

Long-Term Follow-up Study on Drop-out TMD Patients With Self-Administered Questionnaires

Hirofumi Yatani, DDS, PhD
Associate Professor

Takushi Kaneshima, DDS
Research Associate and Clinical
Researcher

Takuo Kuboki, DDS, PhD
Assistant Professor

Akio Yoshimoto, DDS
Graduate Student

Yoshizo Matsuka, DDS, PhD
Assistant Professor

Atsushi Yamashita, DDS, PhD
Professor

Department of Fixed Prosthodontics
Okayama University Dental School
Okayama, Japan

Correspondence to:

Dr Hirofumi Yatani
Department of Fixed Prosthodontics
Okayama University Dental School
2-5-1 Shikata
Okayama, Japan

Although patient attrition might be a serious threat to the validity of treatment-outcome studies on temporomandibular disorders (TMD), studies on TMD patient attrition are scarce. Of the 1405 consecutive TMD patients examined in a recent 10-year period, 367 (26.1%) drop-out patients or patients identified with a control group were sampled. A mailed questionnaire failed to reach 41 patients, and 203 (62.3%) were returned. The questionnaire elicited information on reasons for dropping out, changes in symptoms, treatment received in other clinics after dropping out, present treatment needs, and current signs and symptoms. Dropouts were divided into two groups: (1) those who failed to show up for their first scheduled appointment after the clinical examination; (2) those who failed to complete treatment. A group of patients who were judged by the examiner not to need treatment were included as a control group. The main reasons for dropping out were environmental obstacles, perceived improvement of the disease, and dissatisfaction with services. Only 21.7% considered themselves to be in need of treatment, and only 10.3% had visited other clinics after dropping out. Only 8.9% complained of the continued aggravation of symptoms, whereas 57.6% reported improvement. In addition, pain, dysfunction, and daily activity limitation tended to improve with time, although temporomandibular joint noise tended to persist. These results suggest that TMD signs and symptoms tend to decrease in patients after dropping out, and that the natural fluctuation of TMD signs and symptoms should be taken into consideration when treating TMD.

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Many patients with chronic pain and dysfunction of all types drop out of treatment.¹⁻⁷ Although drop-out rates vary widely across studies, it appears in general that 20% to 50% of patients drop out of treatment. Unfortunately, very few studies have investigated the drop-out percentage of patients with temporomandibular disorders (TMD).^{3,8} Smith⁸ reported that 245 (35.3%) of the 694 TMD patients who were referred for consultation between 1976 and 1984 had dropped out of treatment.

During the past decade, a number of treatment-outcome studies on TMD have been published.⁹⁻¹⁹ Although the majority of these studies reported successful treatment results, the validity of these

studies still has not been fully verified; most of them lacked control groups, had short follow-up periods, and used obscure criteria for establishing the success of the therapeutic interventions. Patient attrition also was not considered in any of these studies. Interestingly, a recent controlled clinical trial on splint therapy for myofascial masticatory muscle pain reported that the gradual reduction in the intensity and unpleasantness of myofascial pain was not related to the type of treatment applied.²⁰

In a review article on chronic-pain treatment-outcome studies, Turk and Rudy²¹ pointed out that patient attrition might mitigate conclusions regarding the generalizability of the favorable results reported. Patients with TMD, especially those with chronic pain, are often treated over long periods of time and, consequently, some may drop out without completing treatment. Therefore, treatment results may be biased if they fail to consider drop-out patients. Among the aforementioned variables that threaten the validity of TMD treatment-outcome studies, patient attrition would be a serious consideration if the percentage of patients who dropped out was high or if the dropouts occurred for biased reasons or within a particular diagnostic subgroup. Dropouts may include only patients with severe pain and symptoms or only patients who do not experience favorable effects after initial treatment. Studies that report high drop-out rates should also report the reasons for patient attrition. These reasons may reveal significant biasing. It is important, therefore, to investigate the outcomes of TMD patients who either did not enter treatment because they failed to show up for appointments after their initial examination or who dropped out during the course of treatment. This study evaluates this non-compliant group of patients by means of a mailed self-administered questionnaire, which also assesses the current signs and symptoms of TMD among this group.

Materials and Methods

Drop-out Classification

Patients selected for this study were examined at the Department of Fixed Prosthodontics, Okayama University Dental School, Okayama, Japan, and diagnosed as having one or more signs and symptoms of TMD during the past 10 years. Patients were divided into two populations, noncompliant and compliant. The noncompliant population was further divided into two types of drop-out patients: (1) patients who failed to attend the first

scheduled appointment after the clinical examination (nontreatment group) and (2) patients who started treatment but failed to complete it (withdrawal group). In this study, therapist judgment was the means by which a patient was or was not defined as a dropout.²² When the investigator judged that treatment was terminated unilaterally by the patient against the therapist's advice, the patient was defined as having dropped out of treatment.

