Crossbites and their management*

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The history of our science reveals that we orthodontists have frequently changed our opinions quite radically on the basic question of when a malocclusion should be treated. Personal opinion and clinical experience, as well as scientific investigations, have contributed to these changes.

At first, corrective action was not taken before all of the permanent teeth anterior to the first permanent molars were erupted and this delay was held to be in the best interest of the patient. It should be realized, however, that at that time the true nature of malocclusion was not sensed, the patient was frequently not seen until the malocclusion was fully developed and the chief aim of treatment was the aligning of the teeth in the separate arches in the interest of appearance. Little or no thought was given to occlusion, i.e., the relations of the teeth of one arch to those of the other and the possible influence of these relations.

The penetrating studies of occlusion during the latter part of the last century served to direct the thinking of the orthodontist into entirely new channels. His concept was wrenched from esthetics to function and the field of orthondotics took its place among the medical sciences as a result. This new concept might be stated as follows: within the same dental arch, every single tooth is clearly related to every other tooth; and of no less significance, the members of one dental arch are clearly related to their opposite numbers in the other. Consequently, only one position is possible — ideal and suitable within the denture — for each tooth. Forces inherent in the denture — commonly called the forces of occlusion — aid and direct the teeth in reaching their appropriate and final placement.

With the acceptance of this concept of normal occlusion there inevitably developed a change in the objectives of treatment. Now all interest was directed toward the correct placement of each tooth in relation to those of the same as well as the opposite jaw. The excellence of the results obtained by these methods in numerous cases led to our belief in the efficacy of function as a developmental agency and in this belief we seemed to be supported by evidence derived from the general field of science as finally summarized by Wolff in his Law of the Transformation of Bone.

This new preoccupation led to a change in the time deemed proper for starting the work of correction and for a long time, corrective action was approved and taken whenever any malposition of any of the teeth showed itself. Such action — in keeping with the efforts of all orthopedic surgery — would, it was believed, safeguard correct functioning and thus make for the best development and the best form. We had attained another milestone.

But it will be recalled that the time came when the functional concept of development came to be all but completely ignored. Orthodontists became preoccupied with another concept which was the direct result of certain

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misconstructions of scientific investigations. Since there were strong clinical indications that malfunctions alone did not explain all malocclusions and that the correction of occlusal relations did not always lead to successful and lasting results, it was thought that a new solution of such problems would have to be found. About this time our attention was called to the fields of growth and development, areas in which we had already found the clues to at least same types of malocclusions. This new professional concentration received additional stimulus from the introduction and utilization of the method of roentgen cephalometry, which made possible new types of studies. Previous methods, it will be recalled, had fostered the idea that, although bones grew according to an inherent genetic impulse from which they obtained a basic form, the ultimate form and *size* were guided and determined by the specific functions to which the bone was subjected.

The use of the method of x-ray cephalometry made it possible for the first time to examine bone changes induced by orthodontic mechanisms. When the results of such cephalometric studies were reported by the staff of the Department of Orthodontics at the University of Illinois, the functional concept of development suffered a tremendous setback — a setback which still plagues our science and our profession. According to the report, bone, beyond the alveolar process, could not be grown either by orthodontics or by function.

As a result of this pronouncement a now-familiar concept was formulated, viz, in view of the fact that the form and size of jawbones were inherited and that scientific inquiry had revealed the inability of mechanical or functional stimuli to grow bone, there was nothing the orthodontists could do but make the most of a bad situation. Immediately they abandoned their devotion to the earlier principles which had gained high recognition for our science and which had been verified and successfully used by every orthodontist and every orthopedic surgeon in America. As a guide for their treatment they returned to their old confidence in the aesthetic principle according to which no advantages were to be derived from early treatment. We were back where we started, biding our time and declining to begin treatment until growth processes were finished. A tragic — or almost tragic — professional mistake had been made.

