The Fallacy of Denture Expansion As a Treatment Procedure*

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As far back as the year 1723, when Pierre Fauchard introduced the historic archwire, and through succeeding years, even to the present day, the so-called expansion of dentures has been the basic form of treatment for the correction of malocclusion of the teeth. In the earlier years, and I am afraid in later years also, most operators viewed this problem of treatment purely as a mechanical puzzle in which a certain number of dental units were to be arranged in an arch form, the size of which was to be governed by the total width of the units. Consequently, the solution of this mental conception of the problem resolved itself into evolving a mechanical device, whereby the arch could be made of sufficient width and length to accommodate every tooth without an overlapping member of the group.

All appliances for this corrective work, previous to the introduction of the pin and tube mechanism and the Case contouring appliance, were fashioned for this specific purpose, and were modifications of a basic instrument known as an expansion archwire. It was not until the old "E" expansion archwire was superceded by the pin and tube appliance, the ribbon archwire and the edgewise arch mechanism, that the word expansion was dropped from appliance nomenclature. Unfortunately, however, this expansion principle of treatment remained basic even with these more efficient appliances. The extent and degree of its employment was, however, reduced and other forms of tooth movements were substituted as a compromise. These substitutions consisted of root movement for the improvement of axial positioning of teeth and distal shifting of teeth whereby arch length was gained to avoid lateral and forward movements of teeth. This summarizes the form of treatment that has been in existence for two hundred years. The product of this method of corrective procedure can justly be characterized as unsatisfactory in a large percentage of cases for it was unstable, at times attended by tissue destruction and, in certain cases, accentuated the facial inharmony.

When the basic principle of normal occlusion was introduced by our revered teacher, Dr. Angle, as the ideal to attain in treatment, orthodontia at last could be classified among the sciences. Coincidentally, the specialty turned from its concentration on the mechanical aspects of treatment problems and began to exhibit an interest in the biologic phase of the subject. Investigations were begun concerning the reactions of tissues to forces applied for the purpose of moving the teeth and there are a few here today who can attest to the thrill they received when Albin Oppenheim presented his outstanding contribution to this phase of our problem.

*Read before the Edward H. Angle Society of Orthodontists, Santa Barbara, California, March 24, 1947.

Subsequently an intensive investigation into the phenomena of facial growth and development was inaugurated by Milo Hellman and continued by Broadbent, Todd, Brodie and Schour. The outstanding contribution of this group was made by Broadbent who conducted his study on living children through the agency of accurately controlled rentgenograms.

Investigators in allied fields also came to our aid and contributed greatly to our basic knowledge. The cooperation of T. Wingate Todd, Alex Hrdlicka and William K. Gregory should be especially mentioned.

From these investigations it has been quite positively proven that the facial pattern is laid down very early in life and remains unaltered. It has also been shown that growth of the jaw bones is characterized by a time gradient, a longivity gradient, a locus gradient and a gradient of intensity. Of great importance in prognosis and treatment planning is the fact that growth centers, whose period of activity is completed, cannot be stimulated to renewed activity. In addition to this, Brodie stated that the osseous changes effected by an orthodontic mechanism are limited to the bone of the alveolar process.

Throughout these later years, during which this important research data was being accumulated and presented to the specialty, clinical procedures continued along the same beaten path of denture expansion and mechanical retention, hoping against hope that primary mechanical and secondary functional stimulation would enlarge the supporting osseous bases beneath these expanded dentures so as to assure permanent results in laboriously alined dental arches. Yet, after years of mechanical support, case after case, representing by far the largest percentage of treated dentures, gradually relapsed into varying states of malocclusion. Hope and faith in idealism were kept alive by the introduction of new mechanisms of vastly increased efficiency whereby perfect control was gained over crown and root movements. As a result, the percentage of successes was increased but still the balance was greatly in favor of the failures. The orthodontic face was everywhere prevalent and retaining appliances were removed with fear and trepidation. The great safety valve to conscience was "pressure from malposed third molars." Orthodontists owe a great debt of gratitude to these innocent culprits for they have saved many a face in our specialty and I do not mean the faces of patients!

