REVIEW PAPERS

The Evolution of Dentistry: From Ancient Practices to Modern Science – insight into selected aspects

Ewolucja stomatologii: od starożytnych praktyk do współczesnej nauki – wybrane aspekty

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KEYWORDS:

- history of dentistry
- dentistry
- dentist
- dental treatment

ABSTRACT

The history of dentistry as a branch of modern medicine dates back a long time. Recently, numerous studies have appeared on the influence of diseases of the oral cavity, teeth, and periodontal tissues on the occurrence and clinical course of other diseases, including systemic diseases. According to the authors of the present study, a reminder in summary form of the history of dentistry is important for the general knowledge and further development of dentistry.

SŁOWA KLUCZOWE:

- historia stomatologii
- stomatologia
- dentysta
- leczenie stomatologiczne

STRESZCZENIE

Dzieje stomatologii jako dziedziny współczesnej medycyny sięgają bardzo odległych czasów. W ostatnim okresie pojawiają się liczne badanie dotyczące wpływu chorób jamy ustnej, zębów, a także tkanek przyzębia na występowanie i przebieg kliniczny innych chorób, w tym ogólnoustrojowych. W tej sytuacji, według autorów niniejszego opracowania, przypomnienie w skrótowej formie historii stomatologii ma istotne znaczenie dla ogólnej wiedzy i dalszego rozwoju stomatologii.

Introduction

Dentistry has a long and fascinating history as a field of science and art. Its origins date back to prehistoric times. Initially, dentistry involved very simple, basic procedures, but over time, it evolved and developed into more specialized treatments related to the care of teeth, gums, tongue, mucous membranes, and other tissues of the oral cavity, as well as adjacent structures, including the temporomandibular joint in humans (1).

The oldest case of dental treatment was found in a 4,000--year-old skeleton of a young man discovered in the Italian Dolomites. On a molar with a significant cavity, traces of scraping with a sharp tool for removing decay were preserved. Another prehistoric archaeological find indicating the existence of this field of science are skulls from 9,000--7,500 years ago, with teeth showing signs of cavity treatment and fillings, found in Mehrgarh, Pakistan (2). The site at Mehrgarh suggests that this earliest form of dentistry involved the treatment of dental conditions, possibly using bow drills by skilled artisans working with beads (2). The earliest dental fillings of beeswax were discovered in Slovenia and dated around 6,500 years ago (2).

Dentistry in Antiquity

The development of dentistry paralleled the growth of civilizations, with significant progress seen in ancient Egypt. Medicine, including dentistry, was primarily practiced by a priestly caste, and Hesy Re is considered the first recorded dentist. The Ebers Papyrus documented oral diseases and treatments, including remedies for abscesses and gum pain. Archaeological findings reveal early attempts at dental prosthetics using gold wire to attach teeth, sometimes sourced from other individuals. To relieve pain, Egyptians used plant-based anesthetics such as opium and myrrh (4). In ancient China, tooth pain, known as ya-tongy, was classified

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based on its causes. Around 18 herbal remedies were developed, alongside acupuncture, which identified 26 points for tooth pain and six for gum issues, some located far from the mouth (5). The first evidence of dental surgery dates back to Asclepius' time. Celsus Aurelianus described a lead instrument (plumbeumodontagogoon) for extractions. Between 500-300 BCE, Hippocrates and Aristotle wrote about tooth eruption, cavity treatments, gum diseases, and stabilizing loose teeth with wires (3). In 100 BCE, Celsus extensively documented oral hygiene, pain management, and jaw fractures (5). The Etruscans (166-201 CE) pioneered gold crowns and fixed bridges (6). During the Islamic Golden Age, Rhazes advocated for preserving teeth before extraction, using fillings made from mastic and alum to prevent decay. For periodontal pain, he recommended opium, rose oil, and gum scarification (6). In the 8th century, Ali Abbas described periapical lesion treatment using hot needles and chemical cleansers (7). Serapion (10th century) identified tooth roots and advised using opium for cavities, bloodletting for oral pain, and securing loose teeth with gold or silver wire (7). These early advancements laid the foundation for modern dentistry, emphasizing both restorative techniques and pain management.

