

LETTERS TO THE EDITOR

Dear Editor,

NEED FOR REAPPRAISAL OF THE USES OF INDICES

Re: Otuyemi OD, Jones SP. Methods of assessing and grading malocclusion: a review. *Aust Orthod J* 1995; 14: 21-27.

This article raises two important issues which should be appreciated by the orthodontic community - (a) the matter of determining treatment need in the individual; (b) the evaluation of quality of treatment. The latter point looms as an issue in quality assurance. I believe these issues are not well served by the article.

The number of 'indices' reviewed by the authors (and there are more) gives an insight into the continuing difficulties in this field. As yet no index has been devised which will give an acceptably reliable indicator of the need for treatment at the level of the individual. Misclassifications are to be expected. The standard validation or reference criterion is the subjective assessment of one or more orthodontists. We know this criterion is unstable. In the case of the PAR index which was validated using the mean scores of 74 examiners, it has never been explained satisfactorily how validation was satisfied when intra-examiner agreement was admitted by its inventors to be poor (Richmond S, Shaw WC et al, 1992).

Virtually every study to date suggests that while orthodontists do agree reasonably well with each other concerning cases which should be treated, when they re-examine the same cases there will be disagreements in about 20 per cent of the sample. An individual patient may be deemed to be in need of treatment by one set of subjective scores (Time 1) only to be excluded by the replicate scores made by the same examiner(s) some time later (Time 2). Thus the fallibility of the

validation process is critical to the performance of the index as an indicator of need. There is no invariant reference criterion or base line validation benchmark. True validation is in reality impossible.

These issues are not addressed by the authors yet are central to the equitable provision of services within any publicly funded scheme or public service. Such detail may seem far removed from the activities of the average orthodontist (or dentist) but in recent years there has been considerable exposition of the possible use of indices as the determinants of treatment need in spite of their known and demonstrable shortcomings. Unfortunately indices are seen to satisfy the modern administrative requirement of apparent numerical exactitude thereby assuming a respectability which is not warranted. The question raised by Carlos (1970) remains as valid today - does the index measure what it was designed to measure? In virtually every instance we can confidently say "We don't know" at least as far as the individual patient is concerned. Interested readers might reference a thoughtful discussion by Howat (1993) or a more recent discussion by Solow (1995).

Similarly, the utilisation of indices for the purposes of quality assurance raises some difficult issues. Where the malocclusion is not particularly 'severe' to begin with, the PAR index will understate the quality of treatment because the amount of improvement will necessarily be minimal. There are also some important doubts concerning the weightings given to the components of the PAR index. As outlined above, the validation process for the PAR must be questioned because the level of agreement within the original validating raters was judged to be poor. In spite of this, the present authors go on to conclude that the PAR "has much to commend it as a measure of treatment outcome and is becoming accepted as a research and audit tool". Such a conclusion should at least warrant cautious analysis by practising orthodontists who may well find themselves on the receiving end of the audit process using this or any other of the available indices. Failure to challenge the validity of such claims may result in the gradual imposition of methods which should be subjected to much closer scrutiny before they are even considered, let alone accepted.

The authors confuse the term 'epidemiological indices'. Any index (and its integral attribute measurements) may be used for epidemiological purposes providing the results are not misapplied. Most of the present indices could be used for epidemiological purposes. Kelly, Sanchez and Van Kirk (1973) used the TPI as an epidemiological tool. It is for broad planning purposes that indices would seem to be of some benefit. The method of Bjork, Krebbs and Solow (1964) was not an index. It was a recording system for generating epidemiological data and was the precursor to the FDI system. Neither is the IOTN (Dental Health Component) an index. It is more accurately described as a classification but with relatively little intra-class discrimination.