All through this period the literature was filled with illustrations of successfully treated cases but one has to look very carefully for any reports of failures even though every one of us had plenty of them.

In the April, 1936, issue of the International Journal of Orthodontia and Oral Surgery there is a panel discussion of Orthodontic Failures. The contributors were Alfred P. Rogers, John V. Mershon and Milo Hellman. Summarizing the conclusions of these three men, we find seventeen reasons tabulated. They are as follows:

(a) An inherent tissue resistance to responding to the forces emanating from the mechanism.

(b) Variations from normal inherent to the individual and of such an "extreme character that they doom a case of orthodontia to permanent failure from the standpoint of normal occlusion."

(c) Heredity.
(d) Failure in the developmental processes of growth.
(e) Errors in treatment.
(f) Forms of treatment that interfere with development.
(g) Too continuous treatment.
(h) Too rapid treatment.
(i) Compromise in the form of extraction.
(j) The use of retaining devices.
(k) "Abnormal variations in the developmental processes of growth." Class III cases are referred to.
(l) Failures due to lack of appraisal of developmental progress.
(m) Failures due to neglect of distinguishing between favorable and unfavorable trends in the development of the dentition.
(n) Failures due to improper decisions of the actual need for orthodontic treatment in borderline cases.
(o) Failures due to inappropriate timing of the introduction of the mechanical procedure, when teeth are definitely in malocclusion and treatment is indicated.
(p) Failures due to inability to carry out successfully the measures employed.
(q) Failures due to unfavorable changes which follow successfully treated cases. Class III cases were again referred to.

This is a rather impressive list of causes for failures in the treatment of malocclusion and would make one wonder how it was possible to carry through a case without falling a victim to some one of these errors. Yet, in the list we find no mention of an error in treatment because of denture expansion or enlargement. Extraction being condemned, it naturally follows that denture enlargement was considered to be a legitimate method of procedure and one that would bring satisfactory end results.

In the Dental Cosmos for July, 1924, the writer presented a paper entitled, "Pitfalls in Class I cases of Malocclusion." To the best of his knowledge, this was one of the first papers to call attention to malocclusions characterized by the forward movement of the buccal segments of the denture. The treatment suggested was the distal movement of these forward misplaced teeth instead of the usual procedure of expansion combined with the forward movement of the incisors whereby space would be obtained for the outstanding canine teeth.

Almost coincidentally to the publication of this paper, an essay by George Grieve of Toronto, appeared in print. In this Dr. Grieve described the forward positioning of teeth in relation to the basal bones, tabulating it as the "Forward Translation of Teeth." In the more exaggerated malocclusions of this type he advocated the extraction of four premolars and the repositioning of the six anterior teeth, utilizing the premolar spaces for this purpose. Those of us who were still convinced that extraction was a violation of principles, condemned Dr. Grieve for advocating this compromise. We continued in our efforts to move teeth distally and to expand the dental arches. As a result, Dr. Grieve was increasing to a marked degree his percentage of stabilized completed cases, with improved

esthetics and we were gaining some headway along that line but not in proportion to the work involved in such treatment or to the degree obtained by Dr. Grieve. (Figs. 1, 2, 3 and 4.)

This brings historical events down to the time that our colleague, Charles Tweed, entered the picture. I shall never forget the reaction that came to me when I saw the exhibit of one hundred consecutively treated cases that he placed before us in Chicago in 1940. His work was so outstanding as to elevate him, in my mind, to the position of the best clinical orthodontist in the world and incidentally, I have not changed my opinion since that day.

Confronted by such clinical results and almost coincidentally by the reports of research men that growth of the jaws anterior to the first permanent molars was completed at five to seven years of age and could not, thereafter, be stimulated to renewed activity, and also that the osseous changes resulting from the application of orthodontic appliances was limited to the alveolar processes, I decided that Grieve and Tweed were not heretics who were tearing down and destroying all the principles and ideals that it had taken years to evolve and which many of us had taught and preached so emphatically for our entire period of practice. Rather, by their so-called compromise, were they obtaining results that were characterized by more of the qualities of the normal than were the products of those of us who stubbornly refused to change our methods of procedure.