The compliant population consisted of patients who completed treatment, who were still undergoing treatment at the time of the survey, or who were judged by the examiner not to require treatment (control group). Patients assigned to the control group included: (1) those who were asymptomatic at the time of their first visit but had previously suffered from muscle and/or joint pain; (2) those with very slight muscle and/or joint pain (or tenderness) who were already improving; (3) those with disc displacement with reduction who had no pain, a long history of painless clicking, and no signs of intermittent locking; and (4) patients who were considered to be in an adaptation stage of disc displacement without reduction and/or had osteoarthritis with little or no pain and dysfunction. The control group was investigated along with the other two drop-out groups to assist in the interpretation of the results. For the sake of convenience, the term "dropout" was used for the control group as well as for the noncompliant group.

Initial-Visit Examination

A clinical examination was performed at the initial visit to detect signs and symptoms of TMD using methods routinely employed at the Department of Fixed Prosthodontics, Okayama University Dental School.²³ The examination included evaluation of general medical and dental history, pain, range of mandibular movements, temporomandibular joint (TMJ) sounds, tenderness to palpation of the TMJs and masticatory muscles, accompanying symptoms, general posture, and occlusion.

For most patients, sagittal magnetic resonance imaging (MRI) and tomography at intercuspal and maximal mouth-opening positions were undertaken to detect disc position and bony change in the condyle or the eminence, respectively. The tomographic images were obtained under hypocycloidal movement with the use of Optimplanimat (Siemens, Bensheim, Germany), and the T1-weighted MR images were obtained using Signa 1.5T (General Electric) or Magnetom 1.5T (Siemens).

Table 1 Types of Therapeutic Treatments Received by Withdrawal-Group Patients

Type of therapy	Withdrawal-group patients				
	Myalgia	Arthralgia	ADDwR*	ADDwoR†	OA‡
Patient education	U	U	U	U	U
Pain medication	O	F	O	F	O
TENS	O				
Manual manipulation				F	F
Jaw-opening exercise				F	F
Appliance therapy	U	O	U	F	F
Occlusal therapy	O		O	O	O

*ADDwR: anterior disc displacement with reduction.

†ADDwoR: anterior disc displacement without reduction.

‡OA: osteoarthritis/osteoarthritis.

TENS: transcutaneous electrical nerve stimulation.

U = usually used; F = frequently used; O = occasionally used.

According to the findings obtained through the clinical and imaging examinations, the patients were subcategorized based on the recently developed Research Diagnostic Criteria for Temporomandibular Disorders.²⁴ Diagnostic subgroups were formed for masticatory muscle disorders (myalgia), arthralgia suspected as having capsulitis and/or synovitis, anterior disc displacement with or without reduction, and osteoarthritis/osteoarthritis of the TMJ. Patients who had both muscle and joint problems or who had more than two joint problems were assigned to one subgroup based on the criteria that met their more serious symptoms.

Treatment

All patients in the withdrawal group had undergone some type of conservative treatment before they dropped out. Patients received an explanation of their disease definitively diagnosed. Possible perpetuating factors were discussed, and patients were instructed on how to reduce those factors in their daily lives. They were also assured that most forms of TMD are benign and have a good prognosis.

The treatment that patients in the withdrawal group received included pharmacologic management by nonsteroidal, anti-inflammatory drugs (NSAIDs) and/or muscle relaxant, transcutaneous electrical nerve stimulation (TENS), physical therapy, appliance therapy, and, in some cases, occlusal adjustments or prosthodontic reconstruction. More detailed information is given in Table 1.

Sample

Of the 1405 consecutive TMD patients examined during the past 10 years, 367 (97 males and 270

Table 2 Questions Concerning Present Subjective Pain

1. Does it hurt when you open wide or yawn?
2. Does it hurt when you chew, or use the jaws?
3. Does it hurt when you are not chewing or using the jaws?
4. Is your pain worse on waking?
5. Do you have pain in front of the ears or earaches?
6. Do you have jaw muscle (cheek) pain?
7. Do you have pain in the temples?
8. Do you have pain or soreness in the teeth?

females), who were determined by chart review to be drop-out patients or to qualify for the control group, were sampled in the current study. They represented approximately 26% of all TMD patients. The mean duration of time since their last visit was 3.3 years (range = 1.6 months to 9.9 years).

Questionnaire

A questionnaire was sent to each patient using an unfamiliar sender's name rather than the chief dentist involved with the patient's examination or treatment. This approach was used to encourage an honest and candid response. Each questionnaire covered eight major categories: (1) reasons for dropping out (patients in the control group were not asked this question); (2) treatment received at other hospitals or private practices after dropping out; (3) changes in the signs and symptoms of TMD after dropping out; (4) self-assessment of the present need for treatment; (5) present subjective jaw pain (eight questions; see Table 2)²⁵ and a visual analogue scale (VAS) of pain, scaled 0–100; (6) present subjective jaw dysfunction (five questions; see Table 3);²⁵ (7) maximum interincisal opening objectively measured

Table 3 Questions Concerning Present Subjective Dysfunction

1. Do your jaw joints make noise so that it bothers you or others?
2. Do you find it difficult to open your mouth wide?
3. Does your jaw ever get stuck (lock) as you open it?
4. Does your jaw ever lock open so that you cannot close it?
5. Is your bite uncomfortable?

Table 4 Questions Concerning Activity of Daily Living (ADL)

(Answer if you have limitation when doing the following activities.)

