

Treatment of Jaw Clicking with a Mandibular Repositioning Appliance

Clicking of the temporomandibular joint is thought to be caused by a momentary jamming of the condyle/disk complex against the articulating surface of the temporal bone. It has been suggested that repositioning the mandible with an interocclusal appliance may be a useful way to treat this condition occurring from a displaced disk. There is, however, limited evidence as to the long-term efficacy of such treatment.

This report presents the results of a one- to three-year follow-up of 25 patients who initially complained of jaw clicking, popping and occasional momentary locking and who were diagnosed as having an internal derangement of the temporomandibular joint.

All of the patients were treated by mandibular repositioning using an interocclusal appliance. Fourteen of the 25 patients actually completed the repositioning treatment. Of those 14, 12 patients (86%) indicated on a questionnaire that they had had a moderate to highly successful treatment result. Of the 11 patients who did not complete treatment, six remained in follow-up and were treated with a conventional non-repositioning splint. Only one of these six patients reported moderate to highly successful improvement after treatment.

These results suggest that patients with disk displacement can be successfully treated with a repositioning appliance and subsequent dental stabilization. They also suggest, however, that much more information will be required before temporomandibular repositioning can be considered a highly predictable treatment. Research must be undertaken on problems such as potential joint remodeling changes that could result from temporomandibular repositioning. The role of surgical intervention for patients with unsuccessfully repositioned joints must also be explored. Finally there must be a better understanding of the use of arthrograms for determining the mechanisms involved in repositioning failure.

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Treatment of Jaw Clicking with Temporomandibular Repositioning: Analysis of 25 Cases

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The most common symptom in the temporomandibular joints is the click, which occurs in more than 23% of all young adults.¹ Clicking is thought to be caused by a momentary jamming of the condyle/disk complex against the articulating surface of the temporal bone.² This change in the normal smooth gliding function has been theorized to be due to:

1. A muscle "incoordination" within the masticatory motor system,
2. A change in the normal smooth contour of the articulating surfaces in the joint, or
3. The reduction of the mandibular disk from a displaced or dislocated position at closure to a normal position during opening.^{3,4}

It has been suggested that repositioning the mandible with an interocclusal appliance may be a useful way to treat the click occurring from a displaced disk.⁵ However, there is limited evidence as to the long-term efficacy of this treatment.⁶ In addition, there is little documentation or discussion regarding the complications that can occur during and after the treatment. It is for these reasons the cases in this report are presented.

Materials and Methods

The 25 patients selected for this study represented 15% of all new patients (162) who reported to my private practice within the UCLA Temporomandibular Joint and Facial Pain Clinic over the 22-month period from December 1979 to October 1981. All of these patients had a chief complaint of jaw clicking, popping, and occasional momentary locking. All were treated with a temporomandibular repositioning appliance. These patients did not have complex or significant myofascial pain symptoms, and the few pain symptoms that they did exhibit seemed related historically and anatomically to the articular disturbance.

After histories and physical examinations were completed for the 25 patients, all of them were diagnosed as

having moderate to severe temporomandibular joint internal derangement (subclassified as a condyle/disk incoordination). The most significant clinical finding evident in these patients was a middle range jaw opening click and a late closing click in one or both joints. Interviews with the subjects suggested that this articular dysfunction was a significant disturbance to their jaw function. In addition, most of these patients had had jaw clicking symptoms for many years, but all of them said that the clicking seemed to have gotten worse during the previous 12 months.

After I had examined each patient, we took bilateral TMJ radiographs (tomograms) to evaluate the form and relative position of the condyles within the fossae. These radiographs were taken with a linear tomogram which used a 20° standard axially corrected head position. All the x-rays were interpreted by an oral radiologist.

Treatment Procedures

A temporomandibular joint repositioning appliance was the treatment prescribed for this clinical problem. The design of the appliance varied from patient to patient, and both maxillary and mandibular full-coverage repositioning appliances were used (Figures 1 and 2). The primary purpose of the appliance was to stabilize the mandible in a position at which full opening and closing movements could occur without jaw clicking. Some patients' mandibles were repositioned by modifying their existing flat plane non-repositioning interocclusal appliance with acrylic so that their jaws functioned in a slightly protruded position (Figures 3 and 4).