The die having been cast, your essayist began to follow the technical methods of Tweed with gratifying results as illustrated by increased stability and vastly improved esthetics.

As you may recall, in the earlier days of Tweed's teaching, excessive expansion of the dentures was advocated, primarily to enable the operator to place the incisors in positions overlying basal bone, without resorting to the extraction of teeth. This practice was a mistake and in cases, so treated, a recurrence of the malposition of the mandibular incisors was subsequently encountered.

In the East, the first man to call attention to this fundamental error, was Dr. Harry Bull of Jersey City, a member of our Eastern Component of the Edward H. Angle Society of Orthodontia and a most competent operator. He based his claim for lack of stability in cases so treated on the fact that the buccal teeth were being moved off their underlying basal supporting bone and that no form of treatment that moved any teeth to positions where they were not sustained by osseous structures comprising the body of the mandible or of the maxillae, was fundamentally correct.

As a result of frequent discussions with Dr. Bull, your essayist began an analytic study of this problem of permanent stability subsequent to treatment. Anatomy has always been an intriguing subject to me and perverted muscular action as a secondary etiological factor in the production of malocclusion received careful consideration in the analysis of all cases. Muscle exercises were routinely given to my patients as essential home treatment but the results obtained were practically negative. Dentures, enlarged to accommodate the full complement of teeth, either by

expansion or by distal movement of buccal teeth, with or without mandibular incisors placed in positions overlying their basal supporting bone, and retained for one or more years, just would not remain stabilized.

I then began to study those cases in my practice that could really be called successful treatments, as illustrated by permanent stability after years of freedom from mechanical support. I found a most significant factor as a result of this study. The width across the mandibular canines and mandibular first molar teeth, in the models of the original malocclusions and in the models of the stabilized, completed cases, showed little, if any, variation. (Figs. 4 and 5.) After measuring a large number of cases, including successes and failures, it seemed rational to draw certain conclusions. These may be mentioned as follows:

1. Every malocclusion represents a denture under the influence of and stabilized by balanced muscular forces.
2. These balanced muscular forces are inherent to the individual and cannot be changed by any known method of treatment.
3. These muscular forces are present in two forms—muscular tonus and muscular contractions.
4. Successful treatment, as illustrated by permanent stability, must aim to preserve this muscular balance rather than alter or upset it.
5. The key teeth in designating the tooth positioning that is harmonious with the muscular forces constantly in action upon the denture, are the mandibular canine and mandibular first molar dental units.
6. Therefore, stabilized results can only be gained when the width of the mandibular denture in the canine and molar areas is maintained inviolate.
7. The form of the maxillary denture and the positioning of the maxillary teeth are governed by the mandibular denture form and tooth positioning established by adhering to the dictates of muscular balance.
8. When it is impossible to rearrange the mandibular dental units in the desired alinement with the incisors re-established in locations overlying their basal supporting bone, without moving the canine teeth labially and the molar teeth buccally, extraction of dental units is definitely indicated.
9. If muscular balance is preserved in treatment, it should be possible to eliminate mechanical retention at the end of active treatment and have a result that would remain stable.

Having drawn these conclusions, the next logical step was to test them out in clinical application. For the past three years this has been done. The archwire patterns were shaped to preserve the width across the mandibular canine and molar teeth that was present in the malocclusion denture. Only in extraction cases, wherein the canines were moved distally into the wider, premolar areas of the denture, were these canine key teeth moved slightly buccally. Also, in closed bite dentures, in which the canine crowns had been tipped lingually by the occluding maxillary canines, the mandibular canines were tipped labially to normal axial inclination coincidentally to opening the bite.

