

# Orthodontics in 3 millennia. Chapter 11: The golden age of orthodontics

**Norman Wahl**

*Sequim, Wash*

For orthodontists, the post-World War II era was characterized by the introduction of fluoridation, sit-down dentistry, and an upswing in extractions. Postwar prosperity, the baby boom, and increased enlightenment of parents contributed to what was later called the “golden age of orthodontics.” The subsequent clamor for more orthodontists led to a proliferation of graduate departments and inauguration of the AAO Preceptorship Program. There was also an increase in mixed-dentition treatment, requiring improved methods of analyzing arch lengths. (*Am J Orthod Dentofacial Orthop* 2006;130:549-53)

**W**ith the end of World War II, researchers were able to devote their full energies to nonmilitary uses. In 1949, medical investigators added a potent weapon to their arsenal of anti-inflammatory drugs: cortisone. In the early 1950s, Jonas Salk developed the first polio vaccine, about the same time that the mystery of DNA was decoded.

The era of fluoridation began in 1945 when 2 municipalities (Grand Rapids, Mich, and Newburgh, NY) added sodium fluoride to their public water systems. About 10 years later, when the California Dental Association pushed through a statewide fluoridation plan, publisher William Randolph Hearst hailed the event with the editorial: “Hats off to a bunch of dentists who would assess themselves \$18 a year to put themselves out of business.”<sup>1</sup> The implications for orthodontists were yet to be realized. In 1957, John Borden introduced the high-speed Airotor (Timken, Keene, NH), opening the door to production dentistry. Four-handed, sit-down dentistry, with the fully reclining chair (1960s), deleted forever the age-old image of the clinician “bent upon” his task and brought blessed relief to our backs.

By midcentury, university graduate orthodontic departments had proliferated. There were approximately 1500 orthodontic specialists in the United States. Delegation was almost nonexistent, appliances were largely handmade by the clinician, and diagnosis was based on Angle’s classification. After the dampening effect of the Great Depression and World War II on the demand for our services, the orthodontic specialty took off.

Orthodontists found themselves in what is now called the “golden age of orthodontics.” The baby boom was in full swing; clinicians could practice without government interference; they could set their own fees; and they answered to no one except themselves, their patients, and their ethics committees. Dental insurance was coming into play, creating a source of new patients. Demand was also influenced by the public’s increased valuation of health and beauty, and by third-party insurance and managed care.

Orthodontists practicing at midcentury welcomed the first practical cephalometric analysis, the reintroduction of the facebow, the “sutural theory” of bone growth, laminagraphy, the Bimler, the bionator, and twin brackets. Still, many issues remained unresolved.

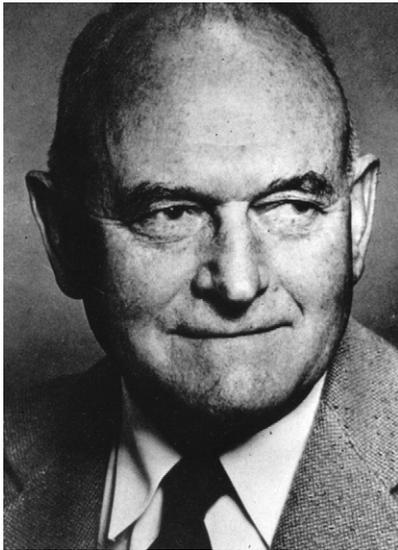
## **Orthodontic education**

By the mid 1940s, 18 university dental schools were offering graduate and postgraduate courses varying in length from 8 to 14 months. The so-called short courses offered by commercial and proprietary schools forced the Council on Dental Education of the American Association of Orthodontists (AAO) to reevaluate orthodontic training, proposing a new plan—a full-time course of instruction that would be equivalent to 2 years of academic time. This plan was approved by the education committee of the American Dental Association in 1963.<sup>2</sup>

From about 1950 to 1970, the specialty of orthodontics was bathed in prosperity. The postwar baby boom that had started in 1946 was in full swing. Between 1954 and 1957 (the peak year), more than 4 million babies were born each year in the United States.<sup>3</sup> And since there still were relatively few practitioners, most of them had waiting lists. It was thought, therefore, that immediate attention should be given to expanding the number of orthodontists and introducing

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**Fig 1.** George W. Hahn guided AAO Preceptorship Program throughout its lifetime.

new methods to increase their capacity to treat more patients.<sup>4</sup>

The AAO could not direct universities to develop graduate orthodontic programs, so it developed its own alternative: preceptor training. The American Dental Association's Council on Dental Education had previously rejected preceptor-based education, but in 1950 the American Board of Orthodontics successfully defended before the council the usefulness and validity of careful, rigorous preceptorship training as an alternative to university-based education.

