

is not good enough for members of a learned, evidence-based calling. We need a rational theoretical basis, a healthy sense of skepticism, and a desire to be as right as we are successful.

Andreas Vesalius was a conservative scientist. Many of his pioneering dissections thus were designed to rediscover the truths of Galenic physiology, among which is the idea that blood passes from the right ventricle to the left by way of holes in the interventricular septum. Vesalius, however, could not find these holes and declared it a tribute to the glory of God that they could be so important, yet so small that he could not see them. Can it really be that the effects of functional appliances are a modern (since 1870) version of Vesalius's holes—vitaly important, but so small that few can detect them?

A useful answer probably can be inferred from the contemporary literature; however, if we can keep enough canaries in the air, it probably will go unnoticed.

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REFERENCES

- Meikle MC. What do prospective randomized clinical trials tell us about the treatment of Class II malocclusions? A personal viewpoint. *Eur J Orthod* 2005;27:105-14.
- McNamara JA Jr. Components of a Class II malocclusion in children 8-10 years of age. *Angle Orthod* 1981;51:177-202.
- Chen JY, Will LA, Niederman R. Analysis of efficacy of functional appliances on mandibular growth. *Am J Orthod Dentofacial Orthop* 2002;122:470-6.
- Ghafari J, Shofer FS, Jacobsson-Hunt U, Markowitz DL, Laster LL. Headgear versus function regulator in the early treatment of Class II, Division 1 malocclusion: A randomized clinical trial. *Am J Orthod Dentofacial Orthop* 1998;113:51-61.
- Baumrind S, Korn EL, Molthen R, West EE. Changes in facial dimensions associated with the use of forces to retract the maxilla. *Am J Orthod* 1981;80:17-30.
- Keeling SD, Wheeler TT, King GJ, Garvan CW, Cohen DA, Cabassa S, et al. Anteroposterior skeletal and dental changes after early Class II treatment with bionators and headgear. *Am J Orthod Dentofacial Orthop* 1998;113:40-50.
- Johnston LE Jr. Functional appliances: a mortgage on mandibular position. *Aust Orthod J* 1996;14:154-6.
- Johnston LE Jr. Growing jaws for fun and profit: a modest proposal. In: McNamara JA Jr, editor. What works, what doesn't, and why. Monograph 35. Craniofacial Growth Series. Ann Arbor: Center for Human Growth and Development; University of Michigan; 1998. p. 63-86.
- Jakobsson SO. Cephalometric evaluation of treatment effect on Class II, Division 1 malocclusions. *Am J Orthod* 1967;53:446-57.
- Pancherz H, Hansen K. Occlusal changes during and after Herbst treatment: a cephalometric investigation. *Eur J Orthod* 1986;8:215-28.
- Wieslander L. Long-term effect of treatment with the headgear-Herbst appliance in the early mixed dentition. Stability or relapse? *Am J Orthod Dentofacial Orthop* 1993;104:319-29.
- Lande MJ. Growth of the bony facial profile. *Angle Orthod* 1952;22:78-90.
- Johnston LE Jr. A comparative analysis of Class II treatments. In: Vig PS, Ribbens KA, editors. Science and clinical judgment in orthodontics. Monograph 19. Craniofacial Growth Series. Ann Arbor: Center for Human Growth and Development; University of Michigan; 1986. p. 103-48.
- Johnston LE Jr. Growth and the Class II patient: rendering unto Caesar. *Semin Orthod* 1998;4:59-62.
- Pancherz H. A cephalometric analysis of skeletal and dental changes contributing to Class II correction in activator treatment. *Am J Orthod* 1984;85:125-34.
- Pancherz H, Fackel U. The skeletofacial growth pattern pre- and post-dentofacial orthopaedics. A long-term study of Class II malocclusion treated with the Herbst appliance. *Eur J Orthod* 1990;12:209-18.
- Pancherz H, Littmann C. Morphologie und lage des unterkiefers bei der herbst-behandlung. Eine kephalometrische analyse der veränderungen bis zum wachstumsabschluss. *Inf Orthod Kieferorthop* 1989;21:493-513.
- Cozza P, De Toffol L, Colagrossi S. Dentoskeletal effects and facial changes during activator therapy. *Eur J Orthod* 2004;26:293-302.
- Lamparski DG. Skeletal age assessment utilizing cervical vertebrae [thesis]. Pittsburgh: University of Pittsburgh; 1972.

