

Orthodontics in 3 millennia. Chapter 1: Antiquity to the mid-19th century

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Orthodontics had its beginnings in the time of the ancient Egyptians, who used crude metal bands and catgut, but it was not until the late 18th century that the first practical appliances came into use. These were fine-tuned during the early 1900s; today's mechanisms are merely refinements. Major changes occurred when practitioners—originally physicians—began turning their attention from cosmetic “regulating” to occlusion and stability, while empiricism gave way to objectivity and the scientific method. The purpose of this article is to review the history of orthodontics from antiquity to the modern era. The article is divided into chapters that will be presented serially in every other issue of the *Journal*. (*Am J Orthod Dentofacial Orthop* 2005;127:255-9)

Ever since Eve flashed Adam her first grin, we have been concerned about our smiles. However, it would be another 100 millennia¹ before we could do anything about it. Although the smile was the first goal for early “regulators,” it was occlusion that gave orthodontics its scientific foundation. Now it appears that facial esthetics is again in the forefront as we realize why patients come to us in the first place.

From evidence found in human skulls, crooked teeth have been around since the time of Neanderthal man (about 50,000 BC), but it was not until about 3000 years ago that we had the first written record of attempts to correct crowded or protruding teeth.² Long before braces, long before the word “orthodontics” was coined, it was known that teeth moved in response to pressure. Primitive (and surprisingly well-designed) orthodontic appliances have been found with Greek and Etruscan artifacts.³ Archaeologists have discovered Egyptian mummies with crude metal bands wrapped around individual teeth. It is speculated that catgut was used to close the gaps.⁴

ORTHODONTICS IN GREECE AND ROME

The earliest description of irregularities of the teeth was given about 400 BC by Hippocrates (ca 460-377 BC). The first treatment of an irregular tooth was recorded by Celsus (25 BC-AD 50), a Roman writer, who said, “If a second tooth should happen to grow in children before the first has fallen out, that which ought

to be shed is to be drawn out and the new one daily pushed toward its place by means of the finger until it arrives at its just proportion.” That might still be good advice, but kids today do not need ancient history to tell them how to goad a high canine into place.

Probably the first mechanical treatment was advocated by Pliny the Elder (AD 23-79), who suggested filing elongated teeth to bring them into proper alignment. This method remained in practice until the 1800s.⁵

MIDDLE AGES (5TH TO 15TH CENTURIES) TO THE 18TH CENTURY

Progress during the Middle Ages was nil. Dentistry entered a period of marked decline, as did all sciences. After the 16th century, considerable progress was made, although little was written of orthodontics during this period. In France, students of dentistry were admitted to a university as early as 1580. The first mention of practicing dentistry exclusively was made by Pierre Dionis (1658-1718). He called dentists “operators for the teeth” and stated that they could also “open or widen the teeth when they are set too close together.”

Matthaeus Gottfried Purmann (1692) was the first to report taking wax impressions. In 1756, Phillip Pfaff used plaster of Paris impressions.⁶

Malocclusions were called “irregularities” of the teeth, and their correction was termed “regulating.” It remained for the Enlightenment to reawaken the spirit of scientific thought necessary to advance dentistry and other disciplines.

Beginning in the 18th century, the leading country in the field of dentistry was France. This was due, in large measure, to the efforts of 1 man: Pierre Fauchard (1678-1761; **Fig 1**) has been called the “Father of

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Submitted, October 2004; revised and accepted, November 2004.

0889-5406/\$30.00

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doi:10.1016/j.ajodo.2004.11.013



Fig 1. Pierre Fauchard.