For a number of years, the specialty in general indulged this mistake and worked with the sole objective of adjusting the occlusion after removing dental units to harmonize tooth and bone mass. During this time little or no attention was given to the treatment of primary or mixed dentitions. Indeed, the impression was given to the laity as well as to the members of the allied professions of dentistry and medicine, that we were not particularly concerned about them.

We are only now beginning to emerge from the orgy of extraction and the recovery is being hastened by our realization that extraction, as a panacea, is no cure-all. In this period of recovery we are seeking the causes that led to our radical departure from well established practices and are realizing that some of our previous concepts were based on misconceptions of facts which in themselves are true. Wolff's law we had wrongly interpreted to mean that the size of a bone could be increased by increasing its function. Wolff said nothing about the size of a bone; his law refers only to changes in *form* that result from function. Similarly, x-ray studies have indicated that bone cannot be *grown* by artificial means but the same studies have shown that bones do grow, and further, that such growth, and particularly that of the alveolar process,

may be retarded or warped by a number of *functional* conditions. Just as changes have been seen in the alveolar process as a result of orthodontic treatment, so they may be seen as a result of disturbed relation of parts, of altered muscle-bone relations and the like. Thus, we are faced with two opposite possibilities, viz, abnormal bone-muscle relations as a result of disturbed occlusion, or disturbed occlusion as a result of abnormal bone-muscle relations. Needless to say, both conditions may exist simultaneously. In any case, changes in facial form and harmony may be expected.

In view of these facts, which appear to have been established beyond question of doubt, it has become clear that we must return to some of our former concepts if we are to effect a full, complete, and dependable diagnosis from which a simplified plan of treatment can be evolved. It is no longer considered possible to make such a diagnosis from a set of occluded models or from the patient with the teeth in occlusion. Any deductions made from such relationships may be grossly misleading, for they are static relationships and do not take into account the functional activities of the denture. To interpret properly the deformity, determinations must be made while observing the positions of the teeth, their supporting structures, and the muscles, in actual function. To examine the latter, the patient is placed in an upright position in the dental chair with little or no support given the head by the head rest. Instructions are then given to open the mouth, then to close and stop at the first point of contact of the upper and lower teeth. This must be repeated and the patient instructed to make certain that upon establishing contact the muscles are in balance, and the mandible suspended as dictated by this undisturbed balance. The patient is then instructed to complete the closure to full occlusion. As this is done any deflection is noted as well as the cause of the deflection. The inclusion of this step in diagnostic procedures will often result in a very simplified treatment in malocclusions of any age, but especially is it true in primary and mixed dentures. This is undoubtedly due to the fact that at this age the malfunction has not yet produced far-reaching and permanent effects.

The author has seen, as all of you no doubt have, a Class III occluded relation return to a Class I by the simple procedure of moving a lingually occluded maxillary incisor into position. Similar deflections caused by teeth in malalignment have also been observed in both the lateral and vertical planes. These clinical experiences have emphasized the necessity for study of the functional aspect of occlusion and the advisability of early treatment to intercept developing dental and facial deformities. It must be remembered that the growth and development of the primary and mixed dentition is still under a strong impelling genetic force with functional forces in the minor role. With the establishment of the permanent dentition the role of these forces is reversed so that precisely in proportion as function is permitted to operate along intended lines, will the *form*, if not the size, of the denture be in harmony with its related parts.

With the discovery of our error in the interpretation of Wolff's Law, our faith in the principles of the law has been renewed. We have returned to the concepts of early treatment, with the idea of intercepting dental and facial deformities before they have become firmly established. Already some amazing results of simplified treatment have been obtained in discrepancies involving the anteroposterior relations of the denture. I would like now to demon-

strate an equally simplified plan in cases involving the medio-lateral relations.

Four cases will be shown, in each of which there is presented a different kind of crossbite. (In all cases the left hand figures show the original condition, the right hand figures the results of treatment.) In these as in most similar cases, the etiology is not clearly defined. Whether the condition results from habit, factors contingent upon sore teeth, developmental or other factors, is not readily determinable. One thing is certain however: the malocclusion arises from environmental or local rather than from constitutional or structural factors.