The position selected initially was generally 1 to 4 mm more protruded than the patient's maximum intercuspation position. In cases involving unilateral disk derangement, a unilateral posterior condyle displacement, and a maxillomandibular midline discrepancy, I generally corrected this to a slightly latero-protrusive position. In all the cases, the treatment position chosen was such that the condyle was placed in front of the reciprocal jaw closing

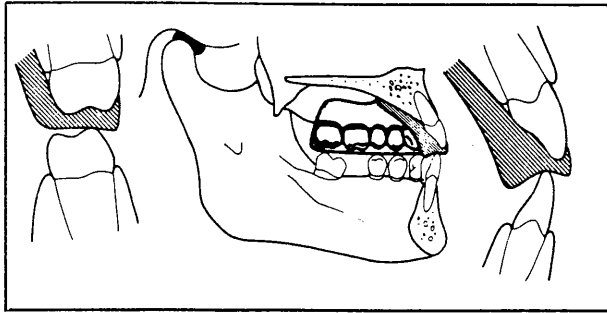


FIG. 1
Cross-section illustration of the maxillary repositioning appliance. This is a full-coverage acrylic flat plane appliance with a lingual ramp from canine to canine to guide the mandible into an anterior position.

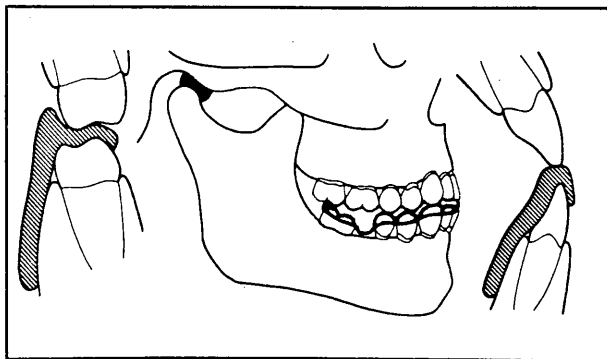


FIG. 2
Cross-section illustration of the mandibular repositioning appliance. This is a full-coverage acrylic appliance with deep fossae developed for the posterior maxillary lingual cusp tips. A high lingual wall is present to prevent lateral movement.



FIG. 3
This photo shows a maxillary full-coverage non-repositioning appliance that was modified into a repositioning appliance by adding acrylic to form a lingual ramp from canine to canine so the anterior position could be maintained. The appliance was adjusted to allow for stable multi-tooth contact.



FIG. 4
Repositioning appliance in place with the patient's mouth open. If the patient closes in a retruded arc, his or her teeth will contact the lingual ramp, which then guides the mandible into a forward relationship.

click. The vertical opening of the appliance was generally 3 to 4 mm in the molar region.

After the appliance was inserted, the patient was instructed to wear it 24 hours a day, removing it only for cleaning after meals. Each patient then returned to the clinic once every three weeks so we could evaluate jaw function and adjust the appliance. If the appliance had allowed the patient to function without clicking since the previous appointment, I adjusted it slightly by reducing the thickness of the appliance and changing the repositioning indentations so that the mandible would be maintained in a less forward and less open position.

The goal of this adjustment procedure was to return the mandible to a reasonably normal jaw relationship without having the original dysfunctional symptoms return. This jaw relationship was judged on several factors:

1. The condyle position within the fossa (determined by follow-up radiographs).
2. The subjective sensations of the patient with regard to a comfortable position.
3. The amount the posterior teeth were separated on closure into the appliance-determined position as opposed to the amount of separation for an attempted closure to maximum intercuspation without the appliance.

At each appointment, I evaluated the full range of jaw motion to determine whether a click-free range of motion existed. If it did, I reduced the appliance in thickness. When the appliance thickness was reduced to less than 1 mm of vertical thickness in the molar region, we took new radiographs (tomograms). These radiographs allowed the "appliance-determined" condyle/fossa position to be

monitored and also allowed us to compare this to the original maximum intercuspation position.