#### **AAO Preceptorship Program**

The main objective of the preceptorship program was to provide a sound foundation in clinical orthodontics and to produce competent orthodontists eligible to apply for AAO membership and American Board of Orthodontics certification. Moreover, the arrangement would allow orthodontists to train in underserved areas far from dental schools.<sup>5</sup>

George W. Hahn (1894-1977, Fig 1), whose qualifications included leadership of another controversial program (Curriculum II), was the natural choice to head the preceptorship program, a supervised one in which a dentist (preceptee) would be trained at the office of an approved orthodontist (preceptor), who would be responsible for the 3-year training period. Preceptors also followed rigorous protocols for teaching. The program started in 1958 and ended in 1970. It received wide attention because of its controversial nature, but 266 dentists were approved from the 12-year program.<sup>2</sup>



**Fig 2.** Canadian George W. Grieve was 1 of first Angle graduates to advocate extractions.

Furthermore, it helped counteract the accusation that the AAO was limiting the supply of trained orthodontists.

#### **THE GOLDEN AGE OF EXTRACTIONS Upswing**

By the 1930s, the relatively common extraction practices of the late 19th century, dictated largely by technique limitations, had given way to Angle's non-extraction dogma. Although a more tempered position continued to be held by Case and others, the word "extraction" had become all but unmentionable. Thus, when it was mentioned in the literature, it was frequently described euphemistically as "reduction in the total number of dental units."<sup>6</sup>

According to Lischer, "The extraction of 1 or more permanent teeth to facilitate an orthodontic treatment dates back at least to Fauchard (1728), and has been resorted to ever since. . . . The narrow, orthodox view that extraction of a tooth is never justified is being discarded. . . . The profile of a growing child must never be regarded as a fixed line, but one in which further changes will continue to take place."<sup>7</sup> As early as 1920, George W. Grieve (1870-1950, Angle School, 1907; Fig 2), considered the dean of Canadian orthodontists, recommended the removal of permanent teeth.<sup>8</sup> However, the increase in extractions that took place in the mid 1940s was due, in large part, to the influence of Charles Tweed, whose teachings had become widely accepted. He advocated positioning the mandibular incisors upright over basal bone (appxi-

mately 90° to the mandibular plane angle) and argued that expansion of dental units off this bone led to instability. Extractions in the permanent dentition rapidly became the most common treatment strategy for the correction of Class I and II malocclusions, and, as Allan Brodie ruefully remarked, “soon the air was filled with bicuspid.” The prevalence of extractions soared from a modest 30% in 1953 to 76% in 1968.<sup>9</sup>

Tweed did not extract indiscriminately, but, in too many patients, practitioners looked on the removal of 4 premolars as the easy way out of an arch-length problem. Conservative leaders, although acknowledging that extraction had its place, were reluctant to endorse it publicly, out of fear that it would lead to abuses. Brodie, who became Angle’s torchbearer, said, “If I say it’s OK to extract, the first thing you know, everybody’s going to be extracting instead of making a proper diagnosis. Doctor Angle told me that and it’s true.”<sup>10</sup>

### Downswing

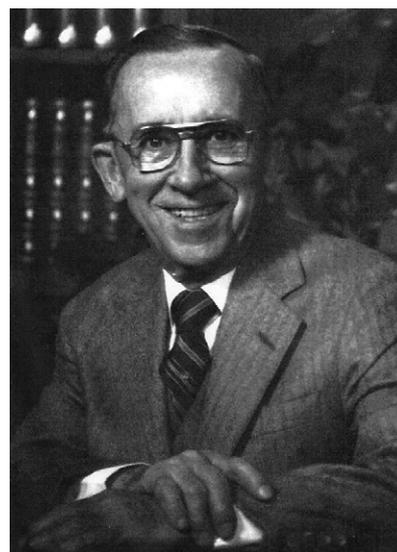
By the 1980s, the pendulum had swung back toward nonextraction as orthodontists began using new appliances and technologies to increase arch length and width, making it easier to treat crowded dentitions without extractions.<sup>11</sup>

Several other factors were responsible for this shift, including some negative ones.