The vast amount of research applied to malocclusion assessment has been very useful in defining and refining the issues which impinge on the individual's need for treatment but has not yet produced an index which can be reliably or equitably applied in discriminating between individual priorities in the face of economic constraints. Indices certainly give the same 'answer' time after time when applied consistently. Unfortunately there is no guarantee that the answer is correct in terms of need or outcome. It should be recognised that indices will give significant and probably near equal rates of positive and negative misclassification.

Yours sincerely,
T.J. Freer

References

- Carlos J. Evaluation of indices of malocclusion. *Inter Dent J* 1970; 20: 606-617.
- Howat A. Orthodontics and health: have we widened our perspectives? *Comm Dent Health* 1990; 10: 29-37.
- Kelly J, Sanchez M, Van Kirk LE. An assessment of the occlusion of the teeth of children 6-11 years. National Centre for Health Statistics, Washington, DC, 1973. DHEW publication (HRA) 74-1612, Series 11, No. 130.
- Richmond S, Shaw WC et al. The development of the PAR index (Peer Assessment Rating): reliability and validity. *Europ J Orthod* 1992; 14: 125-139.
- Solow B. Guest Editorial: Orthodontic screening and third party financing. *Eur J Orthod* 1995; 17: 79-83.

Dear Editor,

**DOES CONCEPTUAL IGNORANCE
MISGUIDE ORTHODONTIC
DIAGNOSTIC PERSPECTIVE?
DOES FEAR DENY CHANGE?**

Your Guest Editorial, *Science and Friction in Orthodontics* (The Australian Orthodontic Journal, Volume 14, Number 1) quotes that functional appliances are judged not to stimulate mandibular growth.

(In the course of this discussion 'functional appliances' refers to an appliance which holds the mandible away from its natural position of rest and which is used full time and when eating.)

That Editorial further defends the view that the general practitioner, through 'anecdotal education', is remiss in supporting the use of functional appliances and that the specialist orthodontist, through 'scientific education', holds the truth of orthodontic treatment potential in his or her hands.

Further, scientific thinking is used to defend conventional orthodontic approaches and to devalue the supposed anecdotal evidence of a different view.

However, the real questions for the supposed science of Orthodontics to answer before criticising alternative philosophies of treatment are: "Is conventional fixed appliance treatment and diagnosis of Class II malocclusion based on an incomplete view of facial growth and development?" and, "Has conventional fixed appliance treatment planning evolved only in response to the capability of the appliance rather than on a true biological basis of growth and development of the face in terms of what needs to be done to correct the malocclusion?"

Further, if conventional specialist orthodontic thinking is to rely upon 'scientific thinking and analysis', some deep thinking would reveal that the fixed appliance perspectives of Class II malocclusion treatment and concepts of facial growth and development are also open to analysis.

Conceptually, Orthodontics has developed an image of facial growth and development through the course of the evolution of cephalometric analysis. That cephalometric image has misguided the orthodontic profession into the understanding that facial growth and development occurs in a straight line (for example, along some cephalometric 'Y'

axis (Ricketts¹³)). This view not only misleads the clinician in planning the treatment of Class II malocclusions, but also covers up the true process of growth and development: for, in the cephalometric radiograph, no account is taken of the following factors: first, the transverse development of the face; and, especially, that of the maxilla which encompasses the middle third component; second, the rotation and translation of the mandible and other skeletal structures within the facial complex during growth; and third, the vertical eruption of molars.

Moss¹¹ functional matrix theory reveals that facial growth is the process of expansion, translation and rotation that allows molar eruption. This view is supported by Bjork's² implant studies. This alters the former impression held by the conventional orthodontic perception of facial growth as being along a sagittal axis. The conventional two-dimensional cephalometric sagittal view gives the impression that the correction of a Class II malocclusion requires that the mandible grow forward an added number of millimetres in condylar length to gain an incisor relation. This limited concept of facial growth comes from the understanding of drawings of facial growth patterns in text books and the use of cephalometric analysis; but it is basically inadequate in the scientific sense of describing facial growth and development.

