Accelerated Orthodontics

- **Innovative Approaches to Shorten Treatment Time**
  Innovative Approaches to Shorten Treatment Time The Role of Vibration Devices in Faster Tooth Movement Micro Osteoperforation and Its Effects on Treatment 3D Printing Techniques for Customized Appliances Benefits of Digital Impressions in Modern Orthodontics AI Assisted Treatment Planning for Precise Outcomes Remote Monitoring and Virtual Consultations Incorporating New Tools for Patient Compliance Practical Considerations of Accelerated Techniques Research Trends Shaping Future Orthodontic Practices Combining Traditional Methods With Cutting Edge Solutions Adapting to Technological Shifts in Orthodontic Care
- **Indications for Surgical Alignment of the Jaw**
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The Role of Virtual Surgical Planning in Jaw Corrections

Virtual Surgical Planning (VSP) has become an important tool in the field of jaw correction, significantly increasing the accuracy of surgical planning. This technology allows surgeons to create detailed three-dimensional models from CT or CBCT scans, which are then used to simulate various surgical scenarios. This preoperative visualization enables surgeons to predict outcomes more accurately, ensuring a more precise and stable result for patients undergoing jaw correction.

In the process of VSP, surgeons can virtually segment and reposition osteotomized segments of the jaw, such as the maxilla or mandible, with six degrees of freedom. This allows for precise mobilization in horizontal, vertical, and transverse movements according to the planned surgical movements. Retainers are often needed after braces to maintain alignment **Children's braces treatment** permanent teeth. The ability to visualize interosseous gaps, potential sites for bone grafts, and other anatomical details in 3D space enhances the surgeon's understanding of the patient's anatomy, leading to better surgical outcomes.

VSP also enables surgeons to diagnose and manage potential complications, such as interosseous interference or gaps, before they become issues during surgery. This can significantly reduce surgical morbidity and operation times. For example, in cases of facial deformities like malocclusion, VSP allows for comprehensive evaluation and planning, including the prediction of postoperative asymmetry and the need for dental decompensation.

The use of VSP in jaw correction surgeries, such as orthognathic procedures, has been well-documented and is widely accepted as a mainstream approach. It offers advantages over traditional 2D planning methods by ensuring more accurate and quantitative analysis of deformities. This technology also allows for the creation of patient-specific surgical guides and splints, which are critical for precise surgical execution.

In addition to its benefits in human surgery, VSP is also gaining popularity in veterinary oromaxillofacial surgery, where it is used to improve visualization and understanding of complex anatomical structures. The ability to rehearse surgeries virtually can lead to higher precision and confidence during actual procedures.

Incorating VSP into surgical planning not only enhances accuracy but also allows for better patient education and understanding of the surgical process. However, it requires significant time and financial resources for planning and production of surgical guides and implants. The steep learning curve and need for substantial training are additional challenges that surgeons must consider when integrating VSP into their workflow.

In recent studies, the predictability of soft-tissue outcomes using VSP software has shown varying degrees of accuracy, with better results for cranial parts of the face compared to lower areas. This highlight the need for further refinement in soft-tissue simulation tools.

In total, VSP has become an important tool in jaw correction surgeries by increasing accuracy, precision, and patient safety. It offers a comprehensive approach to surgical planning, which can significantly improve outcomes for patients undergoing complex procedures.

The use of 3D virtual planning in orthodontic-surgical planning has revolutionized the field of jaw correction surgeries. This technology involves a comprehensive process that includes data collection, virtual planning, and the fabrication of surgical guides and splints. By integrating computer-aided design and manufacturing (CAD/CAM) techniques, surgeons and orthodontists can now evaluate anatomical structures with greater precision and predict postoperative results more accurately.

The process of virtual surgical planning (VSP) allows for the precise segmentation and repositioning of maxillary and mandibular segments in three-dimensional space. This is especially important in orthognathic surgery, where the goal is to improve facial alignment and occlusion. By using cone-beam computed tomography (CBCT) and digital dental models, surgeons can visualize the interosseous relationship, segment overlap, and potential sites for bone grafts or reduction. This detailed analysis enables the fabrication of patient-specific cutting guides and splints, which are then used intraoperatively to transfer the planned surgical movements accurately.

VSP also improves communication between surgeons, orthodontists, and patients. It allows for the simulation of various surgical scenarios, which helps in choosing the most appropriate approach for each patient. This technology is especially significant for patients undergoing complex procedures, as it helps in predicting hard and soft tissue changes post-surgery. For kids undergoing orthodontic treatment, this predictive accuracy is even more important, as it helps in planning long-term orthodontic movements and ensuring stable outcomes.

In comparison to traditional planning techniques, VSP provides several advantages. It increases the understanding of patient anatomy, allows for the evaluation of different surgical options, and leads to more precise surgical outcomes. The use of 3D printed guides and splints during surgery also helps in ensuring that the planned movements are executed accurately, which can result in fewer complications and a reduction in operative time.

In recent years, advancements in AI-assisted simulation have enhanced the VSP process by engaging patients more actively in the planning process. This not only improves patient understanding and expectations but also allows for more precise spatial positioning of osteotomized segments during surgery. Overall, the integration of 3D virtual planning in orthodontic-surgical planning has significantly enhanced the accuracy and efficiency of jaw correction surgeries, ensuring better outcomes for patients.

The HealthyStart System

The use of Virtual Surgical Planning (VSP) in jaw correction surgeries has revolutionized the field by significantly improving efficiency and accuracy compared to traditional planning methods. Traditional planning, which has long been based on articulator models, is now being outcomped by the precision and detailed visualization that VSP provides. VSP allows surgeons to design and evaluate surgical scenarios with greater precision, ensuring that the osteotomy plans are individually adapted to each patient's needs.

A significant advantage of VSP is its enhanced visualization and simulation of surgical outcomes. This not only helps in planning more accurate surgical movements but also facilitates better communication between the treatment team, including orthodontists and surgeons. The real time modifications that VSP allows enable the team to review and improve the plan together, even when they are not in the same space. This collaboration is particularly important in orthognathic surgery, where precise alignment of the jaw is necessary to correct facial deformities.

In comparison, traditional planning methods are more time and error-driven. The use of articulator models can lead to inaccuracies during surgery, as these models do not provide the same detailed three-dimensional insight that VSP can. Additionally, VSP enables surgeons to predict potential complications and plan for them in advance, which can significantly reduce operative time and postoperative complications. This is especially important in surgeries where precision is not just a goal

but a must, such as in the correction of dentofacial deformities.

The benefits of VSP also translate into a better treatment experience for patients, including kids. It allows them to understand the surgical process more clearly and visualize the outcomes, which can help manage expectations and reduce preoperative nerves. Overall, VSP has become a standard tool in orthognathic surgery, improving the precision and efficiency of jaw correction surgeries and ensuring more predictable outcomes.