Dentistry in the Middle Ages

In medieval Europe, barber surgeons carried out dental practice and were responsible for hair cutting and tasks such as tooth extraction and wound treatment (7). In 1210, a barber guild was established in France, which later transformed into a guild of surgeons (1). During the medieval period, common people were treated by barbers and pharmacists, while members of wealthier families sought care from physicians (8). Eventually, barbers transformed into two groups of surgical doctors: surgeons trained and skilled in complex surgical operations and those who performed more routine hygienic procedures, including tooth extractions (9). In 1530, a book titled Artzney Buchlein (Little Medical Book) was published in Germany, marking the first book dedicated to dentistry (6).

The Renaissance and the Birth of Modern Dentistry

The beginnings of specialisation in dentistry emerged during the Renaissance when a division occurred between the professions of surgeons and dental doctors. It is worth dedicating some space to Ambroise Paré, an outstanding French surgeon considered one of the pioneers of surgery and medicine, particularly in the context of war surgery and traumatology. His observations and experiences during military service led to reforms in the treatment of wounds (3). Paré rejected many traditional methods, such as using hot oil for burns, replacing them with more advanced and less invasive techniques. His contributions to the development of medicine were immense, and his work significantly impacted the advancement of surgery and healthcare (3). Paré also conducted a systematic inquiry on methods of anesthesia during surgery, which was an important step in the development of surgery (8). Although he did not invent any anesthetic substances, his systematic inquiry significantly contributed to this field's development (9). He is still widely respected and remembered as one of the greatest surgeons in the history of medicine.

Paré also made a small but somewhat controversial contribution to the development of dentistry, or rather dental surgery. In his work Opera Chirurgica (10), he dedicated considerable space to treating and extracting teeth. He was the first to apply pressure to the tooth socket after tooth extraction. In another of his works, De Generatione Hominis (On Human Generation), in the last chapter, he also describes the procedure for dealing with difficult teething. When treatments aimed at reducing pain and softening the gums do not help, he recommended opening the gums with a knife or lancet in areas where the teeth are emerging, and there is a slight swelling of the gums.

In 1723, French surgeon Pierre Fauchard published "The Surgeon Dentist, A Treatise on Teeth" (Le Chirurgien Dentiste). Fauchard is regarded as the father of modern dentistry. He was the first to describe a comprehensive system of dental practice, including the basic anatomy and function of the oral cavity, surgical and restorative techniques, and the construction of prosthetics (11). In 1746, Claude Mouton described the gold crown and a post to be placed in the root canal. He also recommended using white enamel for gold crowns to achieve a more aesthetic appearance (11). In 1789, the Frenchman Nicolas Dubois de Chemant received the first patent for porcelain teeth (11).

Breakthroughs of the 19th Century

The 19th century saw significant advancements in dentistry. The first dental schools were established, and techniques for treating teeth and the oral cavity began to improve significantly. Local anesthesia was introduced, enhancing patient comfort during procedures (4). Between 1833 and 1850, the Crawcour brothers from France introduced an amalgam-filling material called Royal Mineral Succedaneum (12). In 1839, the American Journal of Dental Science, the first dental journal in the world, began publication (4). The demand for professional educational institutions grew immensely, which led Horace Hayden and Chapin Harris to establish the world's first dental school, the Baltimore College of Dental Surgery, in 1840. They also established the Doctor of Dental Surgery (DDS) degree (11). 1871 James B. Morrison patented the first commercially produced dental engine with a foot pedal. Morrison's affordable, mechanized tool provided dental drills with sufficient speed to smoothly and quickly cut enamel and dentin, revolutionizing dental practice (3). The same year, American George F. Green received a patent for the first electric dental engine, a self-contained motor with a handpiece (12). In 1895, German physicist Wilhelm Roentgen discovered X-ray radiation (3). In 1896, distinguished dentist C. Edmond Kells from New Orleans performed the first dental X-ray of a living person in the United States (3). In 1899, Edward Hartley Angle classified different forms of malocclusion (11). Angle, who is credited with making orthodontics a dental specialty, also established the first orthodontic school (Angle School of Orthodontia in St. Louis, 1900), the first orthodontic association (American Society of Orthodontia, 1901), and the first specialized journal, Dental (11).

In the 19th century, the development of anesthesia had a groundbreaking impact not only on dentistry but also on the entire field of surgery. The introduction of anesthetic agents such as ether and nitrous oxide changed the perception of surgical procedures among both patients and physicians. It shattered the long-standing belief that surgery and pain were inseparable aspects of medical practice. In 1844,

Figure 1. Dental office. Museum of the History of Medicine, Medical University of Białystok.
Source: photo by Janusz Ostrowski.