The jaw relationship was considered therapeutic if the patient's follow-up radiograph showed the condyle to be in a reasonably concentric position, if the patient exhibited a click-free range of movement, and if the amount of posterior tooth separation was less than 2 mm. When this was the case, I removed the patient's appliance and took an interocclusal record and casts so that we could perform an articulator analysis of the occlusal stability. The amount of vertical posterior tooth separation was generally greater in steep incisal guidance cases.

Overall, the appliances were adjusted to return the mandible as close to the original maximum intercuspation as possible, but it was not exactly the same position in most cases. When the repositioning appliance was removed and the patients were asked to close to maximum intercuspation, most of them did not close to the original intercuspation jaw relationship. I made no specific measurements to rule out localized tooth intrusion or extrusion induced by the appliance. However, when the diagnostic casts were removed from the articulator, they would still interdigitate in the original jaw position. If a patient left the appliance out of his or her mouth for an extended period of time (from a day to as much as two weeks), the mandible usually assumed its original intercuspation relationship and the clicking began again.

Although I made no systematic measurements of the amount of actual change in jaw position, the amount of final jaw repositioning was generally well within the 1-2 mm range. However, some of these patients had almost imperceptible changes in position.

Induced maxillomandibular position changes such as this require some post-repositioning dental stabilization. The type of treatments that these patients required ranged from simple occlusal adjustment to combined orthodontic and prosthodontic reconstruction.

Recall Procedures

All of the patients included in this case report were on a six-month recall program. During each follow-up visit, the patient was given a brief interview and examination and was asked to answer a three-item questionnaire (Table 1). The questionnaire requested the patients to do the following:

1. Judge the frequency of their jaw clicking.
2. Evaluate the amount of functional limitation the jaw problem caused them.
3. Indicate the percentage of improvement since treatment began.

I used the first two questions so that the patients' later responses could be compared to the responses on a questionnaire given at the initial pretreatment interview.

Table 1
Questionnaire Used to Evaluate Treatment

Patient Name _____ Date _____

Please circle the most appropriate number for each of the following:

- A. Since treatment began, how frequently does clicking of the jaw joints occur?
- 0 - No clicking at present.
 - 1 - Clicks quite rarely.
 - 2 - Only clicks occasionally.
 - 3 - Intermittent episodes of clicking.
 - 4 - Clicks almost every time I chew or open wide.
- B. Since treatment began, how much of a problem do you have with jaw function (chewing, talking, etc.)?
- 0 - No real problem.
 - 1 - I can now live with it.
 - 2 - This problem is still an annoyance to me.
 - 3 - This problem often interferes with ongoing activity.
 - 4 - This problem severely limits jaw use and function.
- C. Since treatment began, I have had:
- 1 - 0 to 25% improvement.
 - 2 - 25 to 50% improvement.
 - 3 - 50 to 75% improvement.
 - 4 - 75 to 100% improvement.
 - 5 - No change in symptoms.
 - 6 - Symptoms are increased _____%.

Final Treatment

The group reported upon in this case study consisted of 10 males and 15 females who ranged in age from 18 to 63. Only 14 of the 25 patients successfully completed mandibular repositioning therapy. Ten of these 14 cases underwent a combination of passive eruption and occlusal adjustment therapy to stabilize their therapeutic jaw relationships. These adjustments did not always yield a completely balanced distribution of posterior occlusal contacts, but they did place enough teeth into contact in the new position to produce a stable jaw relationship.

The four other completed cases underwent complex dental treatment for final stabilization. Two cases had bilateral posterior mandibular bridges put in place. The

other two cases required active orthodontic tooth movement, performed while the patient's jaw position was maintained on the appliance, to achieve a stable occlusion.

After each patient's new occlusal position was stabilized, a new appliance was made or the old appliance was adjusted, and the patient then wore it only at night. All 14 patients were also placed on a six-month recall schedule.