- | | |
|-----------------------|----------------------|
| 1. Walking | 10. Resting |
| 2. Eating soft food | 11. Driving |
| 3. Eating hard food | 12. Dressing |
| 4. Jaw opening | 13. Sports |
| 5. Sleeping | 14. Reading |
| 6. Chewing | 15. Watching TV |
| 7. Swallowing | 16. Household chores |
| 8. Talking | 17. Gardening |
| 9. Pushing or pulling | 18. Employment |

by a family member using a millimeter ruler according to instructions in the questionnaire; and (8) activity of daily living (ADL) as a result of their pain or other symptoms (18 questions; see Table 4).²⁵

Regarding categories 5, 6, and 8, each question (except for the VAS) was ranked on a scale of 0 to 4 according to severity (eg, no [0], maybe a little [1], quite a lot [2], almost all the time [3], and all the time without stopping [4] for jaw dysfunction). The total scores of pain, dysfunction, and ADL in each patient were scaled 0–32, 0–20, and 0–72, respectively. Scores for each patient were totalled and used for statistical analysis.

Statistics

Chi-square test, Student's *t* test, and one-way analysis of variance (ANOVA) were used to calculate statistical differences between the control group and the other two drop-out groups combined, between the control group and the nontreatment group, among the three groups, and among the diagnostic subgroups. To test what signs or symptoms most influenced treatment needs, the rank biserial correlation was calculated.²⁶ Levels of significance were based on two-tailed tests where $P < .05$ was considered statistically significant.

Results

The questionnaire failed to reach 41 patients as a result of address change or death. Of the remaining 326 patients (accessible population), 205 returned a questionnaire. Two questionnaires were discarded because they were incomplete or incorrectly filled out. Consequently, data obtained from 203 patients (40 males and 163 females, ages 12 to 83 years; mean 36.5 ± 17.7 years) were analyzed in this study. The return rate was 62.3%. There were no statistically significant differences between the accessible population and the participants in mean age at the first visit, in distributions of gender, in occupation, marital status, and subclassified TMD, or in time after dropping out. There also were no statistically significant differences among the three patient groups in these personal and demographic characteristics, with the exception of distribution of occupation and subclassified TMD (Table 5). The only statistically significant difference found was in mean time after dropping out between the control and the nontreatment groups (Table 5).

Of the 154 patients in the nontreatment and withdrawal groups, 64 (41.6%) reported the difficulty of getting to the appointment as a result of environmental obstacles as the main reason for dropping out of treatment. The obstacles cited were conflict with work hours ($n = 28$, 18.2%), travel distance to clinic ($n = 26$, 16.9%), health problems because of another disease ($n = 5$, 3.2%), pregnancy ($n = 4$, 2.6%), and others ($n = 1$, 0.7%). Fifty patients (32.5%) said they dropped out because of changes in the disease itself: 35 said symptoms disappeared or improved to an acceptable level (22.7%); and 15 said symptoms did not improve or became worse (9.7%). Among the diagnostic subgroups, no statistically significant differences were found in the distribution of the reasons regarding the disease itself ($P = .43$, chi-square test). Twelve patients (7.8%) referred to problems related to dissatisfaction with services: dislike of the type of therapy ($n = 4$, 2.6%), too-high cost ($n = 3$, 1.9%), obscure next appointment ($n = 3$, 1.9%), and dislike of the dentist ($n = 2$, 1.3%). Fourteen patients (9.1%) gave other reasons, and 14 patients (9.1%) did not answer. No statistically significant differences were found in the distribution of the three main reasons for dropping out of treatment between the nontreatment and withdrawal groups ($P = .71$, chi-square test).

A majority of the participants ($n = 182$, 89.7%) did not visit any other clinics after dropping out of treatment. Only 21 patients (10.3%: control group

Table 5 Comparison of Demographic Characteristics Between the Three Groups

Demographic characteristic	Control (n = 49)	Nontreatment (n = 23)	Withdrawal (n = 131)	P value*
Mean age at first visit (y)	38.9 ± 17.2	38.9 ± 19.4	35.1 ± 17.6	.34/.26/.99
Male-female ratio	12 (24.5) 37 (75.5)	6 (26.1) 17 (73.9)	21 (16.0) 110 (84.0)	.30/.28/.88
Occupation				
White collar	15 (30.6)	2 (8.7)	39 (29.8)	.02/.29/.22
Blue collar	4 (8.2)	1 (4.4)	11 (8.4)	
Homemaker	15 (30.6)	12 (52.2)	38 (29.0)	
Student	10 (20.4)	4 (17.4)	41 (31.3)	
Unemployed	5 (10.2)	3 (13.0)	2 (1.5)	
Unknown	0	1 (4.3)	0	
Marital status				
Unmarried	15 (30.6)	8 (34.8)	57 (43.5)	.26/.15/.72
Married	34 (69.4)	15 (65.2)	74 (56.5)	
Subclassification of TMD				
Myalgia only	5 (10.2)	3 (13.0)	14 (10.7)	<.001/<.001/.28
Arthralgia only	16 (32.7)	3 (13.0)	7 (5.4)	
Anterior disc displacement with reduction	20 (40.8)	10 (43.5)	51 (38.9)	
Anterior disc displacement without reduction	5 (10.2)	6 (26.1)	48 (36.6)	
Osteoarthritis/osteoarthritis	3 (6.1)	1 (4.3)	11 (8.4)	
Mean time after dropping out (y)	3.49 ± 2.58	2.30 ± 1.61	2.96 ± 2.43	.13/.11/.05
Time distribution after dropping out (y)				
0 to 1	6 (12.2)	3 (13.0)	28 (21.4)	.20/.48/.15
1 to 2	12 (24.5)	11 (47.8)	34 (26.0)	
2 to 3	11 (22.4)	6 (26.1)	23 (17.6)	
3 to 6	10 (20.4)	2 (8.7)	28 (21.4)	
6 to 10	10 (20.4)	1 (4.3)	18 (13.7)	