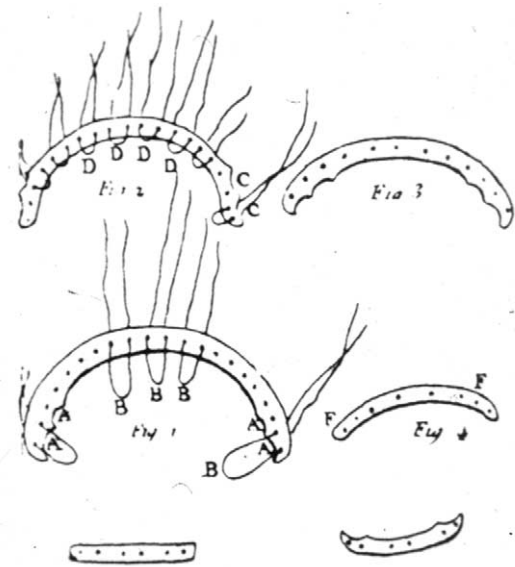


Fig 3. Fauchard's bandeau refined.

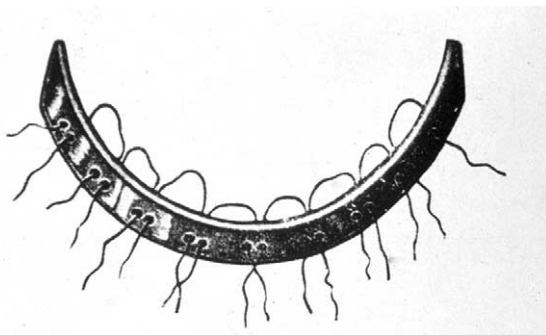


Fig 2. Fauchard's bandeau.

Orthodontia." He was the first to remove dentistry from the bonds of empiricism and put it on a scientific foundation. In 1728, he published the first general work on dentistry, a 2-volume opus entitled *The Surgeon Dentist: A Treatise on the Teeth*.

Fauchard described, but probably was not the first to use, the *bandeau*, an expansion arch consisting of a horseshoe-shaped strip of precious metal to which the teeth were ligated (Fig 2). This became the basis for Angle's E-arch, and even today its principles are used in unraveling a crowded dentition. He also "repositioned" teeth with a forceps, called a "pelican" because of its resemblance to the beak of that bird, and ligated the tooth to its neighbors until healing took place. At that time, little attention was paid to anything other than the alignment of teeth and then almost exclusively to the maxilla.⁷

Fauchard's bandeau was refined (Fig 3) by Etienne Bourdet (1722-1789), dentist to the king of France. His was the first record of recommending serial extraction (1757) and of extracting premolars to relieve crowding. He was also the first to practice "lingual orthodontics," expanding the arch from the lingual. There followed a long line of lingual appliances, including the jack-screw, the expansion plate, and, closer to our time, the lingual arch.

Although he was not a dentist, John Hunter (1728-1793; Fig 4) made the greatest advances in dentistry of his time. An English anatomist and surgeon, Hunter took a particular interest in the anatomy of the teeth and jaws. His text, *The Natural History of the Human Teeth* (1771), presented the first clear statement of orthopedic principles. He was the first to describe normal occlusion to attempt to classify the teeth. He established the difference between teeth and bone and gave the teeth names like *cuspidati* and *bicuspidati*.⁸ He was the first to describe the growth of the jaws, not as a hypothesis, but as a sound, scientific investigation. His findings have never been successfully challenged.⁹

EUROPEAN PIONEERS OF THE EARLY 19TH CENTURY

Joseph Fox (1776-1816), a student of Hunter, was another Englishman who made notable contributions to the budding science of orthodontics. He devoted 4 chapters of his book, *The Natural History and Diseases of the Human Teeth* (1814), to that topic. The first to

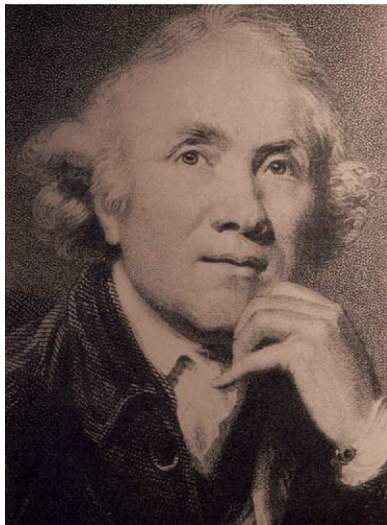


Fig 4. John Hunter.