Each case to be shown received treatment with the simple expansion appliance seen in Fig. 1. In the construction of the appliance, bands of the operator's choice are fitted to the primary second molars. After an impression is taken, the bands are removed from the teeth and accurately placed and waxed in the impression. When the working model is made, preferably of stone, an .040 wire is contoured, beginning at the disto-lingual angle of one of the molar bands, following the gingival margins of the teeth to the mesio-lingual angle of the cuspid. At this point a right angle bend is made so that the wire passes straight across to the cuspid on the opposite side. Here another right angle bend is made in a distal direction. Again on this side the wire is contoured along the gingival margin to the disto-lingual angle of the molar band on that side. When the first permanent molars are present, the wire is extended to engage these teeth. The next step is to cut the wire at one of the anterior right angle bends, leaving just enough of the straight front section to engage a tube of a size suitable to receive the .040 wire. This short front section is inserted in the tube and soldered. A stop on the

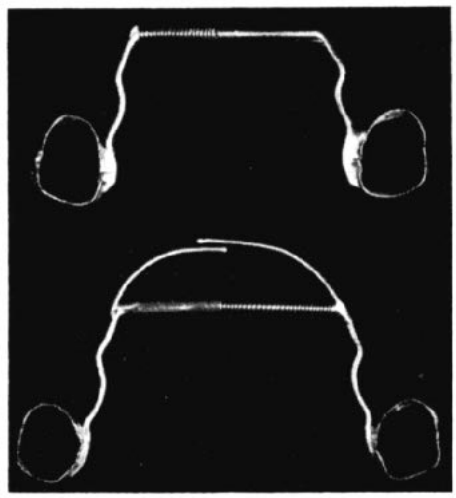

Fig. 1. Appliance used for bilateral expansion. Appliance below same as above, but with springs added for labial tipping of incisors.

wire is next soldered at the opposite right angle bend to confine the coil spring. The wire is inserted with the long front section in the tube and placed in position on the model. It should be made certain that there is no binding of the wire in the tube. When the appliance is made absolutely passive, it is soldered to the molar bands. The length of the tube should be one half the distance from cuspid to cuspid. A piece of expansion coil spring should be cut to extend from the end of the tube to the stop when fully compressed. The coil is placed on the wire which is in turn inserted in the tube and the coil is compressed by forcing the appliance together. It is held in this relation by placing a rubber band or wire ligature about the appliance as near the front section as is possible and the appliance is cemented in place. When the cement has set, the rubber band or ligature is removed. This activates the appliance.

Figure 2 displays the casts of a female patient, age six years and nine months. The crossbite, in this static relation, could be classified as unilateral, with

