

Occlusal Contacts Following Orthodontic Treatment

Measured by a Photocclusion Technique

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Measurement of occlusal contacts on 12 orthodontically treated patients were measured by the photocclusion technique finds a mean increase of 56% in the number of contacts in the first year following treatment.

KEY WORDS: • FUNCTION • OCCLUSION • TREATMENT •

Orthodontic treatment objectives are, broadly stated, improved function and esthetics. When we consider function we necessarily include dental arch form and the interarch dental relationships. Evaluating esthetic improvement, although subjective to some degree, has not been a problem; pre- and posttreatment photographs serve the purpose very nicely. Arch form is well documented and visualized by pre- and posttreatment study casts. Interarch relationships are also documented by study casts and described by the familiar Angle classification, plus "normal" or "acceptable" buccolingual and vertical relationships.

A more informative and detailed examination and evaluation of interarch occlusal contacts has not been a routine orthodontic practice. The most commonly used procedures for those who do wish such information utilize colored articulating paper or indicator wax, although many other methods have been tried (GAZIT AND LIEBERMAN 1973, EHRLICH AND TAICHER 1981, AND RIISE 1982).

It would be of interest to investigate the occlusal contacts at the completion of orthodontic treatment, and to record the changes that occur following cessation of active orthodontic forces. The purpose of this study is to apply a recently-developed technique to the registration of occlusal contacts at time of debanding, and then follow any dynamic occlusal changes that might occur in the first year following treatment.

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The method used for these recordings is based on the principle of memorized birefringence. It was introduced to the profession in 1980 by ARCAN AND ZANDMAN (1982).

— Methods and Materials —

Occlusal contact relations were recorded on 12 patients between 14 and 16 years of age immediately after completion of orthodontic treatment with fixed appliances. All twelve exhibited Class II, division 1 malocclusions before treatment.

Treatment was with a modified Edge-wise technique, extending over approximately 18 months. Four bicuspid teeth were extracted at the beginning of treatment in 4 of the 12 patients. Bicuspid and molar teeth were banded, and the six mandibular and maxillary anterior teeth were bonded.

Occlusal recordings were made at the time of band removal, one month later, and one year later. All patients were free of retaining appliances for at least 3 months prior to the last recording.

Each patient was instructed to close in intercuspal contact position on an occlusal wafer of appropriate size. The patient

was instructed to bite with sustained pressure for 10 seconds. After 2 consecutive bite recordings showed excellent similarity, a wafer was projected on a polariscope and analyzed quantitatively and qualitatively.

The quantitative analysis was carried out by tracing the contacts viewed on the polariscope, and recording each contact.

The qualitative analysis was based on interpretation of the colored stress pattern as described by DAWSON AND ARCAN (1981). This pattern depends on the degree of penetration into the occlusal wafer. A visual interpretation chart translates these patterns into percentages. We considered light contact to be up to 40%, medium between 40% and 60%, and heavy over 60%. Each contact was then recorded as shown in Fig. 1.

— Findings —

Comparative quantitative values at the three different time periods are shown in table 1, and in the histogram (Fig. 2). These represent the combined total of light, medium and heavy contacts.

The mean number of contacts recorded for our 12 patients at the day of band

Table 1

Number of Occlusal Contacts
Immediately After Treatment, One Month later, and One Year Later

Patient Number	1	2	3	4	5	6	7	8	9	10	11	12
End of Treatment	16	5	9	14	6	12	10	18	11	12	16	5
One Month Later	15	10	11	13	8	14	7	18	12	10	18	6
One Year Later	19	20	18	22	10	15	15	25	21	15	20	9
Numbers 2, 3, 6, 7 and 9 were treated with bicuspid extractions												
Mean Number of Contacts Immediately After Treatment	11.2											
Mean Number of Contacts One Year After Treatment	17.4											