At the end of active treatment, the archwires and bands were removed

and no retaining appliances were placed on these dentures. The patients were seen every six weeks and the results were most gratifying. In three cases it was necessary to place a bite plate in the maxillary denture to prohibit a return of too great an overbite. None of the cases required any retention in the mandibular denture. Consequently, I believe that sufficient data had now been accumulated to verify the value of this offering and to establish it as a basic principle for successful treatment. (Figs. 6, 7 and 8.) There is no question in my mind that denture expansion as a treatment procedure in the correction of malocclusion should be discarded and every effort should be directed toward preserving the muscular balance that is the most important factor in establishing and maintaining tooth positioning. It is an inherent and unalterable balancing force in every individual that comes to the orthodontist for corrective procedures and cannot be ignored or modified. It is established early in life and apparently is just as inflexible as is the growth pattern of the basal bones. Furthermore, it can be classified as Nature's orthodontic appliance for its actions are preeminently dispensated upon the tooth crowns and, as a result, their positions are established and maintained, to the greatest extent, by this constantly active force. To ignore its influence is courting failure but to employ its actively sustaining power, is a rational procedure, harmonizing with the laws of common sense and dictating success to a positive.

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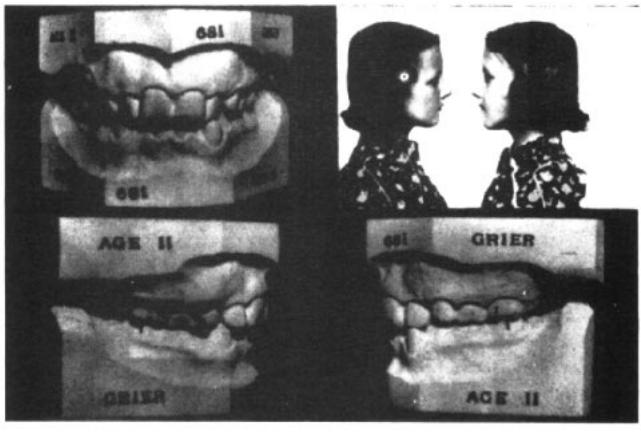
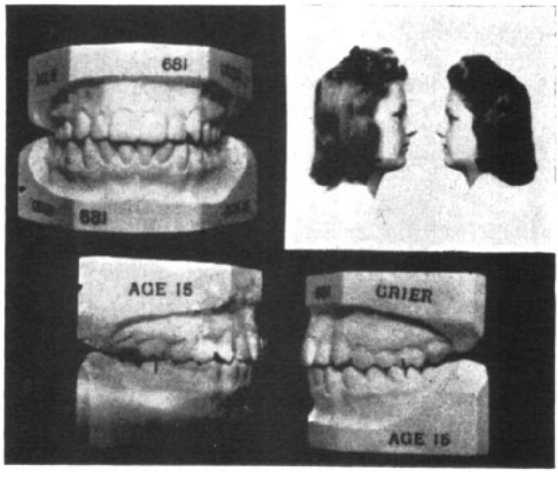
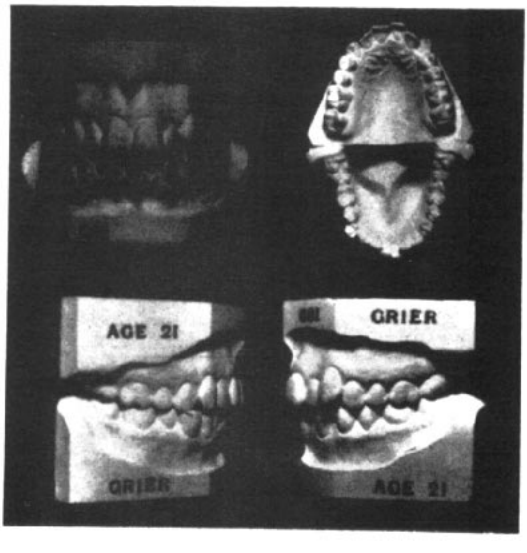


