Commentary: Deep overbite correction

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This paper has a great strength in its conceptual design. Overbite is indeed a combination of the six factors named and the paper sets about to systematically analyze the contribution of each component. Moreover, separate, carefully matched controls exists for both treatment groups. The methodology and the analysis of the data, however, raise some questions regarding the conclusions drawn.

The methodology used to measure the component parts of overbite involved the use of surface skeletal landmarks, such as ANS and menton. Björk in 1972 clearly showed that ANS remodeled in an inferior direction. Vertical remodeling of reference points has potential error in the measurements of overbite component changes that are referenced to these landmarks. Vertical remodeling of ANS will reduce the value reported for M1, potentially altering the data for maxillary movement and upper incisor bodily movement. A parallel situation exists for menton and M6 and lower incisor bodily movement.

While Björk did not measure these changes, his very precise illustrations show up to 3-4 mm of vertical lowering of ANS over the 5 or 6 years of his study. Just halving this amount for the duration of treatment of the tandem mechanics patients would have profound effects on the small increments of change reported in the study. The data on menton is also confounded by mandibular rotation which influences overbite.

A total of nine cephalometric parameters are measured. The intragroup differences between the before and after measurements within the tandem mechanics group and within the tandem mechanics control group are tested for all nine parameters. This results in nine t tests each. The intergroup differences between the tandem mechanics and control groups results in nine more t tests for a total of 27 t tests. The same is true for the bionator group and its control.

Subjecting the same data to multiple t tests is inappropriate without employing a Bonferroni correction factor which consists of dividing the level of significance desired (.05) by the total number of tests (27) to establish a corrected level of significance. This will change the significance of the data reported. It is not clear why multiple t tests were used for the data in Tables IV and V while the separate data on facial type in Table VI was properly subjected to an ANOVA test.

When the analyses in Table IV are corrected, information will be present describing the effects of the tandem mechanics treatment (as compared to matched controls). Correction of the analyses in Table V will establish information as to the effects of bionator treatment.

We only know that these two treatment groups differed in (mean? sic) treatment times of 1.69 years for the bionator group and 3.2 years for the tandem group. We know nothing of the relative ages of the patients receiving these two treatment modalities, or the sexual composition or other details of the two groups. Lacking any direct comparison between the groups, it is inappropriate to contrast them and draw conclusion. The expressed

claim and surprise that fixed therapy resulted in twice as much vertical correction as removable therapy should not be surprising. The fixed therapy took twice as long.

In fact, the original stated intent of this paper is not addressed directly in any of the data. Comparison of each treatment group to its control is proper, but it generates only indirect data with respect to the relative merits of the two treatment modalities. Comparisons between the two treatment modalities is analogous to comparing data from two separate studies where the details of the patient samples are unknown. Comparisons of the relative effects of the two modalities based on this data is just as speculative.

The hypothesis that tandem mechanics increases the vertical height of both the maxilla and mandible, and that this would be useful for patients with decreased lower face height, is expressed. But this is only speculation since this paper compares all the tandem mechanics patients to untreated controls and offers no facial type response data for tandem mechanics comparable to Table VI for the bionator group. Since no data is reported for the tandem group facial types, it is equally hard to understand the conclusion that the response to tandem mechanics was not influenced by facial type.

This paper addresses the right question and recognizes many aspects of the problem usually ignored. Its direction is to be applauded. The problem of overbite is a longstanding one and, were it an easy one, would have long ago been resolved. This study is moving in the right direction, but improved methodology and data analysis are needed before reproducible data will exist on the relative merits of different treatment approaches.

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Author's response

Björk's studies illustrate the importance of using implants to distinguish growth resulting from displacement of bone from growth resulting from remodelling of bone.[1] We agree that the relative contributions of these two processes to vertical movement of ANS and Menton cannot be determined using standard non-implant cephalometric methods. However, we contend that Björk's work indicates that ANS and Menton are good landmarks for locating the spatial position of the maxilla and mandible. For example, although menton may be lower because of deposition of bone at the chin, extrusion of molars, or increases in condylar growth, the lowest point on the bone is still menton. The process of growth was not the subject of our study. We simply wanted to assess the vertical position of the maxilla or mandible in one group compared to another. We feel our analysis meets this need.

We object to the characterization of our statistical analysis as "inappropriate". Bonferroni correction is a statistical option that can be used to offer a more conservative estimate of the chance of a type I error (α). One calculates a Bonferroni correction by dividing α by the number of tests (k). The risk of using a k of 27 is that the region of rejection becomes so small that clinically meaningful differences between the groups may not be detected.[2] We elected not to use Bonferroni because we believe our results are clinically significant. A particular statistical test does not prove or disprove the veracity of research results any more that a certain value for an angle proves the existence of a skeletal discrepancy. Statistics are mathematical tools designed to aid practitioners of medical science. Statistics should be used to help determine the clinical significance of findings when reasonable uncertainty about the effects of treatment exists. The astute clinician uses statistics to reach a decision about research results in the same way he or she uses diagnostic tests to help make decisions about the existence of a skeletal malocclusion.

Mark Hans

1. Björk A, Skieller V. Facial Development and tooth eruption–An implant study at the age of puberty. Am J Orthod 1972:62(4):339–383
2. Kleinbaum David G. Kupper, Lawrence L, Muller Keith E. Applied Regression Analysis and Other Multivariable Methods., Chapter 3, Basic Statistics, pp 32, PWS-Kent Publishing Co., Boston, Mass., 1988.