Dibbets¹² illustrates this point in pointing out how Ricketts' conventional cephalometric superimposition compared with Bjork's implant studies, disguises the rotational change in mandibular position and the massive molar eruption that occurs during normal growth. Neither of these normal growth responses is directly made use of with conventional fixed appliance treatment approaches to Class II treatments.

More enlightened views of facial growth and development (namely, Woodside³, Melsen³, Spahl⁷, Clark⁶, Schudy⁴ and Ingervall¹³) indicate that the Class II malocclusion is a product of the posterior vertical dimension disharmony and the mandibular postural position that reflects a horizontal sagittal discrepancy in the incisor relation.

If, then, as a concept of facial growth, it is understood that the mandible rotates and translates during facial growth, that molars erupt to compensate for that change in position and that the face is expanding, then maxillary expansive functional

appliances work in accordance with growth. In contrast, fixed appliance treatment modalities try to restrict maxillary growth, camouflage skeletal discrepancy by extracted dento-alveolar adaptation and can be said to work against growth.

Melsen¹¹, Clark^{5,6}, Spahl⁷, McNamara⁸, Isaacson⁹, Profit¹⁰ and Orton¹⁴, all attest to treatment of Class II malocclusions through the use of functional appliances that control the vertical eruption of the posterior molars. Thus, the maxillary expansive functional appliance assists the face in developing transversely through expansion in the maxillary arch, translates the mandible and allows it to function in a more normal incisor relation, allows dento-alveolar compensation through the movement of the teeth and controls the eruption of posterior molars. It is the function that allows the mandible to grow to its full genetic potential in accordance with the adaptation of the temporomandibular joint area, condylar and maxillary growth. The whole face is then functioning around a more normal sagittal skeletal relation.

Conceptually then, functional appliances do not work just by stimulating growth of only the condyle of the mandible itself in terms of 'x' millimetres in length sagittally; but, rather, they act as part of, and effect, the growth process of the whole facial complex in accordance with Moss' functional matrix.

Two opposed views to diagnosis are possible:

If it is believed, as a concept of facial growth and development, that the mandible is the template around which the maxilla must fit, then treatment must direct modalities and approaches that push back and compress the maxilla to meet the mandible wherever it is positioned. With such a treatment approach, is it any wonder that specialist Orthodontics has struggled to maintain the facial profile and harmony when its diagnosis has, in error, built retraction and maxillary compression into the treatment plan by using the mandible as the basis of diagnosis. This in-built retraction potential arises from using either the lower incisor to A-Pog Plane or the incisor mandibular plane angle measurements as the key sagittal diagnostic position to which maxillary teeth must be related (Ricketts¹³, Tweed¹⁵).

If the alternative view is taken that the maxilla is in its correct sagittal position for

90 per cent of Class II malocclusions (McNamara⁸, Spahl⁷), but somewhat underdeveloped in the transverse dimension, the treatment approach must be directed at moving the mandible forward to the maxilla and at developing the maxillary arch transversely so that the maxillary occlusion will fit with the mandibular occlusion.

Conceptually, translating the mandible to the maxilla is not a process of only stimulating mandibular growth in the linear incremental amounts, but, rather, a process of translating and re-positioning the mandible and allowing the whole face to grow more normally through function, and in accordance with the new sagittal relations between the maxilla and mandible. This allows small changes (not just large incremental jumps in condylar length) throughout the whole facial complex to account for the correction of the sagittal discrepancy. However, Clark⁶ reports from his cephalometric analyses that his Twin Block-treated Class II malocclusions showed greater incremental mandibular growth compared with the untreated controls during their treatment period as well as retraction of the maxillary incisors.

Thus, the cephalometric changes seen with functional appliances mimic those seen with conventional approaches, but differ in the degree of response with the site of response.