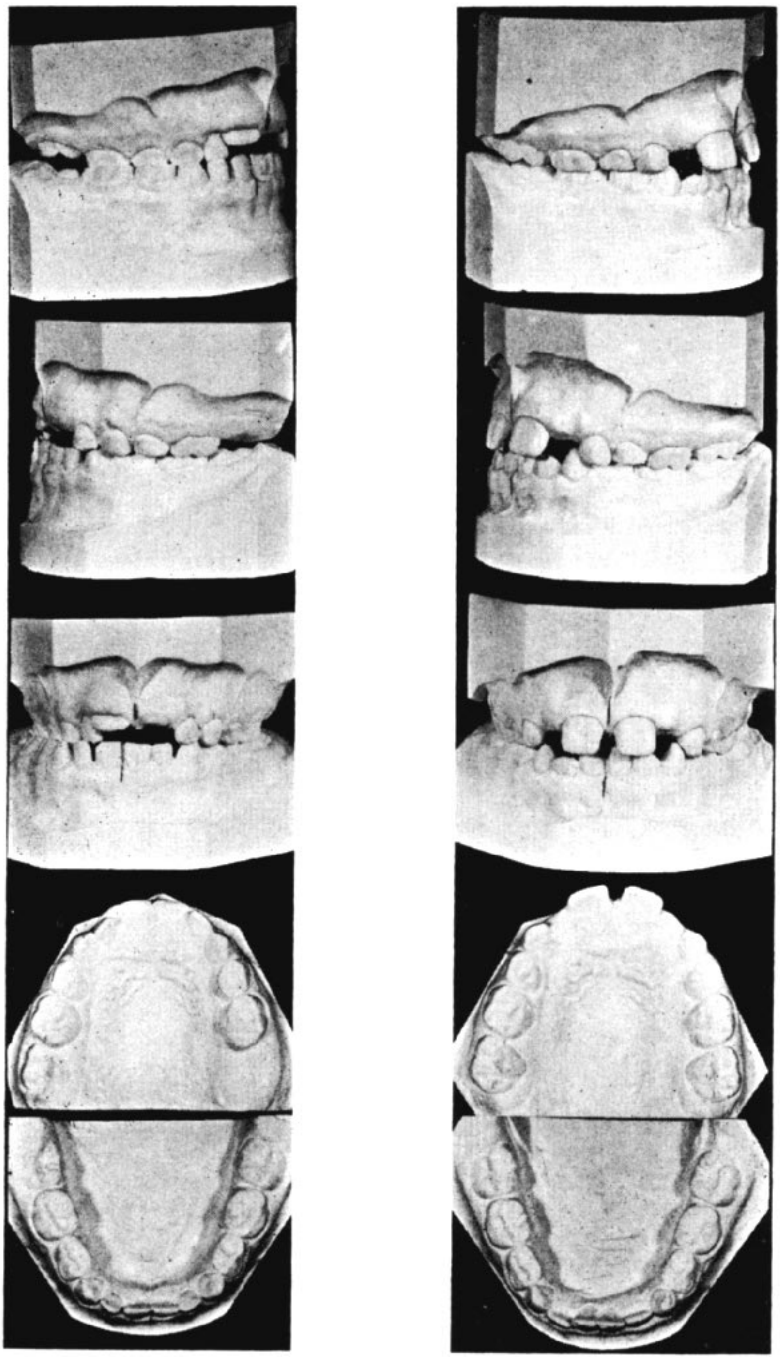

Fig. 2. Plaster records of case No. 1 before treatment (left) and after treatment (right) with simple appliance illustrated in Fig. 1 (above).

the teeth in Class I relation. The apparently normal condition of the left side is to be noted. But also to be noted is the disharmony of the midline. This could signify a deformity in either the maxillary or mandibular denture, or a deflection of the mandible as a result of occlusal interference. Clincally, however, it was determined that the upper midline coincided with the mid-sagittal plane of the head. It was, therefore, correct and could be employed as a point of reference. Functional examination revealed that in rest position the upper and lower midlines coincided. But in closure from rest position, occlusal contact was first made in end-on relation. Then the entire mandible moved to the right as the teeth engaged in full occlusion. In the occlusal views the mandibular teeth are seen to be in good alignment, with the alveolar process symmetrically developed, so there is sufficient room for the eruption of the permanent teeth without crowding. Strangely enough, the same conditions prevailed in the maxillary denture except that there was crowding of the incisors and insufficient width to accommodate the permanent teeth in even alignment. Obviously, there was a maxillary contraction. It is important to note that the contraction was bilateral — as revealed by the symmetrical development — not unilateral as indicated by the occluded original casts. This point bears explanation. It must be remembered that in the functional analysis a right mandibular deflection was discovered, which, in an occluded relation, placed all mandibular teeth to the right of normal. If the upper left maxillary teeth then occluded properly in their static relation they too must of necessity be to the right of their normal relation to their maxillary base and to other anatomic structures. They were, therefore, just as responsible for the disturbance in muscular balance of the mandible as were the teeth on the crossbite side. Buccal movement of the left as well as the right was, accordingly, required to permit an undisturbed muscular function. It should be emphasized that this is a bi-maxillary contraction. The expansion appliance, operating without adjustment over a period of four months, achieved the results shown.