This non-invasive approach targets the natural development of children's teeth and jaw, using soft dental appliances to align teeth and address breathing

issues, reducing the need for more invasive treatments.

Virtual Surgical Planning (VSP) has revolutionized the field of jaw correction surgeries by providing surgeons with the ability to precisely control surgical movements, thereby enhancing the accuracy of the procedure. This technology allows for the detailed analysis and planning of complex surgical interventions, particularly in orthognathic surgery, which involves the correction of facial deformities and malocclusions.

VSP involves the use of three-dimensional imaging and computer-aided design/computer-aided manufacturing (CAD/CAM) techniques to create patient-specific surgical guides and splints. These guides are fabricated using 3D printing technology, which ensures a precise fit to the patient's anatomy. By using these guides, surgeons can accurately translate preoperative plans into intraoperative movements, significantly enhancing the precision of the surgery.

In orthognathic surgery, VSP offers several advantages over traditional planning techniques. It allows for the simulation of surgical outcomes, helping surgeons to anticipate potential complications and modify their plans before the operation. This not only reduces operative time but also minimizes the need for reoperations due to errors or complications. Additionally, VSP facilitates better communication between surgeons, orthodontists, and patients by providing a clear visual prediction of postoperative results, which can improve patient satisfaction and outcomes.

Another significant advantage of VSP is its ability to predict and manage interosseous interference or gaps, which can lead to surgical morbidity if not addressed. By visualizing these potential problems during the planning process, surgeons can develop more effective surgical plans that reduce the likelihood of complications.

Incorating 3D printing into VSP has also been shown to improve surgical efficiency. By creating precise surgical guides and splints, surgeons can perform operations more accurately and with less time, as these guides help in achieving the planned movements with minimal error. This reduction in operative time is crucial, as prolonged surgeries are associated with increased postoperative complications.

Incorating VSP into jaw correction surgeries has significantly improved the accuracy and efficiency of these procedures. It not only enhances surgical outcomes but also provides a more reliable and reproducibility of results, making it a crucial tool in the field of oral and maxillofacial surgery.

Myobrace: A No-Braces Approach

The role of virtual surgical planning (VSP) in jaw correction has become increasingly significant, especially for kids with complex jaw deformities. This technology not only helps in planning surgical procedures but also in integrating orthodontic treatment phases, ensuring a comprehensive approach to patient care.

VSP allows surgeons and orthodontists to visualize and predict postoperative outcomes, including the potential need for prosthetic devices. This simulation enables them to create a detailed treatment plan that aligns with the patient's specific needs and expectations. By using three-dimensional models and computer-aided design, VSP can accurately reposition osteotomized segments in three-dimensional space, which is essential for achieving precise jaw alignment and occlusion.

In orthognathic surgery, VSP is used to perform virtual segmentation of the maxilla or mandible, repositioning these segments with six degrees of freedom. This process helps in predicting and visualizing interosseous interference or gaps, which can be corrected during surgery. Additionally, VSP allows for the fabrication of custom surgical splints and guides, which are used intraoperatively to transfer the planned movements accurately, thereby ensuring that the surgical outcome aligns with the preoperative plan.

The benefits of VSP in orthodontic planning are also significant. It enables a detailed assessment of tooth movements necessary for achieving optimal occlusion, both before and after surgery. This allows for a more precise alignment of teeth and jaw segments, which is essential for successful orthodontic treatment.

Incorating AI-assisted simulation into VSP has enhanced patient collaboration by engaging them in the planning process. Patients can visualize potential outcomes and provide preferences, ensuring that their expectations are aligned with the treatment plan. This not only improves patient understanding but also helps in achieving more predictable surgical results.

In cases where prosthetic devices are necessary, VSP can help in planning their design and implementation. By simulating the postoperative use of these devices, surgeons can better anticipate the patient's needs and create a more comprehensive treatment plan.

In short, VSP has become a powerful tool in jaw correction, integrating both surgical and orthodontic planning to provide a more effective and patient-specific treatment approach.

Myobrace offers a brace-free solution that corrects poor oral habits, guiding jaw and teeth alignment development in children, promoting natural growth and oral health.

The advent of Virtual Surgical Planning (VSP) has revolutionized the field of jaw correction surgeries, particularly in orthognathic and orthodontic planning. This advanced technology enables surgeons to simulate various surgical scenarios, predicting potential outcomes and complications before actual surgery. This not only helps in better preparation and management of treatment but also allows for optimal results and enhanced patient comfort, especially in cases where precise jaw alignment is necessary.

VSP involves several key steps, including the acquisition of detailed CT or cone-beam computed tomography (CBCT) images and scanned dental casts. These are then used to create a three-dimensional model of the patient's skull and dental structures. Surgeons can virtually segment and reposition jaw segments, visualizing the interosseous relationship and potential sites for bone grafts or reduction. This comprehensive planning allows for precise mobilization of jaw segments in three-dimensional space, ensuring accurate alignment and minimal complications during surgery.

A significant advantage of VSP is its potential to minimize surgical errors and reduce operative time. Surgeons can virtually perform surgeries on a digital model, thereby ensuring that the actual procedure is executed with precision. This also facilitates communication between surgeons, orthodontists, and patients, as all can review and understand the planned outcomes and potential

changes in facial anatomy.

In the case of orthodontic planning, VSP helps predict hard and soft tissue changes post-surgery, which is particularly useful for planning orthodontic movements before surgery. It allows for the fabrication of custom cutting guides and splints, which are used intraoperatively to guide the surgeon's movements accurately.

VSP has become an important tool for patient education as well. It allows patients to visualize the potential aesthetic outcomes of their surgery, aligning their expectations with the actual results. This enhanced understanding and communication lead to better patient comfort and more successful treatment outcomes.

Incorating AI-assisted simulations into VSP has also enhanced patient collaboration by actively engaging them in the planning process. This allows for discussing preferences and visualizing outcomes, ensuring alignment between expectations and reality.

Incorating VSP into jaw correction surgeries not only improves the accuracy and efficiency of the procedures but also provides a more comprehensive approach to patient care. It is rapidly becoming the standard of care for surgical treatment planning of dentofacial deformities, ensuring more predictable and less invasive outcomes.

About dentistry

- Sub-Millimeter Surgical Dexterity
- Knowledge of human health, disease, pathology, and anatomy
- Communication/Interpersonal Skills
- Analytical Skills
- Critical Thinking
- Empathy/Professionalism

- Private practices
- Primary care clinics
- Hospitals

- Physician
- dental assistant
- dental technician
- dental hygienist
- various dental specialists

Dentistry

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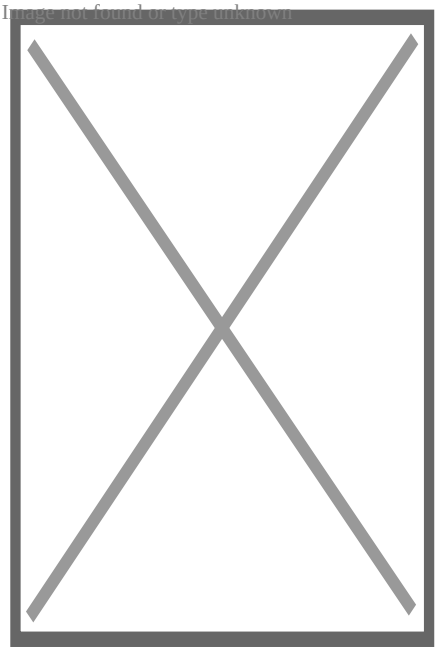

A dentist treats a patient with the help of a dental assistant.