For a variety of reasons, 11 of the 25 original patients discontinued the repositioning therapy. The repositioning appliance was unsuccessful at stopping the clicks of 6 of these 11 patients. These patients had jaw clicks that could be avoided only by maintaining the mandible in an extreme jaw position (greater than 3 mm protrusive from the old intercuspal position). In addition, these patients exhibited no increase in their range of click-free motion; voluntary lateral and retrusive movements still easily produced the click after the patients had worn the repositioning appliances for nine weeks.

These six patients were continued in treatment, but I stopped the repositioning procedures. Therapy then consisted of simply removing the repositioning indentations on the appliance and readjusting it to provide a comfortable habitual closure position for the jaw. (It is my opinion that a large permanent change in jaw position is unacceptable as a final therapeutic position because of the high potential for uncontrolled condyle remodeling. For this reason, the Group 2 patients' jaws were gradually returned to a position close to the original one.) Each patient was then advised to use the appliance only 60–80% of the day and to avoid chewing tough foods and clicking the jaw

whenever possible.

These six patients continued with this form of treatment, and they are now on a six-month recall schedule for evaluation. The other five of the 11 unsuccessfully repositioned patients were lost to recall when they discontinued treatment in the clinic. One of these five moved out of town and was referred to another dentist, and the four remaining patients simply failed to keep their appointments. (These four patients were sent letters instructing them not to continue using their appliances unless they were under the care of another dentist.)

Results

Tables 2 and 3 show the data for the two patient groups (repositioned and non-repositioned). Age, sex, and treatment data are all included.

Data regarding the patient's condyle position and form (determined by the radiologist's report of the pre- and post-treatment tomograms) was unremarkable. Of the 25 subjects in the study, only four demonstrated slight osteoarthrotic changes of condyle form. Of the 11 subjects in Group 2 (the non-repositioned group), four subjects exhibited a bilaterally concentric condyle position, four exhibited bilateral mild to moderate distal positioning, and three exhibited unilateral mild to moderate distal positioning. Of the 14 subjects in Group 1 (repositioned), seven exhibited bilateral mild to moderate distal positioning, six exhibited bilateral concentric positioning, and three exhibited unilateral mild to moderate distal positioning. We found no particular relationship between the treatment

Table 2
Repositioned Subjects

Patient Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	$\bar{x} \pm SD^*$
Duration of Click before Treatment (years)	3	10	8	10	3	10	1	9	1	2	10	5	5	4	5.78 \pm 3.58
Patient Age (years)	18	28	28	29	32	35	63	29	28	27	25	25	24	19	29.3 \pm 10.7
Patient Sex	M	M	M	M	M	M	F	F	F	F	F	F	F	F	—
Number of Visits During Active Treatment	3	5	10	15	7	20	5	3	3	7	5	30	10	6	9.2 \pm 7.7
Number of Months of Active Treatment	4	4	10	20	6	16	4	6	3	4	6	24	8	7	8.7 \pm 6.6
Number of Months of Follow-up Observation	16	35	24	12	28	15	25	25	11	17	15	12	29	16	20.0 \pm 7.5
Maximum Intercuspal Opening at 1st Visit (mm)	47	55	60	47	55	45	45	43	45	40	42	42	42	45	46.6 \pm 5.9
Maximum Intercuspal Opening at Last Visit (mm)	47	54	63	46	55	46	45	45	45	41	43	42	43	45	47.1 \pm 6.1

*Mean and standard deviation.

Table 3
Non-Repositioned Subjects

Patient Number	1	2	3	4	5	6	7	8	9	10	11	$\bar{x} \pm SD^*$
Duration of Click before Treatment (years)	8	16	6	5	5	4	5	10	7	9	12	7.8 \pm 3.1
Patient Age (years)	26	32	29	22	24	23	23	46	27	25	26	28.3 \pm 8.8
Patient Sex	M	M	F	M	M	M	F	F	F	F	F	—
Number of Visits During Active Treatment	—	—	—	—	—	6	5	16	7	5	9	8.0 \pm 4.2
Number of Months of Active Treatment	—	—	—	—	—	4	10	29	12	5	7	11.2 \pm 9.2
Number of Months of Follow-up Observation	—	—	—	—	—	16	19	12	14	16	12	14.8 \pm 2.7
Maximum Interincisal Opening at 1st Visit (mm)	48	44	46	42	47	30	33	37	46	41	57	40.7 \pm 9.8
Maximum Interincisal Opening at Last Visit (mm)	—	—	—	—	—	35	42	42	45	41	57	43.7 \pm 7.3

*Mean and standard deviation do not include Subjects 1-5 since they discontinued treatment.

results and the pretreatment condyle form or position.