Figure 3 presents the casts of a female patient, age three years and ten months. All details are the same as those of the previous case except that the mandibular deflection was of such a nature as to create, on the crossbite side, a Class II relationship. When the occlusal interference was eliminated by expansion of the maxillary denture, a Class I relationship was restored. The results shown were obtained after a five-month application of the expansion appliance to the maxillary denture alone.

Figure 4 shows the casts of a male patient, age eleven years and four months. It differs from the two former cases in that the crossbite is bilateral. It differs also in that the muscular balance of the mandible is undisturbed in function: note the harmony in the midlines and the facial balance and harmony in *both* the *before* and *after* photographs. (Figure 5) It is like the others,, however, in these respects; there is symmetrical development in both maxillary and mandibular dentures and there is present a bilateral maxillary contraction. The required treatment is the same as for the first two cases. As would be expected, a greater amount of expansion is necessary. The disturbance here is entirely a matter of lingually displaced teeth held by a balanced musculature. Note that the muscular balance and the facial harmony have been preserved in treatment.

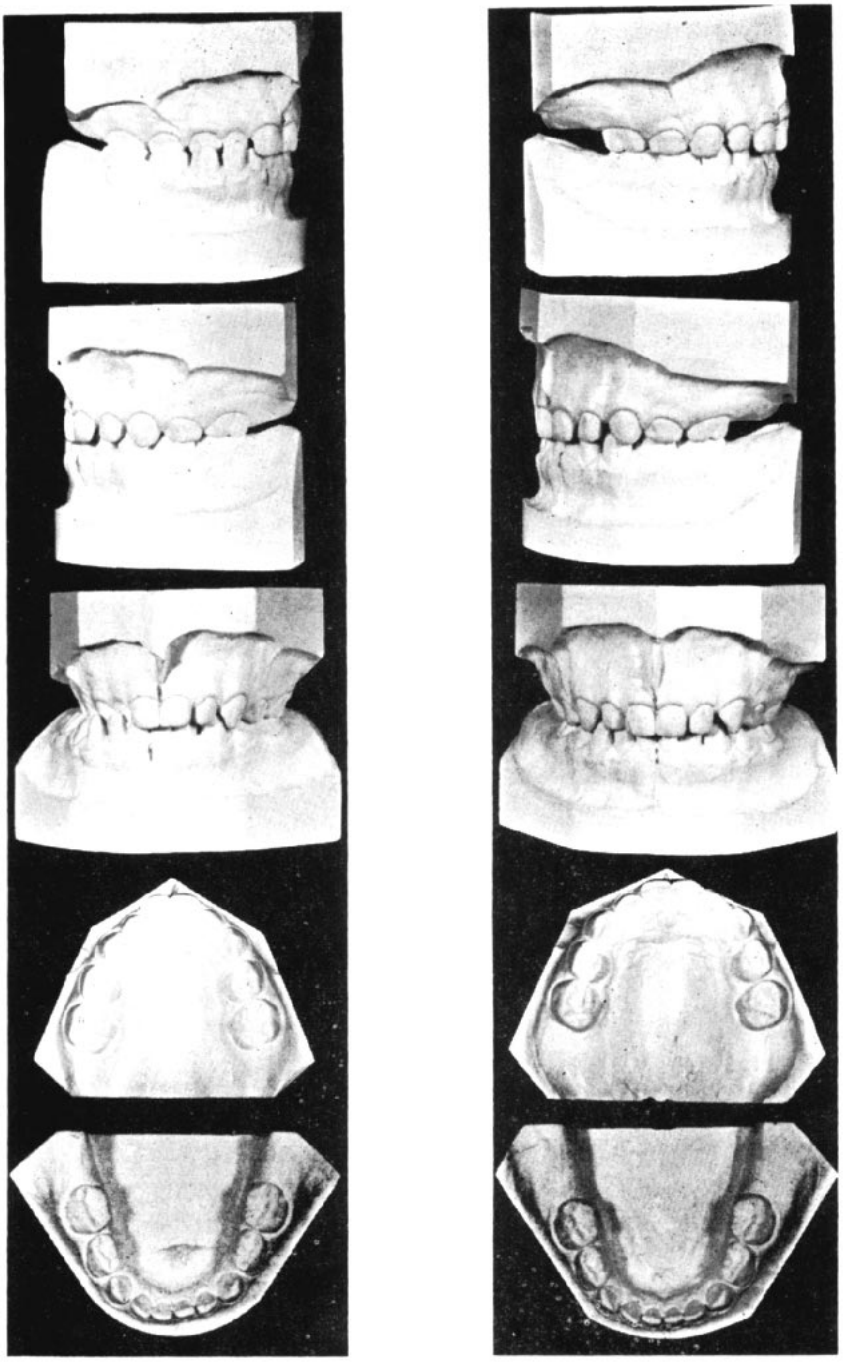

Fig. 3. Plaster records of a female patient, age three years, ten months, before treatment (left) and after five months of treatment (right). Note Class II occlusal relationship on right side of original records.