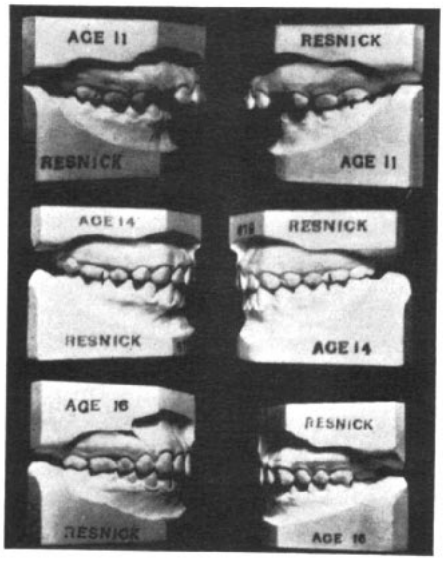
FIG. 1 A. Case with marked retardation of jaw growth and excessive hypertonicity of facial musculature, treated by denture expansion combined with distal movement of the buccal teeth and slight forward movement of the incisors. Result obtained after three years of active treatment.



B. Retaining appliances were subsequently worn for two years.



C. Models of this case taken at age 21, showing excessive relapse.



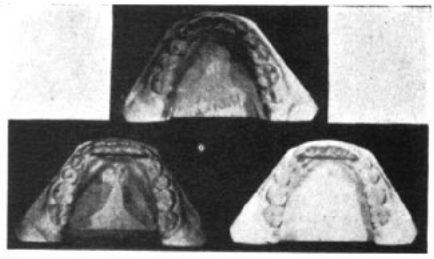
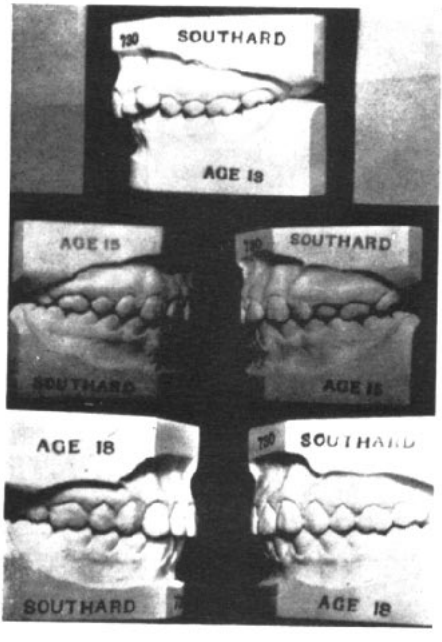


FIG. 5. The restoration of mandibular canine width in another Class II, Division I case, subsequent to treatment in which the dentures were expanded.



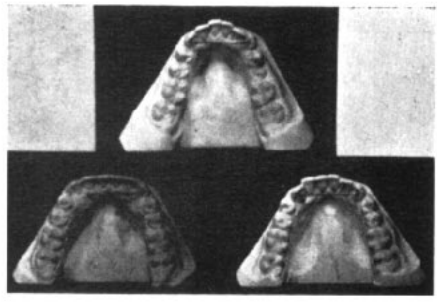
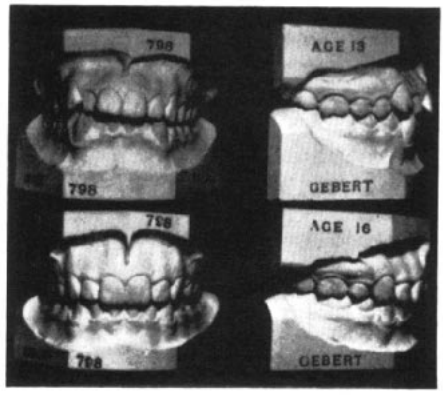
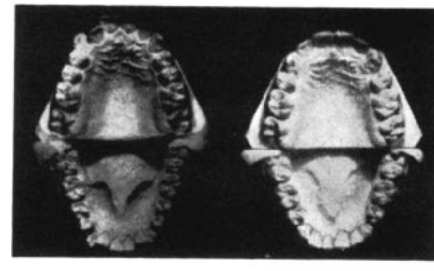


FIG. 6. Another case showing the same final readjustment of mandibular, canine width under the influence of muscular balance.



