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THE EDITOR'S CORNER

The Search for Stability

If you want to start a brawl in a mixed group of dental professionals, just broach the subject of dental or occlusal stability. Few topics elicit such heated debate, and few problems in orthodontics have caused both doctors and patients as much frustration and disappointment. The issue has been recognized since the early days of our specialty: Albin Oppenheim's famous quote, "Retention is one of the most difficult problems in orthodontia; in fact, it is *the* problem",¹ was published in English in 1934 and probably appeared in German before that. And contemporary authors have picked up the cry; as Donald Joondeph has so aptly pointed out, "Stability has become a primary objective in orthodontic treatment, for without it either ideal function or ideal esthetics, or both, may be lost. Retention depends on what is accomplished during treatment."²

Even though a sizable body of evidence has been building over the last century—at last count, the number of scientific papers on stability and retention published in English alone exceeded 200—we still have controversy. Many fundamental questions have not yet been definitively answered: Which manifestations of malocclusion are most likely to relapse after treatment? How are habits related to instability? Does early treatment contribute to stability, and if so, in what malocclusions? Is adult treatment less stable than treatment started during adolescence? Are extraction cases more stable than nonextraction cases and, if so, what about borderline extraction cases?

There are several reasons for our continuing uncertainty. Of course, one of the biggest problems associated with all clinical orthodontic research is that of sample size. I am unaware of any study of stability and retention that has included an unbiased power analysis of the experimental sample, including an honest look at the critical effect size associated with the variables in the study. Without this information we cannot, as skeptical consumers of research literature, accept the validity of the authors' conclusions at face value.

Another critical flaw in the existing literature is that of oversimplification. No one can question that post-treatment relapse is caused by a wide range of factors. Indeed, Joondeph names four “schools of thought” regarding the causes of instability and relapse—the occlusion school, the apical-base school, the mandibular-incisor school, and the musculature school—and goes on to posit nine theorems associated with stability, relapse, and retention.² In short, the issue is *multifactorial*. To assess multifactorial phenomena in an empirical, experimental fashion, we need to use *multivariate* statistics. Most, though not all by any means, of the available studies employ only *univariate* or *bivariate* analyses.

A third major drawback of the current literature on stability is a violation of one of the fundamental principles of parametric statistics—the assumption of random selection. That is, each member of the population from which a study sample is drawn must have an equal chance of being assigned to either the treatment or control group *a priori*. To be completely valid, studies of stability should be conducted as double-blind, randomized clinical trials. Due to limitations in research funding, however, the papers I have seen have involved retrospective analyses of what statisticians refer to as “convenience samples”—in other words, the subjects who were available for study. This does not mean that all the conclusions drawn to date are invalid, but it does mean the jury is still out on the stability of orthodontic treatment.

The subject screams for more attention from sources of research funding such as the National Institute for Dental and Craniofacial Research, a branch of the National Institutes of Health. The AAO Foundation does what it can—and what it does is deeply appreciated by ortho-

dontic investigators—but more research is needed in this area than the AAOF alone can fund. A promising recent development is the establishment of university-sponsored, federally funded “practice-based research networks” that are specifically designed to address the shortcomings of our existing evidence base.³ Until definitive answers about stability and retention are forthcoming, however, what do we orthodontists do when it comes time to make informed decisions about actual patient care?

In Editor's Corners past, I have argued in favor of respecting the opinions of experts, based on their years of careful, reflective clinical practice, rather than relying on conclusions drawn from poorly controlled and haphazardly designed research studies. This month, we begin a two-part JCO Roundtable on “Stability of Orthodontic Treatment”. Our Senior Editor, Eugene Gottlieb, poses some of the many questions surrounding post-treatment stability to an international panel of respected clinicians. We may not consider their answers to be definitive, any more than we do those of the existing scientific literature, but we can regard them as excellent starting points, both for clinical decision making and for the development of testable hypotheses in future research.

RGK

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