Occupation

Names	○ Dentist ○ Dental Surgeon ○ Doctor [1][nb 1]
Occupation type	Profession
Activity sectors	Health care, Anatomy, Physiology, Pathology, Medicine, Pharmacology, Surgery

Description

Competencies	
Education required	Dental Degree
Fields of employment	
Related jobs	

ICD-9-CM 23-24
MeSH D003813
[edit on Wikidata]

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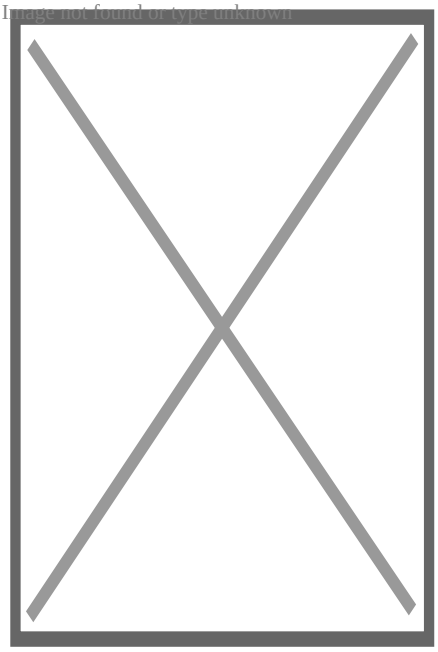

An oral surgeon and dental assistant removing a wisdom tooth

Dentistry, also known as **dental medicine** and **oral medicine**, is the branch of medicine focused on the teeth, gums, and mouth. It consists of the study, diagnosis, prevention, management, and treatment of diseases, disorders, and conditions of the mouth, most commonly focused on dentition (the development and arrangement of teeth) as well as the oral mucosa.[2] Dentistry may also encompass other aspects of the craniofacial complex including the temporomandibular joint. The practitioner is called a dentist.

The history of dentistry is almost as ancient as the history of humanity and civilization, with the earliest evidence dating from 7000 BC to 5500 BC.[3] Dentistry is thought to have been the first specialization in medicine which has gone on to develop its own accredited degree with its own specializations.[4] Dentistry is often also understood to subsume the now largely defunct medical specialty of stomatology (the study of the mouth and its disorders and diseases) for which reason the two terms are used interchangeably in certain regions. However, some specialties such as oral and maxillofacial surgery (facial reconstruction) may require both medical and dental degrees to accomplish. In European history, dentistry is considered to have stemmed from the trade of barber surgeons.[5]

Dental treatments are carried out by a dental team, which often consists of a dentist and dental auxiliaries (such as dental assistants, dental hygienists, dental technicians, and dental therapists). Most dentists either work in private practices (primary care), dental hospitals, or (secondary care) institutions (prisons, armed forces bases, etc.).

The modern movement of evidence-based dentistry calls for the use of high-quality scientific research and evidence to guide decision-making such as in manual tooth conservation, use of fluoride water treatment and fluoride toothpaste, dealing with oral diseases such as tooth decay and periodontitis, as well as systematic diseases such as osteoporosis, diabetes, celiac disease, cancer, and HIV/AIDS which could also affect the oral cavity. Other practices relevant to evidence-based dentistry include radiology of the mouth to inspect teeth deformity or oral malaises, haematology (study of blood) to avoid bleeding complications during dental surgery, cardiology (due to various severe complications arising from dental surgery with patients with heart disease), etc.

Terminology

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The term dentistry comes from *dentist*, which comes from French *dentiste*, which comes from the French and Latin words for tooth.[6] The term for the associated scientific study of teeth is **odontology** (from Ancient Greek: Ã¡Â½â‚¬??Ã•Â•?romanized: *odoús*, lit. 'tooth') – the study of the structure, development, and abnormalities of the teeth.

Dental treatment

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Dentistry usually encompasses practices related to the oral cavity.[7] According to the World Health Organization, oral diseases are major public health problems due to their high incidence and prevalence across the globe, with the disadvantaged affected more than other socio-economic groups.[8]

The majority of dental treatments are carried out to prevent or treat the two most common oral diseases which are dental caries (tooth decay) and periodontal disease (gum disease or pyorrhea). Common treatments involve the restoration of teeth, extraction or surgical removal of teeth, scaling and root planing, endodontic root canal treatment, and cosmetic dentistry[9]

By nature of their general training, dentists, without specialization can carry out the majority of dental treatments such as restorative (fillings, crowns, bridges), prosthetic (dentures), endodontic (root canal) therapy, periodontal (gum) therapy, and extraction of teeth, as well as performing examinations, radiographs (x-rays), and diagnosis. Dentists can also prescribe medications used in the field such as antibiotics, sedatives, and any other drugs used in patient management. Depending on their licensing boards, general dentists may be required to complete additional training to perform sedation, dental implants, etc.

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Irreversible enamel defects caused by an untreated celiac disease. They may be the only clue to its diagnosis, even in absence of gastrointestinal symptoms, but are often confused with fluorosis, tetracycline discoloration, acid reflux or other causes.[10][11][12] The National Institutes of Health include a dental exam in the diagnostic protocol of celiac disease.[10]

Dentists also encourage the prevention of oral diseases through proper hygiene and regular, twice or more yearly, checkups for professional cleaning and evaluation. Oral infections and inflammations may affect overall health and conditions in the oral cavity may be indicative of systemic diseases, such as osteoporosis, diabetes, celiac disease or cancer.[7][10][13][14] Many studies have also shown that gum disease is associated with an increased risk of diabetes, heart disease, and preterm birth. The concept that oral health can affect systemic health and disease is referred to as "oral-systemic health".