- Relapses (including the return of rotations and overbite) and the reopening of extraction spaces.
- Gingival depressions at extraction sites.
- The finding that extraction is no guarantee of stability.
- Flattened lips—“aged” look. The general public often prefers fuller and more prominent lips.<sup>12</sup> Abraham Goldstein studied patients 21 years after retention and found that nonextraction patients looked better.<sup>13</sup>
- Lack of incisor prominence.
- Narrowed maxillary arch.
- Desire to avoid extended treatment.
- The increased fear of malpractice litigation.<sup>7</sup> In the 1980s, claims were made that temporomandibular disorder problems could be attributed to the removal of maxillary premolars.

But there were also some positive factors.

- Increased use of extraoral traction and functional appliances to take advantage of growth.
- More arch length gained by the use of bonded brackets.
- Better understanding of retention.



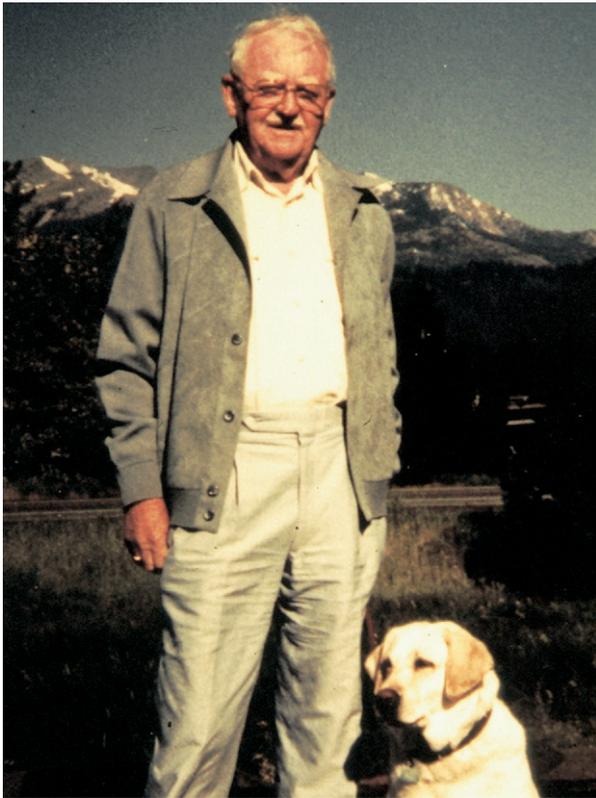
**Fig 3.** Neck gear of Silas J. Kloehn was contributing factor in expanding interest in mixed-dentition treatment.

- Reproximation (eg, air-rotor stripping, “slenderizing”).
- Increased use of removable appliances (which rely mainly on a full complement of teeth).
- Revival of “arch development”<sup>14</sup> (lateral expansion, rotation or distalization of molars, and controlled proclination of mandibular incisors).

By 1993, the prevalence of extraction had returned to 1950s levels (28%). Proffit and Fields<sup>12</sup> believe that nonextraction is once again being carried to an extreme.

### Arch-length analyses

In the 1950s, to a considerable extent a result of Silas J. Kloehn’s (1902-85, Fig 3) revival of cervical traction and Nance’s arch-length analysis, there was increased interest in mixed-dentition treatment and serial extraction. Perceiving a need for improvement in mixed-dentition tooth-size measurement, Hixon and Oldfather<sup>15</sup> in 1958 developed an analysis based on the widths of the mandibular permanent incisors and the x-ray measurements of the unerupted canines and premolars, using a 16-in cone. This contribution proved to be the most popular of its kind to date; however, it was later revised because it was learned that this analysis often underpredicted the widths of unerupted teeth.<sup>16</sup> Moyers’ analysis (1973), based on linear regression equations and the widths of the mandibular incisors, achieved widespread clinical acceptance because of its simplicity and ease of application.<sup>17</sup> Offering insight into why some occlusions did not “fit,”