Further, the orthodontic profession's obsession with cephalometric analysis, in terms of seeking the lower incisors as a key to diagnosis and treatment planning, has ignorantly been blind to the view that posterior vertical dimension controls the sagittal: that is, the sagittal discrepancy is not so much a product of incisor relation disharmony, but, rather, a reflection of molar over-eruption or under-eruption, mandibular position and rotation (Woodside³, Schudy⁴, Clark⁶).

The functional philosophy diagnosis that the problem of the Class II malocclusion resides in the posterior vertical dimension, is evidenced by having deep-bite Class II patients hold their teeth in an edge-to-edge bite relation. This reveals the posterior open-bite (molar under-eruption but a much improved facial proportion and profile) and usually a maxillary arch narrower than the mandibular arch. The anterior open-bite case shows an improved profile but over-erupted molars as reflected by the anterior open-bite.

Practitioners who use fixed appliance mechanics to reduce Class II malocclusions, try to avoid extrusion of lower molars to prevent the backward mandibular rotation increasing the sagittal discrepancy (Schudy⁴) and, therefore, are forced to ignore the posterior vertical dimension and, instead, direct attention to the incisor relation. If it is believed that the posterior vertical dimension is at fault, the only approach to treatment is through the use of a functional appliance with bite blocks which allows, or controls, the posterior vertical growth of the molars whilst translating the mandible to counteract the rotational response.

Thus, the issue confronting the orthodontic profession, worldwide, is not the threat of general practitioners directing treatment from a distance but, rather, the fear of change in their conceptual thinking and understanding of facial growth and development.

Many specialist and general practitioners, as recorded in the literature, attest to the use of functional appliances in the treatment of Class II malocclusion. 3, 5, 6, 7, 8, 9, 10, 11, 14 Are all their patients being mistreated because none of them can show that mandibular length increases through the use of functional appliances; or is it that the opposed view to those treatment modalities has an incorrect perspective of facial growth which tries to measure the treatment response inadequately?

Thus, on a scientific basis, what is at fault is not whether or not functional appliances work, but, rather, the understanding of facial growth that underlies orthodontic diagnosis and treatment planning and the scientific method that attempts to analyse and describe that concept. If Orthodontics is to defend its 'science', surely diagnosis and treatment should be based on a complete perspective of facial growth and development - not just on the 'science' of the mechano-therapy of localised tooth movement.

Yours sincerely,
Iain G. Edwards

References

1. Moss ML, Slaentijn L. The primary role of functional matrices in facial growth. *Am J Orthod Dentofacial Orthop* 1969;55:556-577.

2. Bjork A, Skieller V. Normal and abnormal growth of the mandible. A synthesis of longitudinal cephalometric implant studies over a period of 25 years. *Eur J Ortho* 1983;5:1-46.
3. Woodside D, Melsen B, Ingervall B. The vertical dimension. [lectures] *Aust Orthod J* 1994;13:107-110.
4. Schudy FF. The occlusal plane. Houston: ELRR Publishing, 1992. The vertical dimension of the human face. Houston: ELRR Publishing, 1992.
5. Clark WJ. The twin block technique. *Am J Orthod Dentofacial Orthop* 1988;93:1-18
6. Clark WJ. Chapter 23. In: Twin block functional therapy applications in dentofacial orthopaedics. Turin: Mosby-Wolfe, 1995.
7. Spahl T, Witzig JW. The clinical management of basic maxillo-facial orthopaedic appliances. Vol.I. Hong Kong: Year Book Medical Publishers, 1987. Vol.II Littleton: PSG Publishing, 1989.
8. McNamara JA, Brudon WL. Orthodontic and orthopaedic treatment in the mixed dentition. Ann Arbor: Needham Press, 1993.
9. Isaacson KG, Reid RT, Stephens CD. Functional orthodontic appliances. Oxford: Blackwell Scientific Publications, 1990.
10. Profitt W. Chapter 14. In: Contemporary Orthodontics. St Louis: CV Mosby, 1986.
11. Melsen B. Chapter 5. In: Current controversies in Orthodontics. Chicago: Quintessence Publishing, 1991.
12. Dibbets JM. More comments on superimposition techniques. *Am J Orthod Dentofacial Orthop* 1995;107:6-18A.
13. Ricketts RM. Perspectives in the clinical application of orthodontia - the first 50 years. *Angle Orthod* 1981;51:115-150.
14. Orton H. Letters to the editor. *Am J Orthod Dentofacial Orthop* 1993;104:6.24A.
15. Tweed CH. The diagnostic facial triangle in the control of treatment objectives. *Am J Orthod* 1969;55:651-667.