*P values: first number = among the three groups, second number = between the control group and the other two groups; last number = between the control group and the nontreatment groups.

Percentages are given in parentheses.

= 1, nontreatment group = 7, withdrawal group = 13) visited other clinics and received other types of treatments, including dental treatment by a private practitioner (n = 11, 5.4%), treatment in a dental clinic of the medical hospital (n = 4, 2.0%), acupuncture (n = 2, 1.0%), chiropractic treatment (n = 2, 1.0%), and other treatment (n = 2, 1.0%). Initially, the patients who visited other clinics after dropping out were excluded from the analysis in order to rule out the effects of other types of treatment on their symptoms. However, they were later included in the study since subanalyses, which both included and excluded these patients, showed that the effects were minimal.

Tables 6 and 7 show patients' self-assessment of the changes in their symptoms after dropping out. Only 18 patients (8.9%) reported that their symptoms became worse, while 117 patients (57.6%) reported that their problems improved. There were no statistically significant differences in the self-assessment among the three groups, between the

control group and the other two drop-out groups, between the control and nontreatment groups, and between the myalgia subgroup and the other four TMD subgroups. However, statistically significant differences were found in the self-assessment among diagnostic TMD subgroups. The percentage of patients who answered "Improved" was lowest among those with anterior disc displacement with reduction, and the percentage of patients who answered "Got worse" was highest among those with myalgia only.

Table 8 presents self-assessment for current need of treatment. Of all participants, 67 (33%) reported no need for further treatment as a result of the complete disappearance of their symptoms. Additionally, 65 patients (32%) reported no need for treatment because their symptoms had improved to an acceptable level. Only 44 patients (21.7%) reported that they were in need of treatment. Statistically significant differences were found in the self-assessment among the three groups and

Table 6 Self-Assessment of Changes in Symptoms After Dropping out by Patients in the Three Groups

Type of change	Control (n = 49)	Nontreatment (n = 23)	Withdrawal (n = 131)	Total (n = 203)
Improved	28 (57.1)	12 (52.2)	77 (58.8)	117 (57.6)
No change	18 (36.7)	8 (34.8)	40 (30.5)	66 (32.5)
Got worse	3 (6.1)	2 (8.7)	13 (9.9)	18 (8.9)
No answer	0	1 (4.3)	1 (0.8)	2 (1.0)

$P = .88$ (chi-square test among the three groups).

$P = .64$ (chi-square test between the control group and the other two groups).

$P = .90$ (chi-square test between the control group and the nontreatment groups).

Percentages are given in parentheses.

Table 7 Self-Assessment of Changes in Symptoms After Dropping out by Patients in the Diagnostic Subgroups

Type of change	Diagnostic subgroups				
	Myalgia (n = 22)	Arthralgia (n = 25)	ADDwR* (n = 82)	ADDwoR† (n = 59)	OA‡ (n = 15)
Improved	12 (54.5)	19 (76.0)	35 (42.7)	39 (66.1)	12 (80.0)
No change	6 (27.3)	5 (20.0)	36 (43.9)	16 (27.1)	3 (20.0)
Got worse	4 (18.2)	1 (4.0)	9 (11.0)	4 (6.8)	0
No answer	0	0	2 (2.4)	0	0

*ADDwR: anterior disc displacement with reduction.

†ADDwoR: anterior disc displacement without reduction.

‡OA: osteoarthritis/osteoarthrosis.

$P = .03$ (chi-square test among the five groups).

$P = .27$ (chi-square test between myalgia and the other four groups).

Percentages are given in parentheses.

Table 8 Self-Assessment for Current Need of Treatment by Patients in the Three Groups

Treatment need	Subgroup			
	Control (n = 49)	Nontreatment (n = 23)	Withdrawal (n = 131)	Total (n = 203)
No need because of symptom free	23 (46.9)	7 (30.4)	37 (28.2)	67 (33.0)
No need because of improvement	20 (40.8)	8 (34.8)	37 (28.2)	65 (32.0)
Like treatment if possible	3 (6.1)	3 (13.0)	32 (24.4)	38 (18.7)
Need as soon as possible	0	0	6 (4.6)	6 (3.0)
Other	3 (6.1)	5 (21.7)	19 (14.5)	27 (13.3)

$P = .02$ (chi-square test among the three groups).

$P = .004$ (chi-square test between the control group and the other two groups).

$P = .14$ (chi-square test between the control group and the nontreatment groups).