Education and licensing

[edit]
Main article: Dentistry throughout the world

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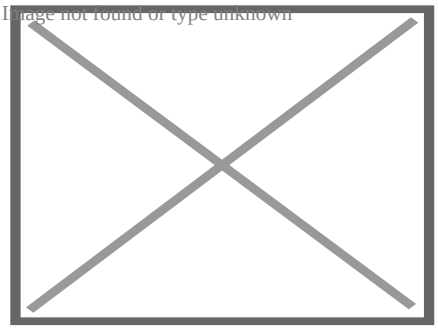
A sagittal cross-section of a molar tooth; 1: crown, 2: root, 3: enamel, 4: dentin and dentin tubules, 5: pulp chamber, 6: blood vessels and nerve, 7: periodontal ligament, 8: apex and periapical region, 9: alveolar bone



Early dental chair in Pioneer West Museum in Shamrock, Texas

John M. Harris started the world's first dental school in Bainbridge, Ohio, and helped to establish dentistry as a health profession. It opened on 21 February 1828, and today is a dental museum.[15] The first dental college, Baltimore College of Dental Surgery, opened in Baltimore, Maryland, US in 1840. The second in the United States was the Ohio College of Dental Surgery, established in Cincinnati, Ohio, in 1845.[16] The Philadelphia College of Dental Surgery followed in 1852.[17] In 1907, Temple University accepted a bid to incorporate the school.

Studies show that dentists that graduated from different countries,[18] or even from different dental schools in one country,[19] may make different clinical decisions for the same clinical condition. For example, dentists that graduated from Israeli dental schools may recommend the removal of asymptomatic impacted third molar (wisdom teeth) more often than dentists that graduated from Latin American or Eastern European dental schools.[20]

In the United Kingdom, the first dental schools, the London School of Dental Surgery and the Metropolitan School of Dental Science, both in London, opened in 1859.[21] The British Dentists Act of 1878 and the 1879 Dentists Register limited the title of "dentist" and "dental surgeon" to qualified and registered practitioners.[22][23] However, others could legally describe themselves as "dental experts" or "dental consultants".[24] The practice of dentistry in the United Kingdom became fully regulated with the 1921 Dentists Act, which required the registration of anyone practising dentistry.[25] The British Dental Association, formed in 1880 with Sir John Tomes as president, played a major role in prosecuting dentists practising illegally.[22] Dentists in the United Kingdom are now regulated by the General Dental Council.

In many countries, dentists usually complete between five and eight years of post-secondary education before practising. Though not mandatory, many dentists choose to complete an internship or residency focusing on specific aspects of dental care after they have received their dental degree. In a few countries, to become a qualified dentist one must usually complete at least four years of postgraduate study;[26] Dental degrees awarded around the world include the Doctor of Dental Surgery (DDS) and Doctor of Dental Medicine (DMD) in North America (US and Canada), and the Bachelor of Dental Surgery/Baccalaureus Dentalis Chirurgiae (BDS, BDent, BChD, BDSc) in the UK and current and former British Commonwealth countries.

All dentists in the United States undergo at least three years of undergraduate studies, but nearly all complete a bachelor's degree. This schooling is followed by four years of dental school to qualify as a "Doctor of Dental Surgery" (DDS) or "Doctor of Dental Medicine" (DMD). Specialization in dentistry is available in the fields of Anesthesiology, Dental Public Health, Endodontics, Oral Radiology, Oral and Maxillofacial Surgery, Oral Medicine, Orofacial Pain, Pathology, Orthodontics, Pediatric Dentistry (Pedodontics), Periodontics, and Prosthodontics.[27]

Specialties

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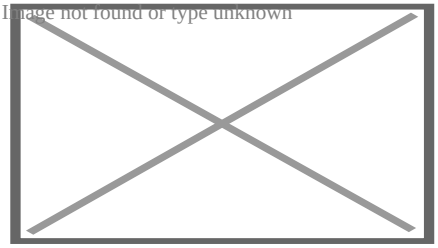
Main article: Specialty (dentistry)



A modern dental clinic in Lappeenranta, Finland

Some dentists undertake further training after their initial degree in order to specialize. Exactly which subjects are recognized by dental registration bodies varies according to location. Examples include:

- Anesthesiology[28] – The specialty of dentistry that deals with the advanced use of general anesthesia, sedation and pain management to facilitate dental procedures.
- Cosmetic dentistry – Focuses on improving the appearance of the mouth, teeth and smile.
- Dental public health – The study of epidemiology and social health policies relevant to oral health.
- Endodontics (also called *endodontology*) – Root canal therapy and study of diseases of the dental pulp and periapical tissues.
- Forensic odontology – The gathering and use of dental evidence in law. This may be performed by any dentist with experience or training in this field. The function of the forensic dentist is primarily documentation and verification of identity.
- Geriatric dentistry or *geriodontics* – The delivery of dental care to older adults involving the diagnosis, prevention, and treatment of problems associated with normal aging and age-related diseases as part of an interdisciplinary team with other health care professionals.
- Oral and maxillofacial pathology – The study, diagnosis, and sometimes the treatment of oral and maxillofacial related diseases.
- Oral and maxillofacial radiology – The study and radiologic interpretation of oral and maxillofacial diseases.

- Oral and maxillofacial surgery (also called *oral surgery*) – Extractions, implants, and surgery of the jaws, mouth and face.[nb 2]
- Oral biology – Research in dental and craniofacial biology
- Oral Implantology – The art and science of replacing extracted teeth with dental implants.
- Oral medicine – The clinical evaluation and diagnosis of oral mucosal diseases
- Orthodontics and dentofacial orthopedics – The straightening of teeth and modification of midface and mandibular growth.
- Pediatric dentistry (also called *pedodontics*) – Dentistry for children
- Periodontology (also called *periodontics*) – The study and treatment of diseases of the periodontium (non-surgical and surgical) as well as placement and maintenance of dental implants
- Prosthodontics (also called *prosthetic dentistry*) – Dentures, bridges and the restoration of implants.
    - Some prosthodontists super-specialize in maxillofacial prosthetics, which is the discipline originally concerned with the rehabilitation of patients with congenital facial and oral defects such as cleft lip and palate or patients born with an underdeveloped ear (microtia). Today, most maxillofacial prosthodontists return function and esthetics to patients with acquired defects secondary to surgical removal of head and neck tumors, or secondary to trauma from war or motor vehicle accidents.
- Special needs dentistry (also called *special care dentistry*) – Dentistry for those with developmental and acquired disabilities.
- Sports dentistry – the branch of sports medicine dealing with prevention and treatment of dental injuries and oral diseases associated with sports and exercise.[29] The sports dentist works as an individual consultant or as a member of the Sports Medicine Team.
- Veterinary dentistry – The field of dentistry applied to the care of animals. It is a specialty of veterinary medicine.[30][31]

History

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See also: History of dental treatments

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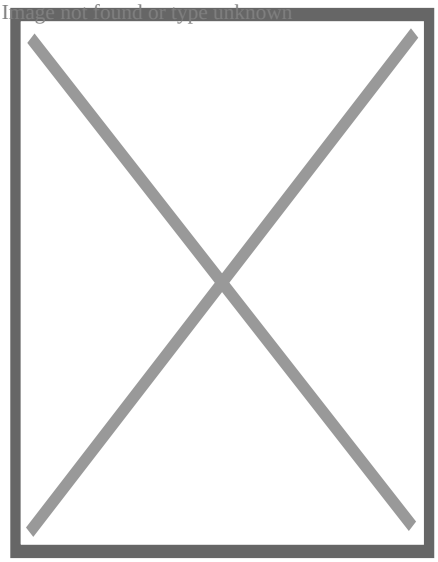

A wealthy patient falling over because of having a tooth extracted with such vigour by a fashionable dentist, c. 1790. History of Dentistry.