RESPONSES

Dear Sir,

Dr Edwards' response to my Editorial is of particular interest because in it he has presented his beliefs about facial growth and its implications for orthodontic appliance selection and mode of effect. He appears to place strong faith in the efficacy of mandibular repositioning devices in the management of Class II malocclusion and suggests that they offer advantages over conventional fixed appliance therapy. It is noteworthy that he is not alone with this viewpoint which could be said to be widely held in the dental profession.

Close examination of the basis for such beliefs, however, reveals that there is not supporting scientific evidence. The Moss functional matrix 'theory' has somehow become elevated from the status of a working hypothesis without verification in the scientific literature and been widely quoted by charismatic 'experts' seeking to promote their favoured device. The eager acceptance of these alternative therapies by so many dentists is a cause for great concern and the reasons for their apparent lack of discrimination should be examined.

Because Dentistry is essentially a technical enterprise, great emphasis is placed upon the mastering of manual tasks in dental schools at both undergraduate and postgraduate levels. As a result, dentists are not given the necessary knowledge to make intelligent decisions when there is uncertainty about the appropriate therapy for a particular condition. The inclusion of basic research methodology and statistics in the dental curriculum at all levels is essential to provide dentists with the knowledge to understand the principles of hypothesis testing and the importance of appropriate controls in clinical trials. Only then will we be able to provide the standard of patient care that is expected of us.

JP Geenty

Dear Sir,

I recently read the Guest Editorial by Dr JP Geenty in your Journal. This is the finest article of this kind that I have ever seen. I just can't believe how he assembled so many items with which I am acquainted and agree with him about them so completely. The specialty of orthodontics is so fraught with irregularities and falsehoods in so many aspects today, that I despair of its condition. And the notion that "science" is involved is absolutely ludicrous in many, many situations.

When I went to the University of Michigan for graduate training, I truthfully went because I had been educated to believe that orthodontic treatment was a necessary part of health service. A few years later, it slowly percolated through my mind that we were largely rendering a cosmetic service of somewhat dubious longevity. In my middle years, I returned to school (while still practising) and earned a PhD at the University of California. With this experience, my scientific outlook and background got another rude awakening.

In my later years, I have become deeply involved with the public aspects of orthodontics as regards tax dollars. Because of my impertinence, the A.A.O. finally belatedly held a consensus

conference to even discuss measuring need for orthodontic treatment and how to measure it with indexes. If you look at the recent A.A.O. program in San Francisco in May 1995 you will see that I was asked to discuss "Is there a need for treatment priority indexes of malocclusion?"

The elected representatives of the A.A.O. have repeatedly asserted in formal resolutions "that only a trained orthodontist can determine the need for treatment." In America, we call this "setting the fox to watch the hen house!" You can well imagine what well informed people in other walks of life think about such a posture. And we sometimes still publish articles in the A.J.O. without proper disclaimers that are, in fact, advancing commercial interests. Tom Graber is one of my very oldest and best friends and I am "on his back" about this constantly. As well as the irrelevant statistical evidence offered on some occasions. In America we continue to offer many, many courses on "How to convert every examination into a treatment start." My God!

Again, my sincere and heartiest compliments on a wonderful editorial. It gives me hope to know that I am not all alone with my thoughts.

Yours very truly,
William S. Parker, DMD, PhD