Percentages are given in parentheses.

between the control group and the other two drop-out groups. However, no statistically significant differences were found in the self-assessment between the control group and the nontreatment groups. The percentage of patients in the withdrawal group seeking treatment (29%) was five times higher than in

the control group (6.1%), and twice as high as in the nontreatment group (13%). There were no statistically significant differences in the self-assessment among diagnostic TMD subgroups and between the myalgia subgroup and the other four TMD subgroups. The necessity of treatment was more

Table 9 Correlation Between Pain or Dysfunction of TMD and Patient's Treatment Need (Rank Biserial Correlation)

Pain—visual analogue scale (VAS)	.46
Pain score	.55
Dysfunction score	.60
ADL score	.70

Table 10 Present Symptoms of TMD Patients Among the Three Groups

	Control (n = 49)	Nontreatment (n = 23)	Withdrawal (n = 131)	Total (n = 203)	<i>P</i> value*
Maximum mouth opening (mm)	47.7 (9.6)	46.7 (7.7)	46.9 (9.2)	47.0 (9.1)	.85/ .58/ .67
Pain—VAS	6.2 (13.2)	7.7 (18.1)	11.4 (15.4)	9.7 (15.3)	.11/ .07/ .68
Pain score	1.5 (2.0)	1.8 (2.6)	2.5 (2.5)	2.2 (2.5)	.33/ .03/ .63
Dysfunction score	2.8 (3.9)	2.4 (3.2)	3.9 (3.8)	3.4 (3.8)	.10/ .18/ .71
ADL score	1.0 (1.4)	2.4 (3.8)	2.9 (3.9)	2.4 (3.6)	.004/ .001/ .021

**P* values: first number = among the three groups; second number = between the control group and the other two groups; last number = between the control group and the nontreatment groups.
Standard deviations appear in parentheses.

Table 11 Present Symptoms of TMD Patients in the Diagnostic Subgroups

Symptoms	Diagnostic subgroups					<i>P</i> value**
	Myalgia (n = 22)	Arthralgia (n = 25)	ADDwR* (n = 82)	ADDwoR† (n = 59)	OA‡ (n = 15)	
Maximum mouth opening (mm)	46.2 (10.0)	49.7 (7.9)	47.1 (9.0)	45.3 (8.7)	51.7 (10.5)	.12/ .64
Pain (VAS)	18.7 (22.6)	4.8 (11.7)	10.7 (15.8)	8.6 (12.6)	2.5 (4.8)	.007/ .003
Pain score	3.9 (3.6)	1.1 (1.8)	2.3 (2.1)	2.3 (2.6)	0.8 (1.2)	< .001/ < .001
Dysfunction score	2.8 (3.5)	2.7 (4.5)	4.5 (4.2)	3.0 (2.8)	1.2 (1.5)	.004/ .42
ADL score	3.5 (5.1)	1.6 (3.3)	2.4 (3.3)	2.5 (3.5)	1.9 (2.5)	.38/ .11

*ADDwR: anterior disc displacement with reduction.

†ADDwoR: anterior disc displacement without reduction.

‡OA: osteoarthritis/osteoarthritis.

***P* values: first number = among the five groups; second number = between myalgia and the other four groups.
Standard deviations appear in parentheses.

strongly correlated with the activity of daily living (ADL) score than with the pain and dysfunction scores (Table 9).

Table 10 lists the present signs and symptoms of TMD among the three groups. The mean maximum mouth opening and VAS pain score were 47.0 ± 9.1 mm and 9.7 ± 15.3 , respectively. There were no statistically significant differences among the three groups in the mean maximum mouth opening and the other three scores excluding the ADL score. However, both pain and ADL scores in the control group were significantly lower than were those in the other two drop-out groups combined. All of the mean scores were relatively high in

the withdrawal group and approximately equal in the nontreatment and control groups. The only statistically significant difference was found in ADL scores between the control and nontreatment groups. However, without exception, all scores obtained were very low as compared with their full scales. Among subgroups (Table 11), statistically significant differences were found in both of the pain scores and in the dysfunction score, but were not found in the maximum mouth opening spaces and in the ADL score. Both of the pain scores for the myalgia subgroup were significantly higher than were those for the other four diagnostic subgroups combined.