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AUTHORS' RESPONSE

We are pleased that Dr Lysle E. Johnston Jr took the time to formulate a Commentary (actually, a small article) in response to our systematic review of the literature on the effects of the functional appliances. We would like to use some of the material in his Commentary to clarify some points in the original article.

Let us consider the following sentences of Dr Johnston: "As we feign enthusiasm for evidence, we actually tend to embrace only the research that agrees with our preconceptions. Unfortunately, what is truth to me might be heresy to you." This type of human fault or weakness appears to be unavoidable, if even Dr Johnston falls for it. Two examples follow, where part of studies that mirror personal expectations are chosen, but other parts that go against preconceptions are neglected.

When it is noted in the review by Chen et al¹ that the conclusion is "functional appliances appear to have little clinical effect on mandibular length" (chosen sentence), another paragraph from the same article should have been mentioned also (neglected sentences): "some variation existed among the subject groups studied in the articles we selected. The age groups ranged from age 7 to 13 years. Although there was overlap in the ages studied, the age differences produced some problems when comparing studies. Growth

does not occur at a constant rate, especially in young children. Even children of the same chronologic age might not have equivalent skeletal maturity or growth potentials. Therefore, when studies such as these do not have skeletal age as a common factor, it is difficult to produce a conclusive statement regarding the amount of growth modification that might or might not occur.” We think that our decision to use “inconclusive” is appropriate for the review by Chen et al.¹

With respect to the study by Pancherz and Fackel,² the reported sentence (chosen sentence) was “the results of the study indicated that dentofacial orthopedics using the Herbst appliance had only a temporary impact on the existing skeletofacial growth pattern.” The part of that article that was omitted (neglected sentence) pertained to the Herbst sample’s timing of treatment, which was before the pubertal growth spurt. Enough evidence already exists (especially in the 4 randomized clinical trials³⁻⁶) to support the concept that the prepubertal use of functional appliances does not produce significant supplemental growth of the mandible.

On a different topic, we excluded the article by Wieslander⁷ from the review because the treatment protocols consisted of a combination of 2 appliances used separately (Herbst full-time plus headgear night-time only), and thus this study was not considered. The addition of the second appliance (headgear, not a functional appliance) obviously could influence the overall treatment effects significantly. This does not mean that we disregarded the possibility that headgear can provide supplementary mandibular growth. McNamara et al⁸ noted a modest increase in mandibular growth in Class II patients treated with cervical face-bows compared with untreated Class II controls. Furthermore, the article by Burkhardt et al⁹ indicated that molar distalization can be associated with amounts of mandibular growth that are comparable to those achieved with Herbst appliances. This topic, however, was beyond the scope of our review because we focused on the effects of functional appliances as classically intended and not on every orthopedic treatment protocol for Class II correction.

Another aspect deserves attention. When Dr Johnston claims that, “for comparison”—of the outcomes of treatment with functional appliances—“untreated Class I or II subjects should be good enough,” substantial evidence in an opposite direction can be provided. As already indicated in our review, some relevant literature demonstrated that mandibular growth in Class II subjects differs significantly from that of subjects with normal occlusions.¹⁰⁻¹² Ngan et al¹³ performed a longitudinal evaluation of growth changes in Class II Division 1 subjects and found that “mandibular growth showed differences between the two Classes of malocclusion. In the Class II sample, mandibular length and corpus length were found to be shorter . . . when compared with a Class I sample. This was particularly apparent

during the pubertal growth period.” With these observations in mind, we can reinterpret the findings by Pancherz,¹⁴ when (as reported in Dr Johnston’s Commentary) he writes: “When the activator patients were compared with subjects exhibiting normal occlusion (Bolton standards), . . . mandibular growth appeared not to be affected by activator treatment.” This actually is a very desirable result for activator therapy: an amount of mandibular growth in the Class II subject that equals the amount of mandibular growth in a subject with ideal dentoskeletal relationships!