Fig. 4. A bilateral crossbite in a male patient of eleven years. There being no midline deviation in the plaster records or facial photogrtphs (Fig. 5), a bilateral maxillary contraction is present. Treated with same appliance as the previous malocclusions.

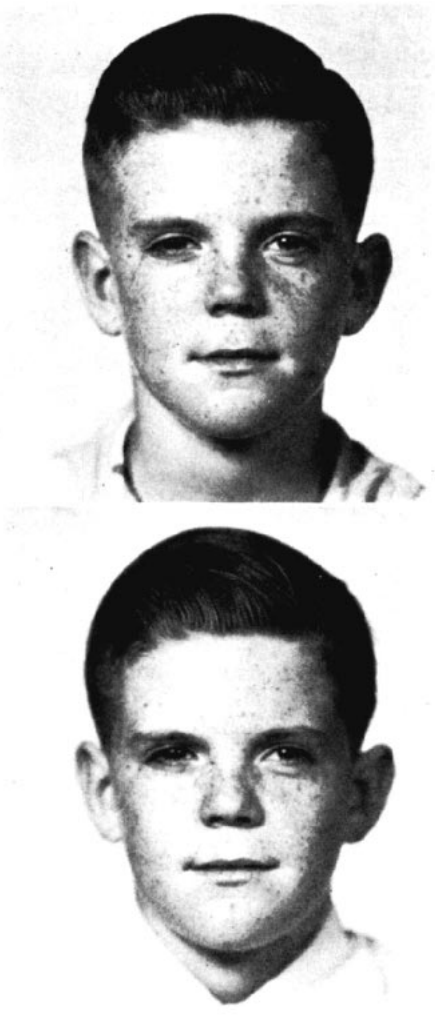

Fig. 5. Before treatment (above) and, after treatment (below), photographs of patient whose plaster records are seen in Fig. 4.

Figure 6 shows still another and much more complicated type of crossbite. It differs, however, from the others only in that the incisor teeth are involved, with a greater disturbance in the vertical plane. As a result of the anterior crossbite, the anterior teeth have been allowed to over-erupt and the upper incisor area has been restricted in its normal forward development. (Fig. 7). There is a bilateral maxillary contraction as well as a right mandibular deflection which require the same treatment as before; in addition, the upper anteriors require forward movement to correct the anterior crossbite. The only change necessary in the appliance is the addition of finger springs for this movement as shown in Figure 1 (below). To be reckoned with is another factor in treatment, viz, the over eruption of the primary cuspids. As the maxillary teeth were expanded sufficiently to contain the mandibular teeth, the primary cuspids prevented a settling of the teeth into occlusion. To achieve the settling, it was necessary to grind these teeth.