A



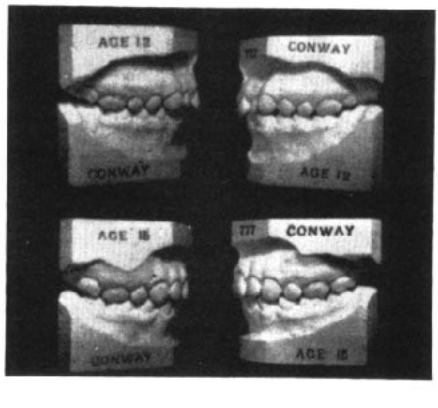
B

C

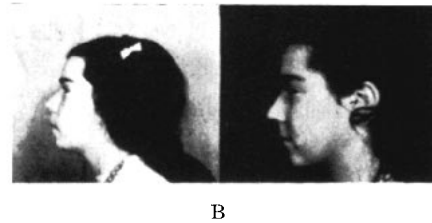
FIG. 7 A. Case treated subsequent to the extraction of four first premolar teeth and care being taken to preserve the muscular balance by avoiding expansion in the mandibular denture. No retaining appliances were worn subsequent to the removal of the active appliances. Second models were taken one year after active treatment was completed.

B. Occlusal view of models of case seen in A.

C. Photographs of patient whose models appear in Figs. A and B.



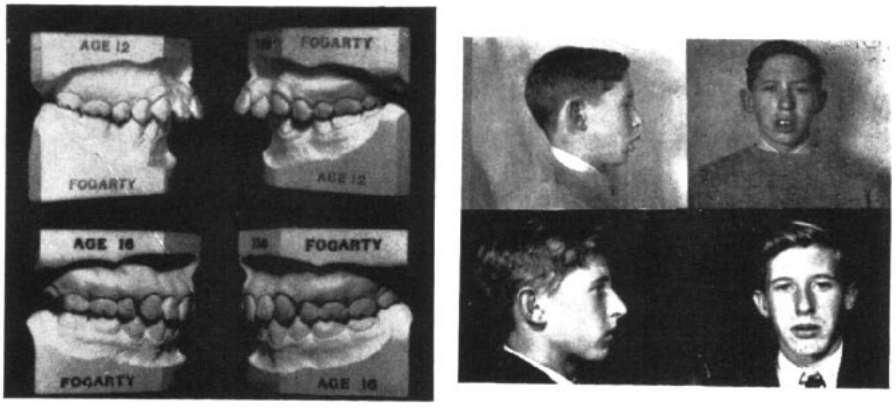
A



B

FIG. 8 A. Another case in which no retaining appliances were used. Second models taken one year after completing treatment.

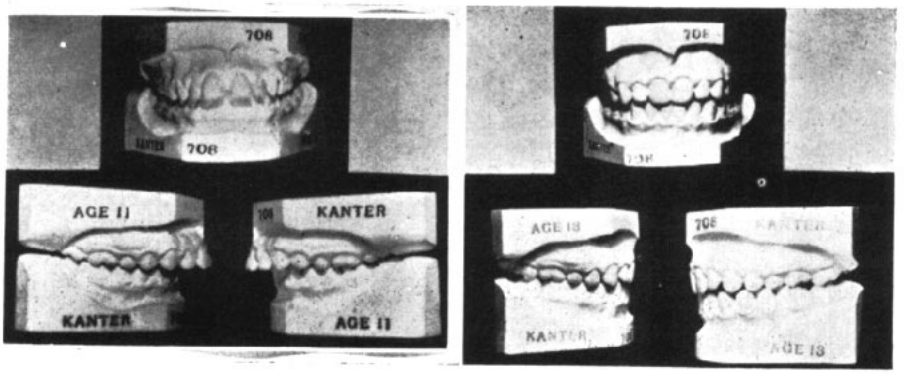
B. Photographs of patient whose models are seen in Fig. A.



A B

FIG. 9 A. Complicated, Class II, Division I case, in which the maxillary first premolar teeth and two mandibular second premolar teeth were extracted. Treatment aimed to preserve muscular balance by avoiding denture expansion. No retaining appliances were used on this case.