Figures 5 through 12 represent graphically the answers given by both groups before treatment and at the last recall appointment in response to Questions 1 and 2. (These questions dealt with the frequency of the click and the severity of the functional limitation.) Figures 13 and 14 show the groups' responses at the last recall appointment to Question 3 (regarding the percentage of improvement).

Discussion

It is apparent from the information in Tables 2 and 3 that no significant pretreatment differences existed between the successfully and unsuccessfully treated patients in terms of age, sex, or pretreatment click duration.

The results from Question 1 (Figures 5–8) show that although the Group 1 subjects showed a marked improvement in the frequency of clicking sounds at follow-up, clicking was not totally eliminated in all the subjects. There were changes in clicking frequency for Group 2 at follow-up also, but they were not nearly so dramatic as the changes seen in Group 1.

The results from Question 2 (Figures 9–12) show that Group 1 subjects felt they had had a significant improvement in function as a result of treatment. The improvements that Group 1 observed were much more dramatic than the slight changes seen in Group 2 at follow-up.

The results from Question 3 (Figures 13–14) illustrate that the subjects with repositioned joints rated their improvement much higher than did the subjects without repositioning. Twelve of the 14 repositioned subjects (86%) rated the treatment as moderately to highly successful (an improvement of greater than 50%), while only

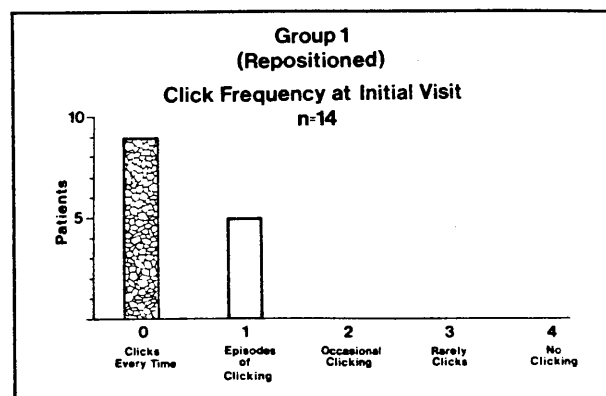


FIG. 5

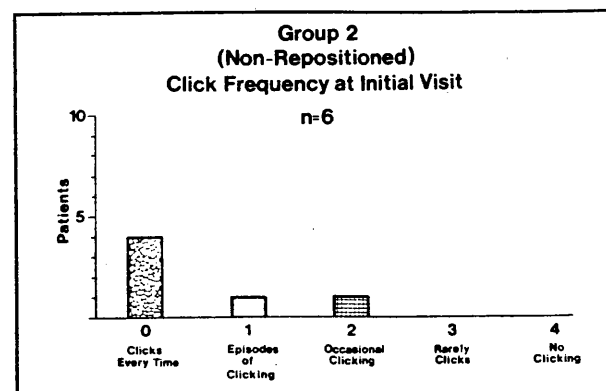


FIG. 6

one of the six non-repositioned subjects (17%) gave this rating.

Unfortunately, these results do not represent a true comparative study, because the subjects in Group 2 were aware that their repositioning was not considered successful. It is thus not surprising that these patients did not consider

