

## AAP Centennial Commentary

# From Normal Scientific Progress to Game Changers: The Impact on Periodontal Clinical Practice

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The purpose of this commentary is to highlight knowledge that has influenced and changed the trajectory of periodontal practice. As you review the “Literature That Shaped Modern Periodontology” published as part of this AAP Centennial series, you will note that most of the citations begin in the 1970s and move forward. That decade corresponds to when the authors established their private practices and most of us began to look to this literature to answer the questions that originated in the hard work of daily practice. How should we best diagnose, treat, and maintain our patients? We would like to break our commentary into four categories that capture the changes we have experienced and will continue to experience in clinical practice: normal scientific progress,<sup>1</sup> megatrends, game changers, and wild cards (Fig. 1).

### NORMAL CHANGES

Magnification, illumination, and ultrasonics have probably done as much to improve outcomes and reduce operator stress as have any other changes in contemporary periodontal practice. None of these represent major paradigm shifts, but all of them have allowed us to practice more effectively. Enhanced visualization and magnification have reopened the discussion of the role of localized factors, especially subgingival biofilms and calculus and their relationship to disease recurrence and to what degree their removal is necessary to reduce recurrence.

### MEGATRENDS

Contemporary periodontal practice began in the early 1970s. Although most periodontal surgical procedures were resective at that time, several important studies emerged which provided a glimmer of hope that periodontal regeneration might be possible. Although few clinicians were able to achieve regenerative outcomes in practice, most read and were aware of studies by master clinicians such as Bob Schallhorn and John Prichard demonstrating that

regeneration of periodontal structures was possible.<sup>2,3</sup> In the late 1960s, following the work of Bjorn Hilding, Billy Pennel introduced periodontists to the free gingival graft (FGG), a procedure widely embraced by the profession.<sup>4,5</sup> Fifty plus years later, this procedure remains the gold standard for generating keratinized tissue. Although arguably more “reparative” than truly “regenerative,” this procedural breakthrough began the long march toward routine and predictable tissue regeneration in clinical practice.

Periodontists have always held strong opinions about the therapies they provide. This partiality was particularly evident prior to the early 1980s when high-level evidence such as randomized controlled trials and meta-analyses/systematic reviews was not available to guide treatment decisions. At that time, the practice of periodontics consisted primarily of scaling, root planing, and curettage; free gingival grafts; and pocket elimination surgery. Beginning in the early 1980s, a debate began between those clinicians trained in flap osseous surgery for pocket elimination and those trained in the modified Widman surgery, which was touted as less invasive but equally effective. In the mid-1980s, a number of studies attempted to enlighten this debate with scientific evidence, the most notable being the Michigan studies,<sup>6,7</sup> which were significant for a number of reasons. Most importantly, these studies showed that for the first time, our profession sought to resolve a debate by turning not to clinical opinion but to science. And while there remains a place for osseous surgery today, the Michigan studies represented another step in periodontics moving away from resection toward less invasive and regenerative procedures.

Another study that changed the landscape of periodontics was the Langer and Langer study in 1985 which shattered a long-held principle that denuded root surfaces could not be covered predictably with soft tissue grafts.<sup>8</sup> Although many variations have developed around this landmark paper, the technique remains the gold standard for root coverage and represents the first major advance for periodontists

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**Normal Scientific Progress<sup>1</sup>**

Ultrasonics  
Magnification  
Illumination

**Game Changers**

Implants<sup>27-29</sup>  
Perio-Systemic Link<sup>30-34</sup>

**Megatrends**

Bone Grafts, GTR, and GBR<sup>2,3,9-16</sup>  
Free Autogenous Grafts<sup>4,5</sup>  
Disease Therapy<sup>6,7</sup>  
Connective Tissue Grafts<sup>8</sup>  
Evidence-Based Approach<sup>17,18,20</sup>  
Patient-Reported Outcomes<sup>19</sup>  
Biologics and Tissue Engineering<sup>21-26</sup>

**Wild Cards (what if 10x better?)**

Laser Therapy  
3-D Printing  
Guided Surgery/Robotics  
Local Delivery  
Host Modulation<sup>42,43</sup>  
Salivary Diagnostics  
Genetic Testing/Risk Factor Analysis  
Non/Minimally Invasive Therapy  
Live Cell-Based Therapy

**Figure 1.**

*Normal scientific progress, megatrends, game changers, and wild cards that have shaped clinical periodontics.*

into the field of oral plastic surgery. This seems to be an area ripe for innovations in the years ahead.

The mid-1980s also brought other clinical innovations that forever changed the practice of periodontics. Gerry Bowers performed seminal studies using allografts in periodontal defects during this time.<sup>9</sup> The principles of guided tissue regeneration (GTR) were also elucidated in Scandinavia,<sup>10-12</sup> while the clinical procedure was developed and refined by US clinicians including John Prichard, Bill and Burt Becker, Bob Schallhorn, Jim Mellonig, and others.<sup>13</sup> Many of these techniques combined membranes with bone grafts to achieve optimal results. Although GTR was technique sensitive and wrought with postoperative complications, it provided for the first time a regenerative possibility to clinicians. The excitement around this technique continued to move the psyche of the profession toward making regeneration predictable and begat many other studies with various membranes and indications. GTR was frequently used for regenerative procedures around teeth well into the 1990s but developed its greatest value when it led to guided bone regenerative procedures (GBR) for implants, through works starting with a case series by Lazzara and carried on by Dahlin and Buser.<sup>14-16</sup> The impossible (regeneration) became

not only possible but predictable, and as a result, dramatically increased indications and improved outcomes for implants.