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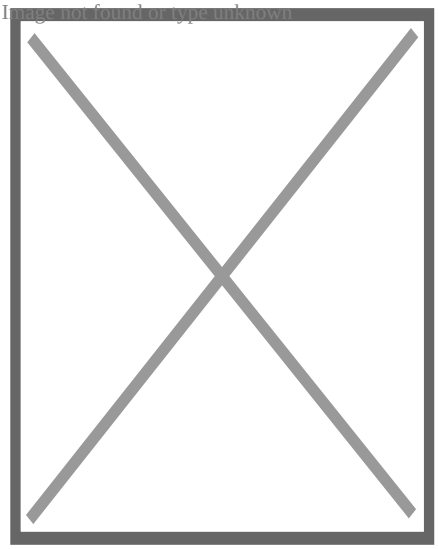

Farmer at the dentist, Johann Liss, c. 1616–17

Tooth decay was low in pre-agricultural societies, but the advent of farming society about 10,000 years ago correlated with an increase in tooth decay (cavities).[32] An infected tooth from Italy partially cleaned with flint tools, between 13,820 and 14,160 years old, represents the oldest known dentistry,[33] although a 2017 study suggests that 130,000 years ago the Neanderthals already used rudimentary dentistry tools.[34] In Italy evidence dated to the Paleolithic, around 13,000 years ago, points to bitumen used to fill a tooth[35] and in Neolithic Slovenia, 6500 years ago, beeswax was used to close a fracture in a tooth.[36] The Indus valley has yielded evidence of dentistry being practised as far back as 7000 BC, during the Stone Age.[37] The Neolithic site of Mehrgarh (now in Pakistan's south western province of Balochistan) indicates that this form of dentistry involved curing tooth related disorders with bow drills operated, perhaps, by skilled bead-crafters.[3] The reconstruction of this ancient form of dentistry showed that the methods used were reliable and effective.[38] The earliest

dental filling, made of beeswax, was discovered in Slovenia and dates from 6500 years ago.[39] Dentistry was practised in prehistoric Malta, as evidenced by a skull which had a dental abscess lanced from the root of a tooth dating back to around 2500 BC.[40]

An ancient Sumerian text describes a "tooth worm" as the cause of dental caries.[41] Evidence of this belief has also been found in ancient India, Egypt, Japan, and China. The legend of the worm is also found in the *Homeric Hymns*,[42] and as late as the 14th century AD the surgeon Guy de Chauliac still promoted the belief that worms cause tooth decay.[43]

Recipes for the treatment of toothache, infections and loose teeth are spread throughout the Ebers Papyrus, Kahun Papyri, Brugsch Papyrus, and Hearst papyrus of Ancient Egypt.[44] The Edwin Smith Papyrus, written in the 17th century BC but which may reflect previous manuscripts from as early as 3000 BC, discusses the treatment of dislocated or fractured jaws.[44][45] In the 18th century BC, the Code of Hammurabi referenced dental extraction twice as it related to punishment.[46] Examination of the remains of some ancient Egyptians and Greco-Romans reveals early attempts at dental prosthetics.[47] However, it is possible the prosthetics were prepared after death for aesthetic reasons.[44]

Ancient Greek scholars Hippocrates and Aristotle wrote about dentistry, including the eruption pattern of teeth, treating decayed teeth and gum disease, extracting teeth with forceps, and using wires to stabilize loose teeth and fractured jaws.[48] Use of dental appliances, bridges and dentures was applied by the Etruscans in northern Italy, from as early as 700 BC, of human or other animal teeth fastened together with gold bands.[49][50][51] The Romans had likely borrowed this technique by the 5th century BC.[50][52] The Phoenicians crafted dentures during the 6th–4th century BC, fashioning them from gold wire and incorporating two ivory teeth.[53] In ancient Egypt, Hesy-Ra is the first named "dentist" (greatest of the teeth). The Egyptians bound replacement teeth together with gold wire. Roman medical writer Cornelius Celsus wrote extensively of oral diseases as well as dental treatments such as narcotic-containing emollients and astringents.[54] The earliest dental amalgams were first documented in a Tang dynasty medical text written by the Chinese physician Su Kung in 659, and appeared in Germany in 1528.[55][56]

During the Islamic Golden Age Dentistry was discussed in several famous books of medicine such as The Canon in medicine written by Avicenna and Al-Tasreef by Al-Zahrawi who is considered the greatest surgeon of the Middle Ages,[57] Avicenna said that jaw fracture should be reduced according to the occlusal guidance of the teeth; this principle is still valid in modern times. Al-Zahrawi invented over 200 surgical tools that resemble the modern kind.[58]

Historically, dental extractions have been used to treat a variety of illnesses. During the Middle Ages and throughout the 19th century, dentistry was not a profession in itself, and often dental procedures were performed by barbers or general physicians. Barbers usually limited their practice to extracting teeth which alleviated pain and associated chronic tooth infection. Instruments used for dental extractions date back several centuries. In the 14th

century, Guy de Chauliac most probably invented the dental pelican[59] (resembling a pelican's beak) which was used to perform dental extractions up until the late 18th century. The pelican was replaced by the dental key[60] which, in turn, was replaced by modern forceps in the 19th century.[61]

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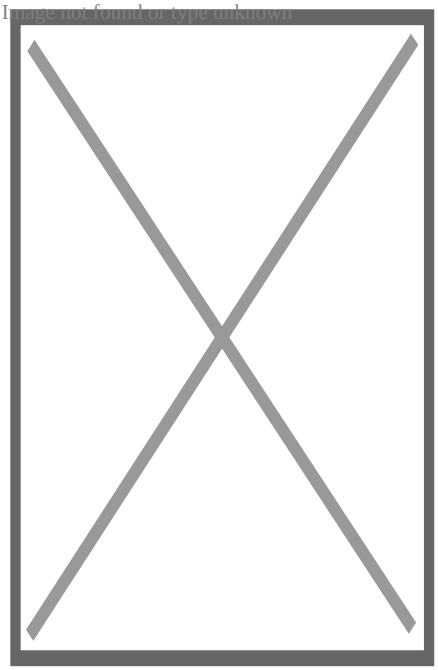

Dental needle-nose pliers designed by Fauchard in the late 17th century to use in prosthodontics

The first book focused solely on dentistry was the "Artzney Buchlein" in 1530,[48] and the first dental textbook written in English was called "Operator for the Teeth" by Charles Allen in 1685.[23]

In the United Kingdom, there was no formal qualification for the providers of dental treatment until 1859 and it was only in 1921 that the practice of dentistry was limited to those who were professionally qualified. The Royal Commission on the National Health Service in 1979 reported that there were then more than twice as many registered dentists per 10,000 population in the UK than there were in 1921.[62]