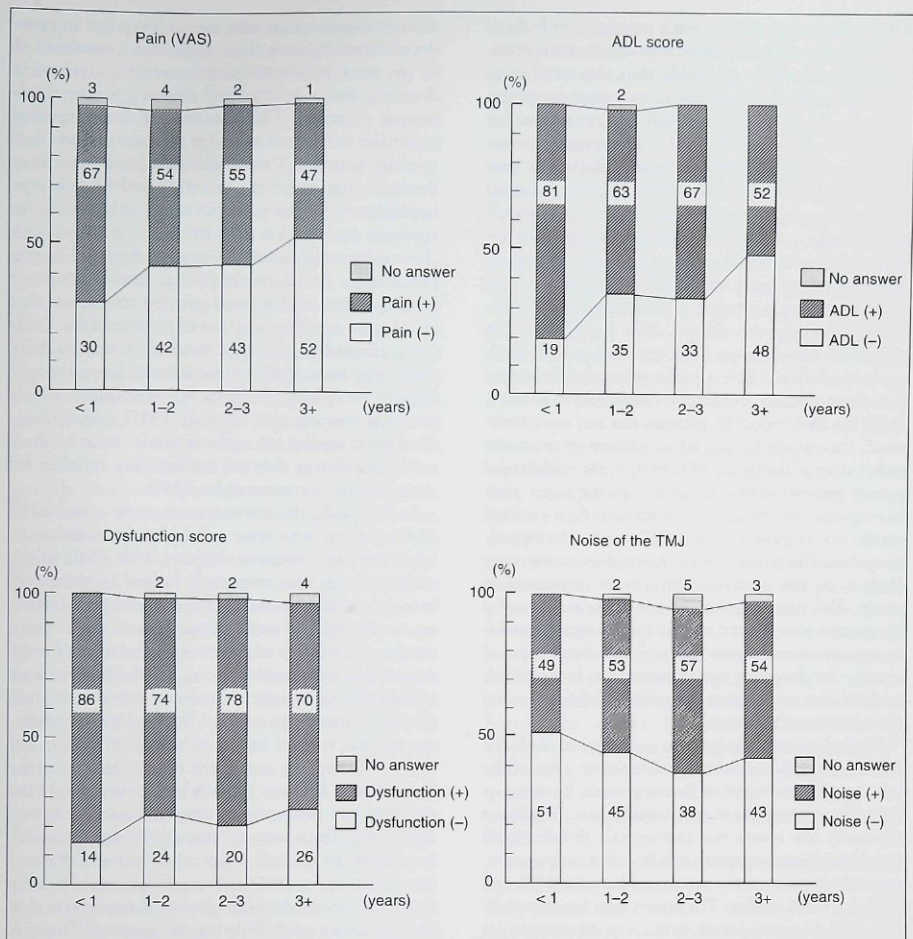


Fig 1 Relationship between follow-up periods since dropping out and the present symptoms of TMD.

Figure 1 shows the relationship between follow-up periods since dropping out and the present signs and symptoms of TMD. The longer the follow-up period since dropping out, the more patient's symptoms tended to improve. The only exception was for TMJ noise. There were statistically significant differences in the distribution of patients with and without pain (VAS: $P = .03$, chi-square test) and with and without daily activity limitations (ADL: $P = .003$, chi-square test) among those who dropped out of treatment within the past year and more than 3 years ago.

Discussion

Studies on the drop-out percentage of TMD are scarce. Funch and Gale³ reported that 36 of 78 patients (46%) with chronic temporomandibular pain failed to complete a behavioral treatment program. Comparable results were obtained by Smith,⁸ who found that 35.3% of TMD patients failed to complete treatment. The drop-out rate in the current study was approximately 26%, including patients in the control group. De Boever et al²⁷ recently reported

a much lower rate (10%), but it represents only those patients who did not return after the first examination. It is therefore probable that the number of TMD patients who drop out of treatment is comparable to those who drop out of treatment for headache or lower-back pain.^{1,6,7} However, since it is clear that drop-out rates are greatly affected by how one defines "dropout," this term should be described as clearly as possible in the literature on the subject.²⁸ In this study, a dropout was defined as one who terminated treatment on his or her own initiative against the therapist's advice. Drop-out patients were divided into two groups, nontreatment and withdrawal. Patients who did not show up for their first scheduled appointment (nontreatment group) obviously are different from patients who actually started but discontinued treatment (withdrawal group). Since the first group of patients did not start treatment, they might be viewed as refusers of treatment rather than as dropouts. However, in the withdrawal group, patients dropped out at varying times after having received treatment, from as little as several weeks to as much as several years afterward. Therefore, the patients who dropped out early were likely to be very similar to those in the nontreatment group. This similarity may be one of the reasons why the present study found no statistically significant difference between the two groups in the distribution of reasons for dropping out of treatment. It is difficult to draw firm conclusions regarding the definition and classification of dropouts.

Mailed questionnaires are economical and can reach a large population in a short time. One of the primary disadvantages of this approach, however, is that the return rate is often quite low. While an extremely low return rate can severely threaten both the internal and external validity of survey results, researchers can expect return rates between 30% and 60% for most studies. The return rate for this study (62.3%) is considered sufficient to ensure its validity.²⁹ Further supporting the internal validity were the findings that there were no statistically significant differences in mean age, in distributions of gender, occupation, marital status, and subclassified categories of TMD, and in time after dropping out between the accessible population and the participants of this study.

Although there were many reasons why TMD patients dropped out, the three most common in this study were environmental obstacles, perceived improvement of the disease, and dissatisfaction with the services offered. These reasons are similar to those that cause attrition among patients of other chronic-pain disease.^{7,22} Generally, any comparison of reasons for dropping out of treatment between popula-

tions or diseases must take into account age and gender differences, since these have been considered to be the most important of the variables involved in dropping out of treatment.³⁰ Age and gender distributions show that TM disorders are more prevalent in females than in males and in younger patients than in older patients. These distributions are similar to those for patients with migraine and tension-type headaches.³¹⁻³⁴ This similarity may partly explain the common reasons for the attrition of patients with chronic-pain diseases of the head and neck. The preponderance of relatively young, female drop-out TMD patients in this study appears to indicate that the reasons for dropping out of treatment for TMD were affected by age and gender. However, there may have been more young female dropouts only because there is a predominance of younger, female patients among our clinical TMD population. Controlled studies for age and gender must be done to clarify whether they are confounding variables for dropping out of treatment for TMD.