Moreover, we resigned ourselves with reluctance (especially the 4 Italians in our group) to the inclusion criterion of only articles in English for the final review. Important articles with local distribution were excluded. However, the issue of communication should be considered. English is the recognized and most-used language for scientific investigation and reporting. At any rate, and personally, in case we receive in our mail an elegant card written in Japanese that announces that we won the Eastern World Lottery, we would never claim the money because we would not be able to read the card.

Finally, we would like to thank Dr Johnston for his contribution to “a healthy sense of skepticism” that helps everyone to understand better. As he indicated, “working in some unknown way to some unspecified degree is not good enough for members of a learned, evidence-based calling.” The attention to treatment timing in relation to individual skeletal maturity when planning therapy for a Class II malocclusion patient is an issue that surely adds some knowledge and specification to our ability to achieve better therapeutic results. We do have a clue that, if the diameter of Vesalius’s holes had been larger than 2 mm, it would not have been difficult to see them.

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REFERENCES

1. Chen JY, Will LA, Niederman R. Analysis of efficacy of functional appliances on mandibular growth. *Am J Orthod Dentofacial Orthop* 2002;122:470-6.
2. Pancherz H, Fackel U. The skeletofacial growth pattern pre- and post-dentofacial orthopaedics. A long-term study of Class II malocclusion treated with the Herbst appliance. *Eur J Orthod* 1990;12:209-18.
3. Jakobsson S. Cephalometric evaluation of treatment effect on Class II, division 1 malocclusion. *Am J Orthod* 1967;53:446-56.
4. Nelson C, Harkness M, Herbison P. Mandibular changes during functional appliance treatment. *Am J Orthod Dentofacial Orthop* 1993;104:153-61.
5. Tulloch JFC, Phillips C, Koch G, Proffit WR. The effect of early intervention on skeletal pattern in Class II malocclusion: a randomized clinical trial. *Am J Orthod Dentofacial Orthop* 1997;111:391-400.

6. O'Brien K, Wright J, Conboy F, Sanjie Y, Mandall N, Chadwick S, et al. Effectiveness of early orthodontic treatment with the Twin-block appliance: a multicenter, randomized, controlled trial. Part I: dental and skeletal effects. *Am J Orthod Dentofacial Orthop* 2003;124:234-43.
7. Wieslander L. Long-term effect of treatment with the headgear-Herbst appliance in the early mixed dentition. Stability or relapse? *Am J Orthod Dentofacial Orthop* 1993;104:319-29.
8. McNamara JA Jr, Peterson JE Jr, Alexander RG. Three-dimensional diagnosis and management of Class II malocclusion in the mixed dentition. *Semin Orthod* 1996;2:114-37.
9. Burkhardt DR, McNamara JA Jr, Baccetti T. Maxillary molar distalization or mandibular enhancement: a cephalometric comparison of comprehensive orthodontic treatment including the pendulum and the Herbst appliances. *Am J Orthod Dentofacial Orthop* 2003;123:108-16.
10. Harris E. A cephalometric analysis of mandibular growth rate. *Am J Orthod* 1962;48:161-73.
11. Buschang PH, Tanguay R, Turkewicz J, Demirjian A, La Palme L. A polynomial approach to craniofacial growth: description and comparison of adolescent males with normal occlusion and those with untreated Class II malocclusion. *Am J Orthod Dentofacial Orthop* 1986;90:437-42.
12. Buschang PH, Tanguay R, Demirjian A, LaPalme L, Turkewicz J. Mathematical models of longitudinal mandibular growth for children with normal and untreated Class II, division 1 malocclusion. *Eur J Orthod* 1988;10:227-34.
13. Ngan PW, Byczek E, Scheick J. Longitudinal evaluation of growth changes in Class II division 1 subjects. *Semin Orthod* 1997;3:222-31.
14. Pancherz H. A cephalometric analysis of skeletal and dental changes contributing to Class II correction in activator treatment. *Am J Orthod* 1984;85:125-34.

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