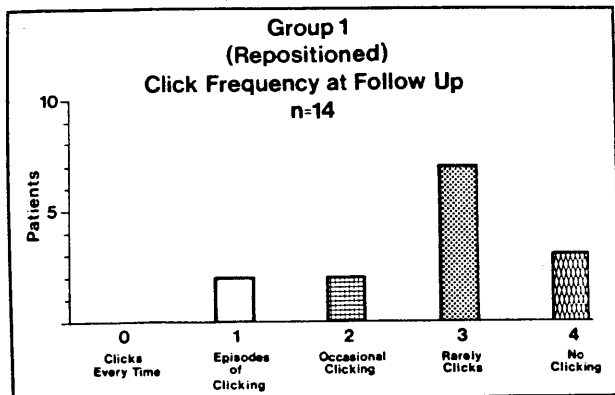


FIG. 7

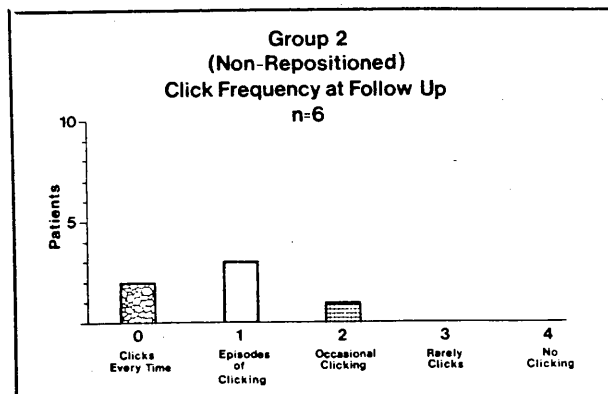


FIG. 8

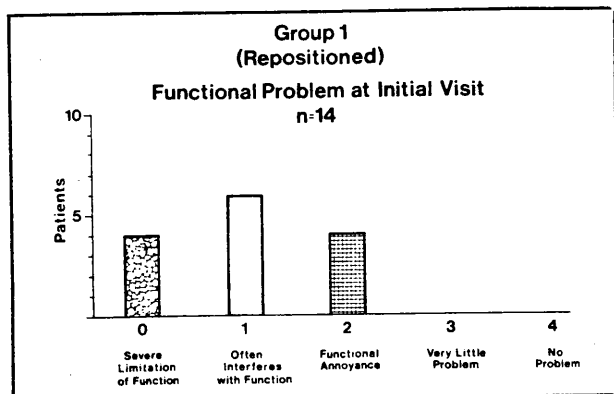


FIG. 9

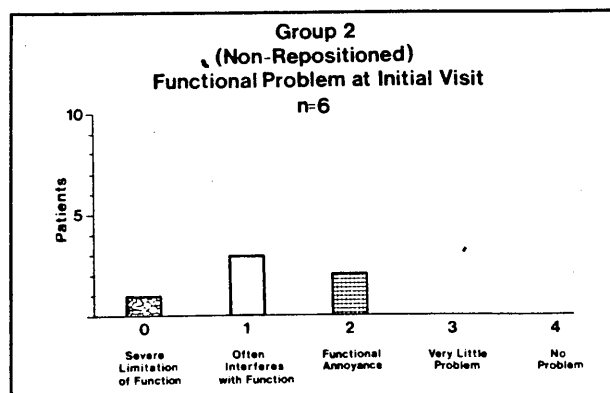


FIG. 10

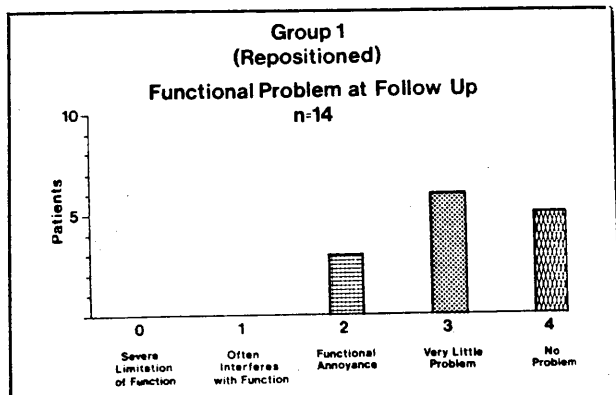


FIG. 11

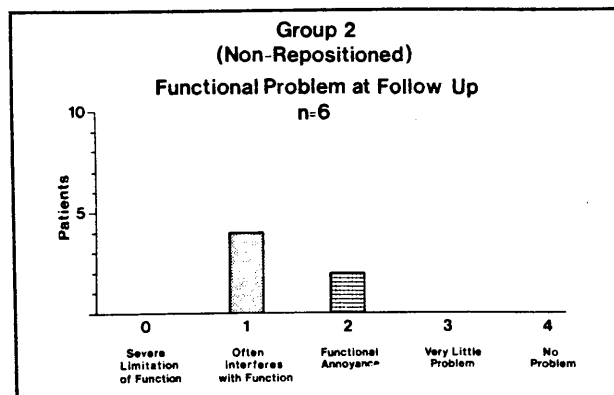


FIG. 12

their overall treatment too successful, and this factor may have introduced a bias into our study.

