. *Korean J Oral Med* 1993;18:81-96.
13. Apfelberg DB, Lovey E, Janetos G, Maser MR, Lash H. Temporomandibular joint disease. Results of a ten-year study. *Post Graduate Med* 1979;65:167-172.
14. Greene CS, Laskin DM. Long term status of TMJ clicking in patients with myofascial pain dysfunction. *J Am Dent Assoc* 1998;17: 461-465.
15. Clark GT, Seligman DA, Solberg WK, Pullinger AG. Guidelines for the treatment of temporomandibular disorders. *J Craniomandib Disord Facial Oral Pain* 1990;4:80-88.
16. de Leeuw R, Boering G, Stegenga B, de Bont LG. Clinical signs of TMJ osteoarthritis and internal derangement 30 years after nonsurgical treatment. *J Orofac Pain* 1994;8:18-24.
17. Okeson JP. Management of temporomandibular disorders and occlusion. 5<sup>th</sup> ed., St. Louis, 1993, Mosby, pp.369-372,438.
18. Ko MY. Treatment outcome of patients with closed lock by conservative therapy. *J PNUH* 1997;1: 265-271.
19. Kaplan AS and Assael LA. Temporomandibular disorders: Diagnosis and treatment. LA, 1991, W.B. Saunders company, pp.136.
20. Lee HJ, Park JS, Ko MY. A prediction on the conservative treatment outcome of TMD patients by prognostic factors. . *Korean J Oral Med* 2001;26: 133-146.
21. Dearnorff MW, Butteworth J. Psychometric profiles of craniomandibular pain patients. Part II. A multidisciplinary case report. *J Craniomand Pract* 1987;5: 367-370.
22. Kim KH, Ahn YW, Park JS, Ko MY. Clinical effect of a combination of physical therapy modalities on TMD patients. *Korean J Oral Med* 2003;28:379-391.
23. Ko MY, Cho SH, Ahn YW. Prognosis of conservative therapy on the TMD patients with noise. *Korean J Oral Med* 2003;28:91-110.
24. Chung SC, Kim YJ, Lee JW. Effect of conservative treatment of temporomandibular disorders (II). *Korean J Oral Med* 1989;14:113-121.

국문요약

## 측두하악관절 원판변위 환자의 보존적 치료결과

부산대학교 치과대학 구강내과학교실

김경희 · 김익환 · 고명연 · 안용우

측두하악관절에 나타나는 가장 흔한 질환인 원판변위를 보이는 환자들에서 보존적 치료결과를 평가하기 위해 1994년부터 2006년까지 13년간 부산대학교병원 구강내과에 내원하여 측두하악관절장애로 진단받은 후 보존적 치료를 시행한 환자 중 88명의 정복성 관절원판변위환자와 60명의 비정복성 관절원판변위환자를 실험군으로, 74명의 근육장애환자를 대조군으로 하여 초진시와 치료종결시의 주관적 증상 및 임상소견을 비교, 분석하여 다음과 같은 결과를 얻었다.

1. 정복성 관절원판변위 환자군, 비정복성 관절원판변위 환자군, 근육장애 환자군은 행동치료, 물리치료, 약물치료, 교합안정장치치료 등의 보존적 치료에 의해 통증, 관절음, 개구제한, 편이개구량이 현저히 개선되었다.
2. 초진시 통증은 근육장애군에서, 관절음은 정복성 관절원판변위 환자군에서, 개구제한은 비정복성 관절원판변위 환자군에서 매우 심했고, 편이 개구량은 정복성 관절원판변위 환자군에서 가장 컸으며 치료종결시 통증은 비정복성 관절원판변위군에서, 관절음은 정복성 관절원판변위 환자군에서, 개구제한은 비정복성 관절원판변위 환자군에서 가장 심했고, 편이 개구량은 정복성 관절원판변위 환자군에서 가장 컸다.
3. 초진시 관절음을 호소했던 환자가 보존적 치료로 관절음이 완전히 사라진 경우는 약 60%였다.
4. 정복성 및 비정복성 관절원판변위 환자에게는 행동치료, 물리치료, 약물치료, 교합안정장치치료를 시행했을 때 비교적 양호한 결과를 보였고, 근육장애 환자에게는 치료방법에 따른 결과는 별 차이가 없었다.
5. 보존적 치료에 따른 결과는 성, 연령, 급, 만성별로 차이가 없었다.
6. 근육장애는 6개월 미만, 10회 정도의 치료에 양호한 예후를 보였으나, 원판변위는 6개월 이상 2년 이하의 기간, 10-20회 정도의 치료에 예후가 좋았다.

주제어 : 관절원판변위, 보존적 치료