In the late 1980s, another event helped chart the course for clinical practice when the specialty brought the evidence-based (EB) approach from medicine to dentistry. Periodontists were natural champions for EB since they had been taught in their residencies to ask why and demand evidence for treatment decisions long before EB became popular. The authors here entered practice in the 1970s under the basic tenet that periodontal therapy was effective only if patients stayed on rigorous maintenance intervals. We were also taught to develop a prognosis for our patients and their teeth based on a set of commonly taught clinical parameters. Surprisingly, no one had ever looked to see how well patients complied with recall

intervals or whether the assignment of a prognosis was effective. Using an EB approach, we challenged this assumption and found that both of these basic periodontal principles were flawed.<sup>17,18</sup> Subsequently, we were introduced to the hierarchy of evidence and invited to apply this concept more systematically to clinical practice. This evidence-based approach was first introduced to the profession through a series of workshops, culminating in a symposium on the evidence-based approach to regenerative treatments around teeth and implants. This symposium included a special section on patient-related outcomes, which had been largely overlooked up to that point.<sup>19,20</sup> The EB approach combined the best available evidence with the practitioner's clinical experience and the patient's values and expectations to determine the optimal treatment alternative. This approach continues to guide treatment decisions today.

Biologics began to push out GTR as the periodontal regenerative treatment of choice by the mid-1990s. Enamel matrix derivative (EMD) was the first biologic in dentistry approved by the US Food and Drug Administration.<sup>21,22</sup> In the late 1980s, clinicians began learning about the efficacy of recombinant human platelet-derived growth factor (rhPDGF) as an effective regenerative molecule.<sup>23-25</sup> Both rhPDGF

and EMD have remained the biologics of choice for most clinicians when attempting regeneration around teeth. Finally, the uniquely inductive bone factor BMP-2 (bone morphogenetic protein-2) was added to the arsenal of bone-stimulating cytokines.<sup>26</sup>

### GAME CHANGERS

Technological change in practice is usually incremental. Small technological steps often build on previous steps, all promising more effective treatment. In rare instances transformational changes occur, and they can have profound effects on the way we treat patients. The continued growth of our profession depends on our ability to recognize these “game changers” and use them to our patients’ advantage. Contemporary periodontics has benefited from at least two of these transformational changes. The first was the popularization of implant dentistry. When we began our practices in the 1970s, we did not know much about implants, and what we did know was discouraging. This paradigm shifted almost instantaneously (as paradigms often do) with Brånemark’s seminal studies in the mid-1980s, and periodontics was forever changed.<sup>27-29</sup> Indeed, this shift was so dramatic that some feel it has threatened the profession, with many clinicians practicing more like implantologists than “true” periodontists. No doubt implants have been important for periodontal practice and have improved the quality of life for many of our patients. However, as the rest of dentistry moves into implants, we may not be able to depend on implants to differentiate our specialty in the future, at least not in the same way that it has in the past. It seems that the time is right to reclaim traditional periodontics — the maintenance of natural teeth in health, comfort, and function for a lifetime. This is a goal that no one is better positioned to reach than us. And seemingly, just in time, comes another “game changer”: the perio-systemic link.<sup>30-34</sup> This transformational change has the potential to alter the clinical practice of periodontics just as profoundly as implants have in the past. The broader field of medicine — along with the general public — is gaining a better understanding of the importance of periodontal health and the negative consequences of chronic inflammation on general systemic health. This knowledge (fueled by an even larger game changer, the internet!) is making it easier for us to convince our patients to accept our treatment plans, and we are seeing more collaboration with our medical colleagues. More collaboration may also mean more competition with other dental specialties concerning who is the “go-to” source for oral health knowledge in the medical world. As medicine shifts from a focus on treating disease to maintaining health — and as the underlying molecular pathways affecting inflammation and supporting health are better understood —

periodontists are in the ideal position among dental specialists to provide this link.<sup>35-38</sup> Already the specialty is recognized as one of the leaders in personalized medicine with some of the only data linking a genetic marker (interleukin-1) and other risk factors to long-term health outcomes (in this case tooth loss, with the goal of maintaining teeth for a lifetime).<sup>39</sup> It is possible that “personalized periodontal therapy” may be the next game changer in clinical practice. On top of that, new reports from the US Centers for Disease Control and Prevention state that the surveillance systems in the National Health and Nutrition Examination Survey studies may have drastically underreported the number of people in the US with moderate to severe periodontitis. New data suggest that the prevalence of periodontitis could be three times as great as was reported, i.e., affecting nearly half of the US adult population over the age of 30.<sup>40</sup> Focusing our practices on health, esthetics, function, and overall well-being and not just on treating disease should do for the specialty of periodontics in the future what implants have done in the past.

### WILD CARDS

Andy Grove, the former chief executive officer of Intel Corporation, applies what he calls the “silver bullet test” when confronted with new technology or ideas.<sup>41</sup> Important new changes are rarely adopted in their first version (think about how implants have transitioned from a fringe therapy to standard of care), so Grove suggests that we separate the quality of the first version from the long-term potential of the innovation. Our ability to identify these emerging trends is essential for discovering tomorrow’s opportunities for our practices. Seeing how the literature of the last 100 years has shaped clinical practice, we know the literature we are reading today and in the future will shape tomorrow’s practices. In applying the silver bullet test, Grove says we should ask ourselves “If the innovation we are considering were 10 times greater than reported, would we find it exciting, or perhaps even threatening?”<sup>41</sup> If not, it is unlikely this development will have a high impact on practice, but if so, then this is an innovation we need to keep our eyes on. Think about it. Even though the following have not been overly exciting in their first iteration, what if they were 10 times better: lasers, guided surgery/robotics, local delivery, host modulation,<sup>42,43</sup> 3-D printing, salivary diagnostics, live cell therapies, minimally invasive techniques, and many more.

Clearly these are exciting times!

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