classify malocclusion (1803), he was also one of the first to observe that the mandible grows mainly by distal extension beyond the molars, with little or no increase in the anterior region. According to Weinberger,² Fox “was the first to give explicit directions for correcting the irregularities” of teeth. He was particularly interested in the judicious removal of deciduous teeth, treatment timing, and the use of bite blocks to open the bite. His other appliances included an expansion arch and a chincup (about 1802).

Joachim Lefoulon, a Frenchman, is probably best known for having given the science a name: *orthodontosie* (1841), which roughly translates into *orthodontia*. He was also the first to combine a labial arch with a lingual arch. In the area of etiology, he arrived at factors of an entirely different character from those of most authorities. These were based on biologic phenomena controlling the growth, form, and dimension of organs and tissues.²

Christophe-François Delabarre (1787-1862; French) introduced the crib and the principle of the lever and the screw (1815). He separated crowded teeth by means of swelling threads or wooden wedges placed between them.

J. M. Alexis Schange (1807-?, French) in 1841 published the first work confined to orthodontics. He introduced a modification of the screw, the clamp band, and, in 1842, 3 years after the vulcanization process had been developed, rubber bands (actually, sections of rubber tubing). He also coined the term *anchorage*.

Friedrich Christoph Kneisel (1797-1847, German), was the dentist to Prince Charles of Prussia. He was the first to use plaster models to record malocclusion

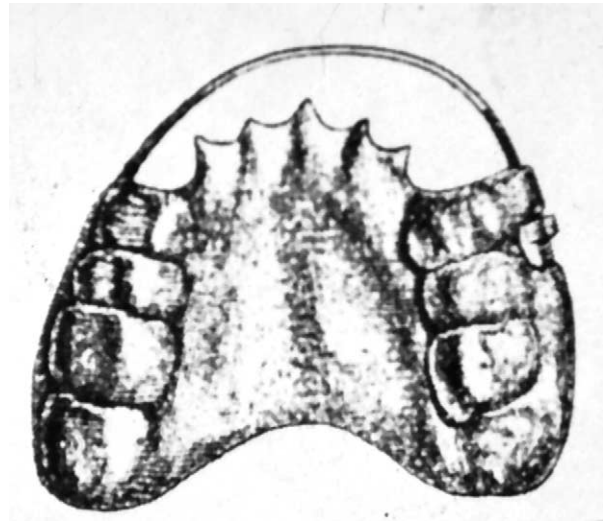


Fig 5. Removable “plate” used by Friedrich Christoph Kneisel and John Tomes.

(1836). That same year, when he fitted his prognathic patient with a chin strap, he became the first to use a removable appliance. Kneisel wrote the first French and German treatises devoted exclusively to orthodontics. He and John Tomes (1812-1895, English) used various removables (Fig 5). Tomes was also first to demonstrate bone resorption and apposition.²

AMERICAN PIONEERS OF THE EARLY 19TH CENTURY

Before the time of Edward Angle and Calvin Case, the treatment of malocclusions was chaotic, with little understanding of normal occlusion and even less understanding of the development of the dentition. Appliances were primitive, not only in design but also in the metals and materials used. There was no rational basis for diagnosis and case analysis.¹⁰

In the United States before the 1830s, there was no dental degree. All work in the mouth was done by physicians, barbers, or charlatans, and there were no such terms as *orthodontics* and *malocclusion*. There were no contributions of value to the specialty by American authors—in fact, orthodontics had little literature until 1880.

However, during approximately the fourth decade of that century, most of these voids began to be filled, as this country gained the commanding position in dentistry. In 1834, the first American dental association, the Society of Surgeon Dentists of the City and State of New York, was founded. In later decades, Americans invented vulcanite and other dental materials, pioneered the electric drill, and discovered anesthesia.