In closing, I should like to reiterate that in recent years we have concerned ourselves with the *correction* of dental and facial deformities, *after* they have become firmly established; the emphasis has been placed on correction. It is, of course, desirable to continue our efforts toward the solution of the problems of correction. But let us never forget *function* as a factor in development.

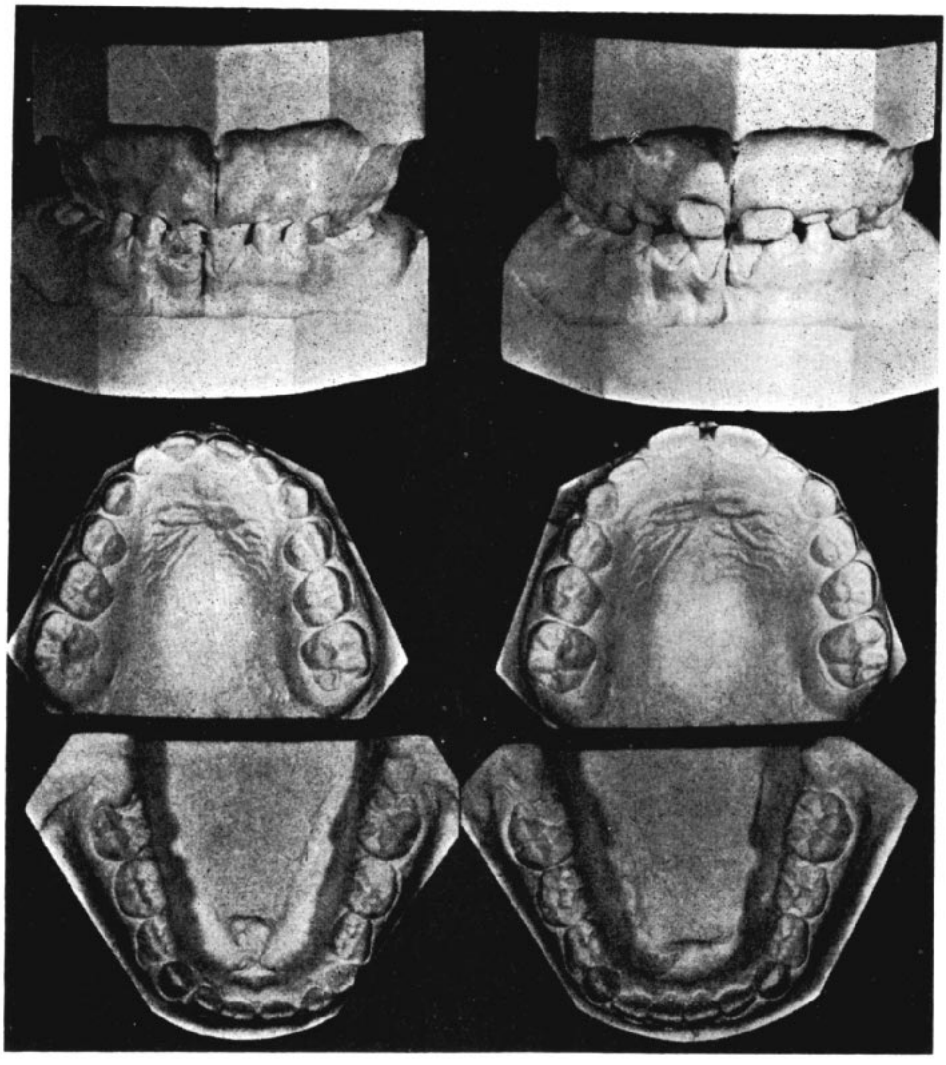

Fig. 6. A unilateral crossbite involving the maxillary incisor teeth as well. Treated by bimaxillary expansion and labial tipping of the incisors with the same appliance to which finger springs were added as in Fig. 1 (below).

Fig. 7. Facial photographs of patient whose plaster records appear in Fig. 6: before treatment (above) and after treatment (below).

Perhaps by directing our treatment to preserve and maintain normal function *during the growing period,* we shall all come to realize that fewer major corrections will have to be made.

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