B. Photographs of patient whose models appear in A.

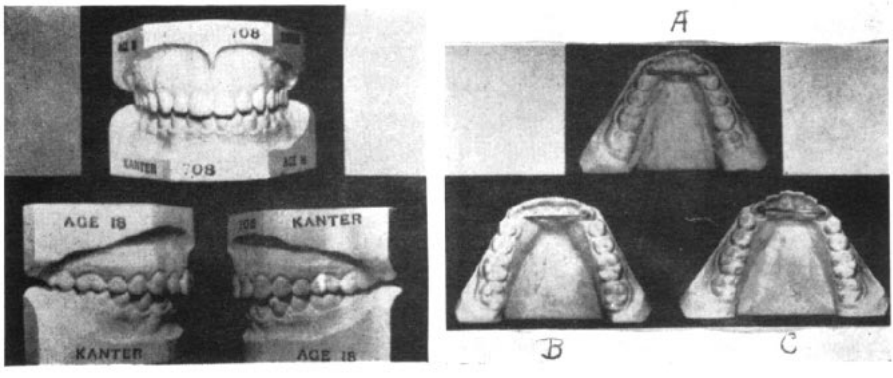


A B

FIG. 2

FIG. 2 A. Models of a Class II, division 1 case, treated without extraction and according to the original principles of Dr. Charles Tweed, consisting of excessive expansion of the denture and the lingual movement of the incisors to positions overlying basal bone.

FIG. 2 B. Result at the end of active treatment.



A B

FIG. 3

FIG. 3 A. Case seen in Figures 2a and b four years after the retaining appliances were removed.

FIG. 3 B. "A." Mandibular canine width, measured by a section of wire, on the malocclusding model. "B." Same section wire placed on model of Figure 2b, showing expansion across mandibular canines. "C." Same section of wire placed on model of figure 3a showing that the width across the mandibular canines is exactly the same as in the original malocclusion.

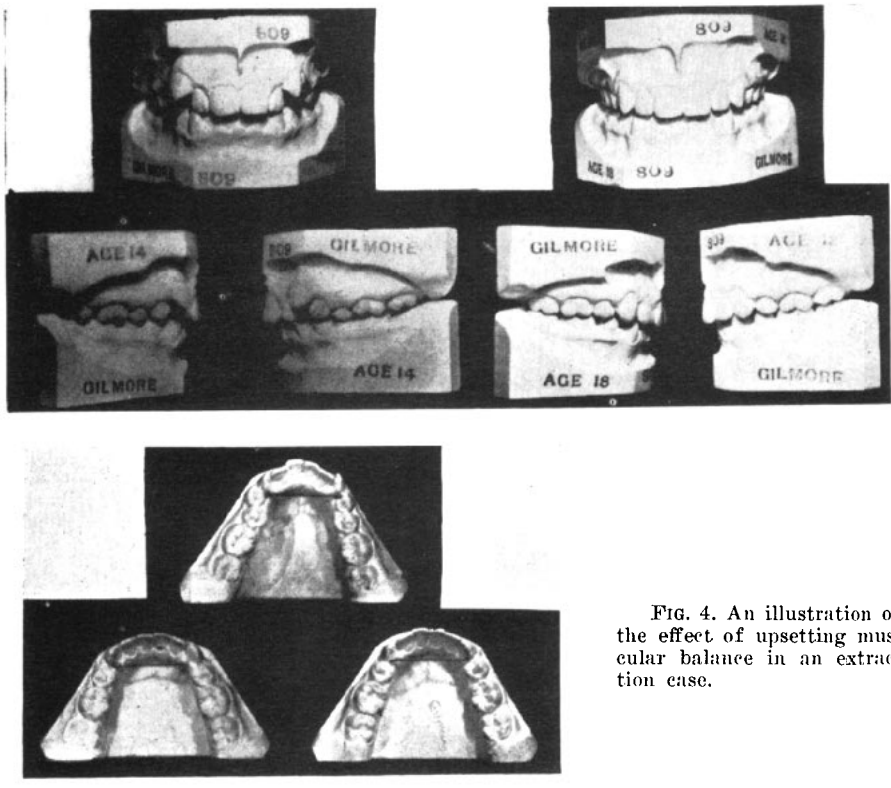


FIG. 4. An illustration of the effect of upsetting muscular balance in an extraction case.