Fig 6. Chapin A. Harris.

As early as 1797, Josiah Flagg (1763-1816) of Boston advertised that he “regulates teeth from their first teeth, to prevent pain and fevers in children, assist nature in the extension of the jaw, for a beautiful arrangement of a second set of teeth.” Philadelphia dentist Leonard Koecker (1728-1850) offered to supply ligatures “to teeth of an irregular position” and was an advocate of early treatment, stating that “if placed under proper care at an early age, the greater portion of the teeth of the permanent set may invariably be preserved to perfect health and regularity,” and that if first molars “be extracted at any period before the age of twelve years, all the anterior teeth will grow more or less backwards and the second and third molars . . . fill up the vacant space.”²

J. S. Gunnell invented occipital anchorage in 1822, beginning orthodontists’ 180-year struggle to get their patients to wear headgears.

In 1839, the first dental journal, the *American Journal of Dental Science*, was established through the efforts of Solyman Brown (1790-1876), who wrote the first patient-education material (“Importance of Regulating the Teeth of Children”); Levi S. Parmly (1790-1859), founder of a dental dynasty; and Chapin A. Harris (1806-1860; Fig 6), who edited the journal from 1839 to 1858. Harris was also instrumental, with Horace H. Hayden (1769-1844), in founding the first school of dentistry that year at the University of Maryland, where he gave the first lectures on “irregularities of the teeth.”¹¹ In 1840, he published the first modern classic book on dentistry, *The Dental Art*. His innovations included the use of gold caps on molars to open the bite and knobs soldered to a band for tooth rotations.

The invention of vulcanite by Charles Goodyear in 1839 greatly reduced the cost and weight of dental plates and other appliances. Made by adding sulfur to rubber, vulcanite could be used to make dentures by heating the mixture in a mold. The first attempts to commercialize the new material were not practical because it softened when heated and was partially soluble in water. When Goodyear accidentally discovered “sulfur cross-linking,” rubber became a workable material.¹²

E. G. Tucker, one of the first to use this new material in his appliances, was the first American to use rubber bands (1846). In 1852, the first national dental association in this country (the American Society of Dental Surgeons, 1840), formed a committee on dental irregularities. In the first report given by Tucker, he condemned the practice of early extraction of deciduous teeth.⁵

EARLY CONCEPTS OF ETIOLOGY

Along with attempts to regulate crooked or protruding teeth came efforts to determine how they got that way. Although some fanciful causes were put forth to explain malocclusion, they were surprisingly well grounded. By the middle of the 19th century, almost all of the pressure habits, including those of the tongue and lips, had been advanced, and some practitioners were talking about congenital and hereditary factors, dietary deficiencies, diseases (both physical and mental), and supernumerary teeth. A few even mentioned growth.¹³

Overbite was believed to be due to mouth breathing, and underbite was thought to stem from persistent thrusting of the jaw, imitation, breathing difficulties, and finger habits. Only a few considered it hereditary. Lefoulon, one of the keenest observers of his time, offered (1841) these factors: (1) constitutional differences brought about by social, economic, and geographic conditions; (2) prenatal conditions; (3) a disease process, such as scrofula; and (4) abnormal pressures during speech.²

During the next century, other authors offered their pet theories for malocclusion:

- Kingsley considered it a result of interracial mixture.
- Case’s theory was that a child inherited the maxilla from 1 parent and the mandible from the other.
- Talbot thought that endocrine glands were a possible cause.
- Angle recognized the importance of rhinology by 1904.
- Rogers suggested myofunctional causes (pernicious tongue and lip habits) (1918).
- Brash supported the theory of inheritance (1929).

- Case showed remarkable foresight in differentiating between “dental malposition” and “dentofacial imperfections,” comparable to today’s terms, *dentoalveolar* and *skeletal*.¹⁰

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