In this study, the nontreatment group consisted of TMD patients who were judged by the examiner to be in need of treatment. Patients with TMD in the control group were conversely judged by the examiner not to need treatment. By comparing the follow-up results of the nontreatment and the control groups, the validity of the examiner's criteria for the necessity of treatment can be assessed. There were no statistically significant differences between the two groups in mean age and in distributions of gender, occupation, marital status, subclassified TMD, and time after dropping out. These results can suggest the homogeneity between the two groups in terms of the personal and demographic characteristics examined. As a result, there were no statistically significant differences in all the follow-up results between the two groups except for ADL score. However, extremely low ADL scores in both groups demonstrate that their activities of daily living are minimally limited. These results strongly suggest that the increase or decrease of TMD signs and symptoms after dropping out of treatment is not associated with the degree of pain and dysfunction identified by the examiner at the initial examination. In other words, the phenomenon of *regression to the mean*³⁵ likely occurs in TMD patients because most patients seek treatment at peak levels of pain and dysfunction. This phenomenon could be a serious measurement error for an assessment of the severity of a TMD patient.

These interpretations seem plausible, but some other important points should also be discussed. An absence of statistically significant differences does not necessarily imply an absence of association. A nonsignificant outcome may be obtained by

making a Type II error; that is, no significant difference has been found when a difference really does exist. The small sample size represented by the two groups might have increased the error. In spite of these limitations, the results may suggest that the current examiner's criteria for treatment need, based on the severity of pain and dysfunction at the first visit, do not necessarily coincide with an accurate patient's treatment need. The activity of daily living score was most strongly correlated with the patient's treatment need.

Of 203 drop-out TMD patients, only 8.9% complained of an aggravation of symptoms, whereas 57.6% reported improvement. As shown in Table 5, a statistically significant difference was found in the distribution of diagnostic subgroups of TMD among three drop-out groups. The withdrawal group included the highest percentage of patients with anterior disc displacement without reduction, whereas the control group most frequently contained patients with arthralgia only. This means that from the examiner's standpoint, the withdrawal and the control groups had the most and the least severe cases, respectively. Nevertheless, there were no statistically significant differences in the self-assessment of changes of symptoms after dropping out among the three groups and between the control group and the other two drop-out groups. The tendency of most drop-out TMD patients to rate their symptoms after dropping out to be either improved or unchanged was also observed in every diagnostic subgroup of TMD. All mean scores for current subjective pain, dysfunction, and ADL were low in every drop-out group and in every diagnostic subgroup, although statistically significant differences were found in some scores among those groups and subgroups. There were no statistically significant differences in maximum mouth opening among three drop-out groups and among diagnostic subgroups. In addition, pain and dysfunction of the patients tended to improve with time except in the case of TMJ noise. These results support the natural fluctuation of TMD symptoms.²⁷ Since many TMD symptoms seem to go into spontaneous remission regardless of the initial diagnosis, this phenomenon should be taken into consideration prior to treatment. As a result, treatments that are noninvasive and reversible should be most often considered.

Although most treatment-outcome studies on TMD report favorable results,^{9,10,12-19} the impact of drop-out TMD patients has rarely been discussed. High drop-out rates may vitiate the effectiveness of the treatment and the validity of the

study.²¹ If drop-out patients had more severe signs and symptoms than patients who completed treatment, the effectiveness of the treatment might be overestimated. In this study, 182 patients (89.7%) had no further treatment after dropping out, and only 21 patients (10.3%) visited other clinics. Of the 203 patients, 132 (65%) sought no further treatment because their symptoms disappeared or improved to an acceptable level, and only 44 (21.7%) reported a need for treatment. Among diagnostic subgroups, patients with anterior disc displacement with reduction sought treatment most frequently (30.5%), but 59.8% of the subgroup still did not feel they needed treatment. Since this study did not compare signs and symptoms of the completers and the dropouts at the initial examination, the impact of dropping out on TMD patients cannot be fully described. However, very low rates among dropouts of having sought and received treatment suggest that drop-out TMD patients mostly progress in benign fashion and are not biased against patients who completed treatment from the standpoint of the severity of signs and symptoms. The findings of this study do not seem to decrease the plausibility of the favorable results obtained from most TMD treatment-outcome studies. However, the drop-out patients who did not return a questionnaire and the very low percentage of myalgia patients represented in this study could introduce some bias in the results. In most TMD populations, myalgia is the largest diagnostic subgroup,^{36,37} although a similar distribution of diagnostic subgroups as was obtained in this study has been reported in Japanese clinicostatistical studies for TMD.^{38,39}

Since this study has some limitations, its validity should be reevaluated in future studies, especially in one that includes TMD patients dropping out of different therapeutic interventions. Noncompliance of TMD patients is extremely important and should be further investigated.

Conclusion

1. This study clearly shows that TMD patients drop out of treatment for various reasons, but most commonly because of environmental obstacles, perceived improvement of the illness, and dissatisfaction with services.
2. The course of TMD signs and symptoms after dropping out of treatment was not associated with the degree of pain and dysfunction at the initial examination.