Modern dentistry

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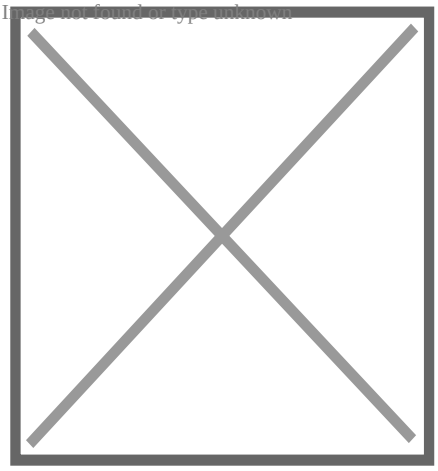

A microscopic device used in dental analysis, c. 1907

It was between 1650 and 1800 that the science of modern dentistry developed. The English physician Thomas Browne in his *A Letter to a Friend* (c. 1656 pub. 1690) made an early dental observation with characteristic humour:

> The Egyptian Mummies that I have seen, have had their Mouths open, and somewhat gaping, which affordeth a good opportunity to view and observe their Teeth, wherein 'tis not easie to find any wanting or decayed: and therefore in Egypt, where one Man practised but one Operation, or the Diseases but of single Parts, it must needs be a barren Profession to confine unto that of drawing of Teeth, and little better than to have been Tooth-drawer unto King Pyrrhus, who had but two in his Head.

The French surgeon Pierre Fauchard became known as the "father of modern dentistry". Despite the limitations of the primitive surgical instruments during the late 17th and early 18th century, Fauchard was a highly skilled surgeon who made remarkable improvisations of dental instruments, often adapting tools from watchmakers, jewelers and even barbers, that he thought could be used in dentistry. He introduced dental fillings as treatment for dental cavities. He asserted that sugar-derived acids like tartaric acid were responsible for dental decay, and also suggested that tumors surrounding the teeth and in the gums could appear in the later stages of tooth decay.[63][64]

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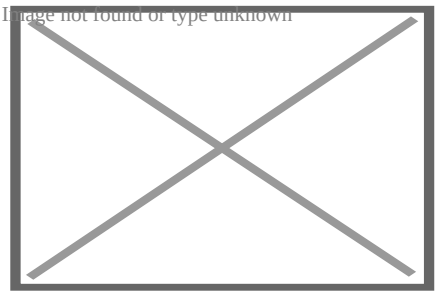
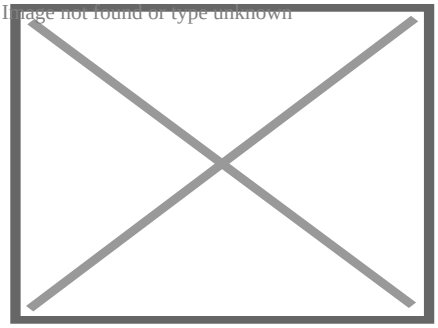


Panoramic radiograph of historic dental implants, made 1978

Fauchard was the pioneer of dental prosthesis, and he invented many methods to replace lost teeth. He suggested that substitutes could be made from carved blocks of ivory or bone. He also introduced dental braces, although they were initially made of gold, he discovered that the teeth position could be corrected as the teeth would follow the pattern of the wires. Waxed linen or silk threads were usually employed to fasten the braces. His contributions to the world of dental science consist primarily of his 1728 publication Le chirurgien dentiste or The Surgeon Dentist. The French text included "basic oral anatomy and function, dental construction, and various operative and restorative techniques, and effectively separated dentistry from the wider category of surgery".[63][64]



A modern dentist's chair

After Fauchard, the study of dentistry rapidly expanded. Two important books, *Natural History of Human Teeth* (1771) and *Practical Treatise on the Diseases of the Teeth* (1778), were published by British surgeon John Hunter. In 1763, he entered into a period of collaboration with the London-based dentist James Spence. He began to theorise about the possibility of tooth transplants from one person to another. He realised that the chances of a successful tooth transplant (initially, at least) would be improved if the donor tooth was as fresh as possible and was matched for size with the recipient. These principles are still used in the transplantation of internal organs. Hunter conducted a series of pioneering operations, in which he attempted a tooth transplant. Although the donated teeth never properly bonded with the recipients' gums, one of Hunter's patients stated that he had three which lasted for six years, a remarkable achievement for the period.[65]

Major advances in science were made in the 19th century, and dentistry evolved from a trade to a profession. The profession came under government regulation by the end of the 19th century. In the UK, the Dentist Act was passed in 1878 and the British Dental Association formed in 1879. In the same year, Francis Brodie Imlach was the first ever dentist to be elected President of the Royal College of Surgeons (Edinburgh), raising dentistry onto a par with clinical surgery for the first time.[66]

Hazards in modern dentistry

[edit]

Main article: Occupational hazards in dentistry

Long term occupational noise exposure can contribute to permanent hearing loss, which is referred to as noise-induced hearing loss (NIHL) and tinnitus. Noise exposure can cause excessive stimulation of the hearing mechanism, which damages the delicate structures of the inner ear.[67] NIHL can occur when an individual is exposed to sound levels above 90 dBA according to the Occupational Safety and Health Administration (OSHA). Regulations state that the permissible noise exposure levels for individuals is 90 dBA.[68] For the National Institute for Occupational Safety and Health (NIOSH), exposure limits are set to 85 dBA. Exposures below 85 dBA are not considered to be hazardous. Time limits are placed on how long an individual can stay in an environment above 85 dBA before it causes hearing loss. OSHA places that limitation at 8 hours for 85 dBA. The exposure time becomes shorter as the dBA level increases.

Within the field of dentistry, a variety of cleaning tools are used including piezoelectric and sonic scalers, and ultrasonic scalers and cleaners.[69] While a majority of the tools do not exceed 75 dBA,[70] prolonged exposure over many years can lead to hearing loss or complaints of tinnitus.[71] Few dentists have reported using personal hearing protective devices,[72][73] which could offset any potential hearing loss or tinnitus.

Evidence-based dentistry

[edit]
Main article: Evidence-based dentistry

There is a movement in modern dentistry to place a greater emphasis on high-quality scientific evidence in decision-making. Evidence-based dentistry (EBD) uses current scientific evidence to guide decisions. It is an approach to oral health that requires the application and examination of relevant scientific data related to the patient's oral and medical health. Along with the dentist's professional skill and expertise, EBD allows dentists to stay up to date on the latest procedures and patients to receive improved treatment. A new paradigm for medical education designed to incorporate current research into education and practice was developed to help practitioners provide the best care for their patients.[74] It was first introduced by Gordon Guyatt and the Evidence-Based Medicine Working Group at McMaster University in Ontario, Canada in the 1990s. It is part of the larger movement toward evidence-based medicine and other evidence-based practices, especially since a major part of dentistry involves dealing with oral and systemic diseases. Other issues relevant to the dental field in terms of evidence-based research and evidence-based practice include population oral health, dental clinical practice, tooth morphology etc.