American dentist Horace Wells was the first to use nitrous oxide as an anesthetic during a tooth extraction. Unfortunately, his attempt was unsuccessful, leading to the abandonment of this method (7, 13). Today, Horace Wells is recognized as one of the pioneers of dental anesthesia, and his discovery marked a significant step toward painless surgical procedures. However, two years later, in 1846, William Morton successfully used ether as an anesthetic during a surgical procedure (4, 13), marking the beginning of modern general anesthesia (Figure 1).This breakthrough allowed for more precise surgical interventions, as surgeons could focus on operative techniques rather than rushing procedures to minimize the patient's suffering (13). This transformation also had a profound impact on medical culture. The reduction of surgical pain increased patients' trust in physicians and contributed to the further development of surgery as a precise medical discipline (13). The invention of procaine by Alfred Einhorn in the 1880s further reinforced this progress, providing more effective and safer anesthesia methods (12, 13). Thus, the 19th century became a pivotal period in which anesthesia not only revolutionized medical practice but also led to a shift in the fundamental ethical and philosophical principles guiding patient care (13).

Dentistry in the 20th Century

The 20th-century dentistry underwent a remarkable evolution, making dental treatments more effective, less painful, and more accessible. Technological advancements and scientific discoveries contributed to improvements in diagnostics, caries treatment, orthodontics, and implantology, as well as enhancing patient comfort. One of the key breakthroughs was the development of modern anesthesia techniques. In 1943, lidocaine was introduced, replacing the previously used cocaine as the primary anesthetic in dentistry (13). Another significant step was the implementation of X-ray technology in dentistry, enabling the detection of caries, periodontal diseases, and inflammatory conditions that were not visible to the naked eye (12). In the second half of the 20th century, modern imaging techniques advanced further, and in the 1980s and 1990s, CBCT (cone beam computed tomography) was introduced, allowing for precise three-dimensional imaging of bone structures (14). Caries treatment in the 20th century became more efficient, mainly due to the development of new filling materials. Traditional amalgams began to be replaced by composite fillings, which were not only more aesthetic but also adhered better to enamel (12). In the 1970s, glass ionomer cements emerged, releasing fluoride and providing additional protection against caries (14). By the end of the 20th century, dental lasers were introduced, enabling painless caries treatment and promoting tissue regeneration (11). Preventive care played a crucial role in combating caries. In the 1940s, water fluoridation was introduced, and in the 1950s, fluoride toothpaste became widely available, significantly reducing caries prevalence (14). Health education and oral hygiene promotion further improved dental health in society (12). Significant advancements were also made in endodontic treatment. Throughout the 20th century, modern rotary instruments were developed, and root canal preparation techniques were improved (14). By the end of the century, surgical microscopes were introduced into endodontics, allowing for precise treatment of even highly complex cases (11). The 20th

century also revolutionized orthodontics and implantology. In the early 1900s, Edward Angle developed the first fixed orthodontic appliance, which laid the foundation for modern teeth straightening methods (12). In the 1950s, research on dental implants began, and a major breakthrough occurred in 1952 when Per-Ingvar Brånemark discovered osseointegration, the ability of titanium to permanently bond with bone (14). This discovery led to the development of modern dental implants, which, since the 1980s, have been widely used as a long-term alternative to dentures and bridges (12).

Modern Dentistry in the 21st Century

Dentistry is developing rapidly, utilising modern technologies and diagnostic and therapeutic methods while improving patient comfort and the aesthetics of treatment (14). Thanks to advancements in medical and pharmaceutical sciences, contemporary dental anesthesia is relatively safe and effective, enabling a variety of procedures to be performed without pain for the patient (11). Modern dentistry also employs advanced technologies such as digital X-rays, computed tomography, 3D scanning, and 3D printing, allowing precise diagnosis and treatment planning (14). Dentistry in the 21st century is also characterized by increasing interdisciplinarity, collaboration with other medical specialists, and a deeper understanding of the impact of oral health on overall health (11). As a result, patients can receive comprehensive dental care that considers their individual needs and expectations (11).

Summary

The history of dentistry reflects humanity's ongoing quest to understand and improve oral health. From rudimentary treatments in prehistoric times to today's sophisticated, technology-driven practices, dentistry has evolved into a complex and vital field of medicine. As we look to the future, integrating advanced technologies and interdisciplinary approaches promises to enhance dental care further, improving patients' oral health and overall well-being worldwide.

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