The results from these one- to three-year follow-up studies seem to indicate that patients who have internal derangements with moderate to severe condyle/disk incoordination characterized as disk displacement with reduction can be successfully treated with a repositioning appliance and subsequent dental stabilization. Active treatment averaged 8.7 months for Group 1, but the most common treatment duration was four to six months. The treatment

was reasonably simple and most cases did not require extensive dental rehabilitation after repositioning. The repositioning appliance therapy was much more successful than the treatment given the patients whose joints were not successfully repositioned (conventional appliances and avoidance of jaw clicking).

Not all of the repositioning patients considered their treatment completely successful. Duration was the only factor that seemed to be related to the subjective success of treatment. Patients who required more than eight months

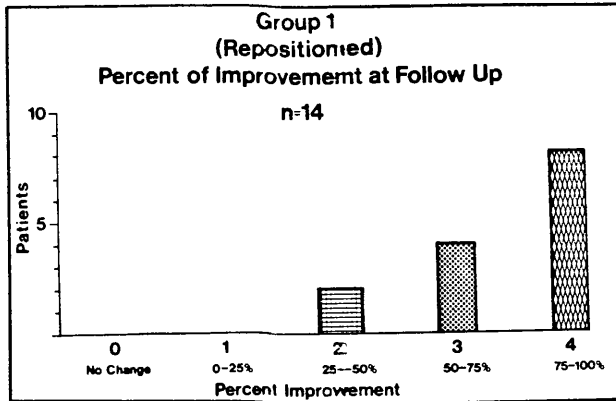


FIG. 13

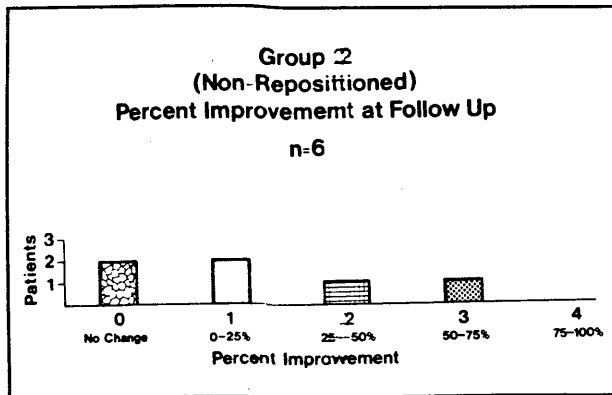


FIG. 14

of repositioning appliance therapy (because their jaw clicking problems recurred) rated the success of their treatment lower than did the subjects who were treated in a shorter period.

Much more information will be required before temporomandibular repositioning can be considered a highly predictable treatment. Research must be undertaken on problems such as the potential joint remodeling changes that could result from temporomandibular repositioning. We must also explore the role of surgical intervention for patients with unsuccessfully repositioned joints. Finally,

we must determine when arthrograms should be used to help us understand the mechanisms involved in repositioning failure.

Conclusion

In their questionnaire responses, 86% of the patients in this study who completed treatment found temporomandibular repositioning to be moderately to highly successful (50-100% improvement) at reducing the problems associated with TMJ clicking. Due to the length of the treatment, to the complex nature of temporomandibular repositioning, and to the demand for the patient's full compliance in wearing the appliance 24 hours a day, not all of the patients who began treatment completed it. Of the patients who did not complete repositioning, a number showed some improvement in symptoms when a conventional non-repositioning appliance was used, but this alternative was not considered a highly successful treatment for jaw clicking.

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