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A dental chair at the University of Michigan School of Dentistry

Ethical and medicolegal issues

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Dentistry is unique in that it requires dental students to have competence-based clinical skills that can only be acquired through supervised specialized laboratory training and direct patient care.[75] This necessitates the need for a scientific and professional basis of care with a foundation of extensive research-based education.[76] According to some experts, the accreditation of dental schools can enhance the quality and professionalism of dental education.[77][78]

See also

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- Dental aerosol
- Dental instrument
- Dental public health
- Domestic healthcare:
  - Dentistry in ancient Rome
  - Dentistry in Canada
  - Dentistry in the Philippines
  - Dentistry in Israel
  - Dentistry in the United Kingdom
  - Dentistry in the United States
- Eco-friendly dentistry
- Geriatric dentistry
- List of dental organizations
- Pediatric dentistry
- Sustainable dentistry

- Veterinary dentistry

Notes

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1. **^** Whether Dentists are referred to as "Doctor" is subject to geographic variation. For example, they are called "Doctor" in the US. In the UK, dentists have traditionally been referred to as "Mister" as they identified themselves with barber surgeons more than physicians (as do surgeons in the UK, see Surgeon#Titles). However more UK dentists now refer to themselves as "Doctor", although this was considered to be potentially misleading by the British public in a single report (see Costley and Fawcett 2010).
2. **^** The scope of oral and maxillofacial surgery is variable. In some countries, both a medical and dental degree is required for training, and the scope includes head and neck oncology and craniofacial deformity.

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Dentistry

Specialties

- Endodontics
- Oral and maxillofacial pathology
- Oral and maxillofacial radiology
- Oral and maxillofacial surgery
- Orthodontics and dentofacial orthopedics
- Pediatric dentistry
- Periodontics
- Prosthodontics
- Dental public health
- Cosmetic dentistry
- Dental implantology
- Geriatric dentistry
- Restorative dentistry
- Forensic odontology
- Dental traumatology
- Holistic dentistry

Dental surgery

- Dental extraction
- Tooth filling
- Root canal therapy
- Root end surgery
- Scaling and root planing
- Teeth cleaning
- Dental bonding
- Tooth polishing
- Tooth bleaching
- Socket preservation
- Dental implant

Organisations

- American Association of Orthodontists
- British Dental Association
- British Dental Health Foundation
- British Orthodontic Society
- Canadian Association of Orthodontists
- Dental Technologists Association
- General Dental Council
- Indian Dental Association
- National Health Service

By country

- Canada
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- United States

See also

- Index of oral health and dental articles
- Outline of dentistry and oral health
- Dental fear
- Dental instruments
- Dental material
- History of dental treatments
  - Ancient Rome
- Infant oral mutilation
- Mouth assessment
- Oral hygiene

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Cleft lip and cleft palate

Related specialities	○ Advance practice nursing ○ Audiology ○ Dentistry ○ Dietetics ○ Genetics ○ Oral and maxillofacial surgery ○ Orthodontics ○ Orthodontic technology ○ Otolaryngology ○ Pediatrics ○ Pediatric dentistry ○ Physician ○ Plastic surgery ○ Psychiatry ○ Psychology ○ Respiratory therapy ○ Social work ○ Speech and language therapy
Related syndromes	○ Hearing loss with craniofacial syndromes ○ Pierre Robin syndrome ○ Popliteal pterygium syndrome ○ Van der Woude syndrome
National and international organisations	○ Cleft Lip and Palate Association ○ Craniofacial Society of Great Britain and Ireland ○ Interplast ○ North Thames Regional Cleft Lip and Palate Service ○ Operation Smile ○ Overseas Plastic Surgery Appeal ○ Shriners Hospitals for Children ○ Smile Train ○ Transforming Faces Worldwide ○ Smile Angel Foundation (China)

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Dental schools

American dental schools	○ UAB ○ Arizona ○ Augusta (DCG) ○ Boston U (Goldman) ○ California (UCLA, UCSF) ○ Case Western Reserve ○ Colorado ○ Columbia ○ Connecticut ○ Creighton ○ Detroit Mercy ○ East Carolina ○ Florida ○ Harvard ○ Howard ○ Illinois–Chicago ○ Indiana ○ Iowa ○ Kentucky ○ Lake Erie ○ Loma Linda ○ Louisville ○ LSU Health–New Orleans ○ Marquette ○ Maryland–Baltimore ○ Meharry ○ Michigan ○ Midwestern ○ Minnesota ○ Mississippi ○ Missouri–Kansas City ○ Nebraska–Medical Center ○ Nevada–Las Vegas ○ New England ○ NYU ○ SUNY (Buffalo, Stony Brook) ○ North Carolina ○ Nova ○ Ohio State ○ Oklahoma ○ Oregon ○ Pacific (Dugoni) ○ Penn ○ Pitt ○ Puerto Rico ○ Rochester

Defunct American dental schools	○ Emory ○ Fairleigh Dickinson ○ Georgetown ○ Harris ○ Loyola ○ Northwestern ○ Ohio College ○ Oral Roberts ○ Pennsylvania College ○ Wash U
Canadian dental schools	○ Alberta ○ British Columbia ○ Dalhousie ○ Laval ○ Manitoba ○ McGill ○ Montréal ○ Saskatchewan ○ Toronto ○ Western
British dental schools	○ Aberdeen ○ Barts and The London School of Medicine and Dentistry ○ Glasgow ○ Guy's, King's & St Thomas's ○ Liverpool ○ Newcastle ○ Peninsula College of Medicine and Dentistry ○ UCL Eastman Dental Institute

Australian and New Zealand dental schools	○ Sydney ○ Melbourne ○ Adelaide ○ Charles Sturt University ○ Griffith University ○ James Cook ○ La Trobe ○ Queensland ○ Western Australia ○ University of Otago
South Korean dental schools	○ Chonbuk ○ Chonnam ○ Chosun ○ Dankook ○ Gangneung-Wonju ○ Kyung Hee ○ Kyungpook ○ Pusan ○ Seoul ○ Wonkwang ○ Yonsei

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Medicine

Surgery	○ Cardiac surgery
	○ Cardiothoracic surgery
	○ Endocrine surgery
	○ Eye surgery
	○ General surgery
	  ○ Colorectal surgery
	  ○ Digestive system surgery
	○ Neurosurgery
	○ Oral and maxillofacial surgery
	○ Orthopedic surgery
	○ Hand surgery
	○ Otolaryngology
	  ○ ENT
	○ Pediatric surgery
	○ Plastic surgery
	○ Reproductive surgery
	○ Surgical oncology
	○ Transplant surgery
	○ Trauma surgery
	○ Urology
	  ○ Andrology
	○ Vascular surgery