Fig. 1 Example of recording of occlusal contact relations

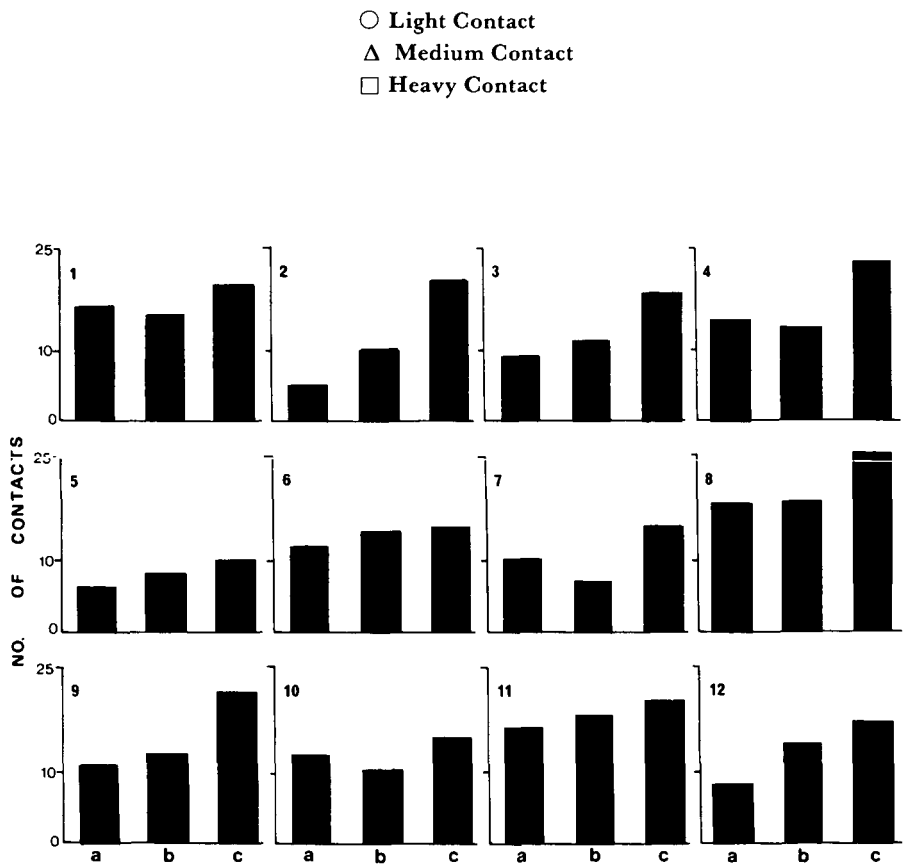


Fig. 2 Histograms showing changes in the total number of contacts in all 12 patients
a—End of active treatment b—One month later c—One year later

removal was 11.2, ranging from a low of 5 to a high of 18. After one month, 4 patients showed a decrease in the number of contacts while 8 showed an increase. All 12 patients showed a marked increase in the number of contacts after one year. The number of contacts after one year was 17.4, which represents a 56% increase (Table 1).

Only 3 patients had contact on posterior and anterior teeth at the time of band removal and two of these had retained the anterior contacts one year later. One patient who had no anterior contacts at the time of band removal had developed anterior contacts one year later. In all of the other patients, contacts were found in the bicuspid and molar areas only.

There were no consistent differences between the number of contacts on the left or right side. It is of interest to note that light and medium contacts were found in the bicuspid area and occasionally in cuspid and incisor areas, while the heavy contacts were usually found only in the molar area (Fig. 1).

— Discussion —

This small study demonstrates the dynamic changes in occlusal contacts that occur following orthodontic treatment. It is our intention to add an untreated control group of similar age children in a follow-up study. The increased number of contacts found in all 12 patients one year after treatment confirms the clinical impression that nature brings teeth together more precisely than the orthodontic appliance. This is most likely due to the lifelong processes of continual eruption and adaptation.

Although there is a marked increase in contacts with time, the question of why certain teeth do not reach contact with their antagonist in the opposite arch remains unanswered. The 12 treated cases selected for this study all showed close to ideal buccolingual and mesiodistal relations when viewed by means of study casts, but when examined by the photocclusion system they showed widely varying numbers of tooth contacts.

The average number of 17.4 occlusal contacts found after one year of orthodontic treatment compares favorably with the 19.7 recorded by McNAMARA AND HENRY (1974) in a group of males 16 to 17 years old. RIISE (1982) found an average of 17.1 contacts in his orthodontically treated sample, compared to 18.4 in a comparable age group of a non-orthodontically treated subjects.

Sample size does not allow for an accurate comparison of the number of contacts in extraction cases and nonextraction cases. From Table 1 we see that the posttreatment mean for the extraction group is essentially the same as that for the total sample.

Our observation that heavy contacts appear most frequently in the molar areas is similar to that found by EHRLICH (1981).

If we agree that masticatory performance is related to the number and quality of occlusal contacts (BEYRON 1959 AND YURKSTAS 1965), it becomes most important to evaluate these contacts by the most accurate method available. One important advantage of the photocclusion technique is that it may serve as a permanent pre- and posttreatment record of the occlusal contact relations for a given patient. A/O

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