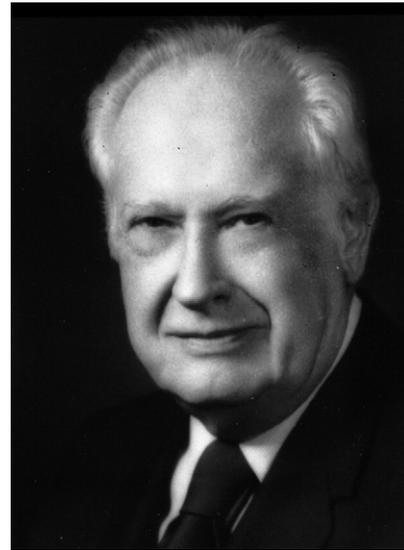


**Fig 4.** One of “Clu” Carey’s many innovations was introduction of second-premolar extraction procedures.

Wayne Bolton<sup>18</sup> devised an analysis based on average measurements to determine tooth-size discrepancies between the maxillary and mandibular arches. This analysis made it possible to determine whether the maxillary or the mandibular teeth (commonly, the 6 anterior teeth) have deficient or excessive mesiodistal diameters. His analysis immediately became a standard part of the complete diagnostic analysis of malocclusion, although, in 2000, Smith et al,<sup>19</sup> examining the validity of Bolton’s ratios for various ethnic groups, concluded that the ratios apply only to white women and should not be used arbitrarily for white men, Hispanics, or blacks. Peck and Peck,<sup>20</sup> believing that tooth shape (rather than tooth width) might be a factor in determining whether crowding of the mandibular incisors would occur, devised an index based on the ratio between the mesiodistal and faciolingual widths. With this and Bolton’s ratios, it became possible to determine the need for reproximation. In extreme cases, a mandibular incisor might require extraction.

#### Second premolar extraction

A borderline patient presents the dilemma of extracting first premolars when the amount of crowding



**Fig 5.** “Tod” Dewel was teacher, *American Journal of Orthodontics* editor, historian, and leading advocate of serial extraction and second-premolar extraction.

does not warrant the 14 or 15 mm per arch thus gained, or the alternative of nonextraction, which might be equally undesirable for reasons of esthetics or stability. For this patient, we wish we could extract half a tooth in each quadrant. The idea of extracting teeth other than the first premolars must have occurred to early clinicians, and some might very well have done so. Surely, many had to deal with congenitally missing second premolars. But it was well into the 20th century before it is mentioned the literature. One of the first authors to spell it out was Clarence W. (Clu) Carey (1904-2003, Fig 4).<sup>21</sup> Carey was an innovator whose many contributions to orthodontics include laminated arches, the Bi-Po toothbrush, and the tooth-size dental calculator. He was nevertheless more cautious when he advocated (1947) extracting 4 second premolars if the discrepancy is more than 2.5 mm and if the operator is willing to accept a compromised result. In 1949, Nance spoke of removing the second rather than the first premolars to keep the incisors over basal bone.<sup>22</sup> Perhaps the most definitive description of second-premolar extraction procedures during those years was written by B. F. (Tod) Dewel (1902-99, Fig 5),<sup>23</sup> who emphasized that closure of extraction spaces requires “a delicate balance . . . between anterior anchorage and posterior resistance.” He reminded us that “extraction of second premolars decreases by 2 teeth the resistance the buccal segments present when the spaces are being closed.” In 1964, Ricketts (1920-2003)<sup>24</sup> advocated placing the mandibular incisors within 1 standard deviation of the Point

A-pogonion plane. That same year, Schoppe<sup>25</sup> suggested that a discrepancy of 7.5 mm or less should be the criterion for considering second premolar removal, if there is no need for incisor retraction. He offered these advantages for the option:

- Permits more rapid mesial movement of molars.
- Permits less lingual movement of incisors.
- Is probably the best means of gaining space when a minimum of space is necessary.
- Tends to alter the profile less.
- Tends to hasten closure of the extraction space.

Reminiscent of Tweed's "100 cases," Logan<sup>26</sup> showed 100 case records of patients treated with second-premolar extractions at the 1970 annual Pacific Coast Society of Orthodontists' meeting. In a 1973 article, he listed these advantages of second-premolar extraction, over and above those proffered by Schoppe.

- Eliminates problems of rotated, tipped, or late-erupting second premolars.
- Facilitates closure of anterior open bite by reducing posterior vertical dimension.
- Eliminates need to bond mandibular second premolars, which are less-than-ideal candidates for bonding.
- Gains additional space for second and third molars.
- Makes it easier to control rotations, axial inclinations, and anterior torque.
- Requires less Class II elastic force and headgear.
- Produces fewer end-to-end bites because of the comparative widths of maxillary and mandibular premolars.
- Maintains the maxillary first premolar, which is usually stronger than the second premolar.

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