3. Of 203 participants, only 8.9% complained of an aggravation of their symptoms, whereas 57.6% reported an improvement. In addition, pain and dysfunction of the patients tended to improve with time except in the case of TMJ noise. These results demonstrate the natural fluctuation of TMD signs and symptoms.
4. Of 203 participants, only 21 (10.3%) sought treatment at other clinics and only 44 (21.7%) reported a need for treatment. These very low rates of having sought and received treatment after dropping out suggest that drop-out TMD patients mostly progress in benign fashion.

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Resumen

Seguimiento a Largo Plazo por Medio de Cuestionarios Autoadministrados en Pacientes con Desórdenes Temporomandibulares que Habían Abandonado el Tratamiento

Aunque la atrición de pacientes podría ser una amenaza seria para la validez de los estudios relacionados a los resultados de tratamientos en los desórdenes temporomandibulares (DTM), los estudios sobre la atrición de pacientes con DTM son extremadamente escasos. De los 1.405 pacientes con DTM examinados en los últimos 10 años, se tomó una muestra de 367 pacientes (26,1%) que habían abandonado el tratamiento, o pacientes identificados con un grupo de control. Los cuestionarios fueron enviados por correo, 41 de estos no fueron recibidos, y 203 (62,3%) fueron devueltos. Los cuestionarios pedían información sobre las razones del abandono, cambios en los síntomas, tratamiento recibido en otras clínicas después del abandono, las necesidades de tratamiento además de signos y síntomas presentes. Las personas que abandonaron el tratamiento fueron divididas en dos grupos: (a) aquellas que no vinieron a su primera cita después del examen clínico; (b) aquellas que no completaron el tratamiento. Un grupo de pacientes que en la opinión del examinador, no necesitaban tratamiento fueron incluidos como un grupo de control. Las razones principales que causaron el abandono fueron obstáculos ambientales, mejorías experimentadas por los pacientes, y la falta de satisfacción con los servicios. Sólo el 21,7% de las personas consideraron que necesitaban tratamiento y solo el 10,3% habían visitado otras clínicas luego de abandonar ésta. Sólo el 8,9% de los pacientes se quejaron debido a que los síntomas continuaban agravándose, mientras que el 57,6% experimentaron mejoría. Además, el dolor, la disfunción, y la limitación en las actividades diarias tendieron a mejorar con el tiempo, pero los ruidos de la ATM tendieron a perseverar. Estos resultados indican que los signos y síntomas de la ATM tienden a disminuir en los pacientes luego de que abandonan el tratamiento, y que la fluctuación natural de los signos y síntomas de la ATM deberían ser considerados al tratar la ATM.

Zusammenfassung

Langzeit-Weiterverfolgung von TMD-Patienten, welche abgebrochen haben, mit selbstverwalteten Fragebogen

Obschon der Verlust von Patienten eine ernsthafte Bedrohung für die Gültigkeit von Behandlungsergebnisstudien über temporomandibuläre Erkrankungen (TMD) darstellt, sind Studien über den TMD-Patientenverlust extrem selten. Von 1405 fortlaufend untersuchten TMD-Patienten in einer früheren 10-Jahresperiode wurden 367 Patienten (26,1%) gesammelt, welche als Abbruchpatienten bestimmt oder mit der Kontrollgruppe gleichgesetzt wurden. Ein zugeschnittener Fragebogen erreichte 41 Patienten nicht, 203 (62,3%) wurden zurückgeschickt. Der Fragebogen holte Informationen über die Gründe des Abbruchs, Veränderungen der Symptome, in anderen Kliniken erhaltene Behandlungen nach dem Abbruch, aktuelle Behandlungsnotwendigkeit und derzeitige Zeichen und Symptome hervor. Die Abbrecher wurden in zwei Gruppen eingeteilt: (a) jene, die es unterließen, zur ersten festgelegten Sitzung nach der klinischen Untersuchung zu erscheinen; (b) jene, die die gesamte Behandlung unterließen. Eine Gruppe von Patienten, bei welchen der Untersucher entschieden hatte, dass keine Behandlung nötig sei, wurden in eine Kontrollgruppe eingeschlossen. Die Hauptgründe für den Abbruch waren Umwelthindernisse, empfundene Verbesserung der Krankheit und Unzufriedenheit mit dem Betrieb. Nur 21,7% betrachteten sich selbst als behandlungsbedürftig, und nur 10,3% besuchten andere Kliniken nach dem Abbruch. Nur 8,9% beschwerten sich über eine fortgesetzte Verschlimmerung der Symptome, wohingegen 57,6% über eine Verbesserung berichteten. Zusätzlich neigen Schmerz, Dysfunktion und Einschränkung im täglichen Leben dazu, sich mit der Zeit zu verbessern, aber Kiefergelenksgeräusche neigen zum Persistieren. Diese Ergebnisse legen nahe, dass TMD-Zeichen und Symptome bei Patienten nach dem Abbruch zum Abnehmen neigen, und dass die natürliche Fluktuation der TMD-Zeichen und Symptome bei der Behandlung von TMD in Betracht gezogen werden sollten.

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