Internal medicine	○ Allergy / Immunology ○ Angiology ○ Cardiology ○ Endocrinology ○ Gastroenterology ○ Hepatology ○ Geriatrics ○ Hematology ○ Hospital medicine ○ Infectious diseases ○ Nephrology ○ Oncology ○ Pulmonology ○ Rheumatology
Obstetrics and gynaecology	○ Gynaecology ○ Gynecologic oncology ○ Maternal–fetal medicine ○ Obstetrics ○ Reproductive endocrinology and infertility ○ Urogynecology

Medical education

- Medical school
- Bachelor of Medicine, Bachelor of Surgery
- Bachelor of Medical Sciences
- Master of Medicine
- Master of Surgery
- Doctor of Medicine
- Doctor of Osteopathic Medicine
- MD–PhD
  - Medical Scientist Training Program

Related topics

- Alternative medicine
- Allied health
- Molecular oncology
- Nanomedicine
- Personalized medicine
- Public health
- Rural health
- Therapy
- Traditional medicine
- Veterinary medicine
- Physician
  - Chief physician
- History of medicine

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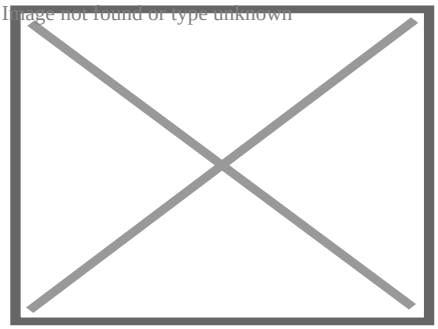
- Historical Dictionary of Switzerland
- NARA

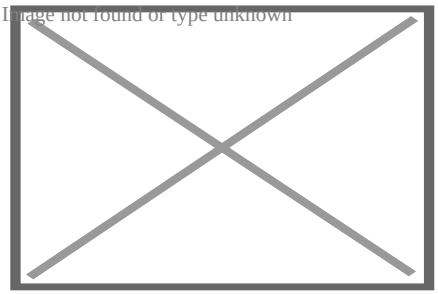
About thumb sucking

For other uses, see Thumbsucker (disambiguation).



Infants may use pacifiers or their thumb or fingers to soothe themselves

Newborn baby thumb sucking



A bonnet macaque thumb sucking

Thumb sucking is a behavior found in humans, chimpanzees, captive ring-tailed lemurs,[1] and other primates.[2] It usually involves placing the thumb into the mouth and rhythmically repeating sucking contact for a prolonged duration. It can also be accomplished with any organ within reach (such as other fingers and toes) and is considered to be soothing and therapeutic for the person. As a child develops the habit, it will usually develop a "favourite" finger to suck on.

At birth, a baby will reflexively suck any object placed in its mouth; this is the sucking reflex responsible for breastfeeding. From the first time they engage in nutritive feeding, infants learn that the habit can not only provide valuable nourishment, but also a great deal of pleasure, comfort, and warmth. Whether from a mother, bottle, or pacifier, this behavior, over time, begins to become associated with a very strong, self-soothing, and pleasurable oral

sensation. As the child grows older, and is eventually weaned off the nutritional sucking, they can either develop alternative means for receiving those same feelings of physical and emotional fulfillment, or they can continue experiencing those pleasantly soothing experiences by beginning to suck their thumbs or fingers.[3] This reflex disappears at about 4 months of age; thumb sucking is not purely an instinctive behavior and therefore can last much longer.[4] Moreover, ultrasound scans have revealed that thumb sucking can start before birth, as early as 15 weeks from conception; whether this behavior is voluntary or due to random movements of the fetus in the womb is not conclusively known.

Thumb sucking generally stops by the age of 4 years. Some older children will retain the habit, which can cause severe dental problems.[5] While most dentists would recommend breaking the habit as early as possible, it has been shown that as long as the habit is broken before the onset of permanent teeth, at around 5 years old, the damage is reversible.[6] Thumb sucking is sometimes retained into adulthood and may be due to simply habit continuation. Using anatomical and neurophysiological data a study has found that sucking the thumb is said to stimulate receptors within the brain which cause the release of mental and physical tension.[7]

Dental problems and prevention

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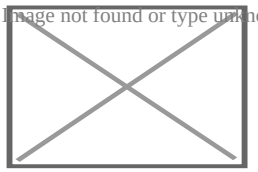

Alveolar prognathism, caused by thumb sucking and tongue thrusting in a 7-year-old girl.

Percentage of children who suck their thumbs (data from two researchers)

Age	Kantorowicz[4]	Brückl[8]
0–1	92%	66%
1–2	93%	
2–3	87%	–
3–4	86%	
4–5	85%	25%
5–6	76%	
Over 6	—	9%

Most children stop sucking on thumbs, pacifiers or other objects on their own between 2 and 4 years of age. No harm is done to their teeth or jaws until permanent teeth start to erupt. The only time it might cause concern is if it goes on beyond 6 to 8 years of age. At this time, it may affect the shape of the oral cavity or dentition.[9] During thumbsucking the tongue sits in a lowered position and so no longer balances the forces from the buccal group of musculature. This results in narrowing of the upper arch and a posterior crossbite. Thumbsucking can also cause the maxillary central incisors to tip labially and the mandibular incisors to tip lingually, resulting in an increased overjet and anterior open bite malocclusion, as the thumb rests on them during the course of sucking. In addition to proclination of the maxillary incisors, mandibular incisors retrusion will also happen. Transverse maxillary deficiency gives rise to posterior crossbite, ultimately leading to a Class II malocclusion.[10]

Children may experience difficulty in swallowing and speech patterns due to the adverse changes. Aside from the damaging physical aspects of thumb sucking, there are also additional risks, which unfortunately, are present at all ages. These include increased risk of infection from communicable diseases, due to the simple fact that non-sterile thumbs are covered with infectious agents, as well as many social implications. Some children experience social difficulties, as often children are taunted by their peers for engaging in what they can consider to be an “immature” habit. This taunting often results the child being rejected by the group or being subjected to ridicule by their peers, which can cause understandable psychological stress.[11]

Methods to stop sucking habits are divided into 2 categories: Preventive Therapy and Appliance Therapy.[10]

Examples to prevent their children from sucking their thumbs include the use of bitterants or piquant substances on their child's hands—although this is not a procedure encouraged by the American Dental Association[9] or the Association of Pediatric Dentists. Some suggest that positive reinforcements or calendar rewards be given to encourage the child to stop sucking their thumb.

The American Dental Association recommends:

- Praise children for not sucking, instead of scolding them when they do.
- If a child is sucking their thumb when feeling insecure or needing comfort, focus instead on correcting the cause of the anxiety and provide comfort to your child.
- If a child is sucking on their thumb because of boredom, try getting the child's attention with a fun activity.
- Involve older children in the selection of a means to cease thumb sucking.
- The pediatric dentist can offer encouragement to the child and explain what could happen to the child's teeth if he/she does not stop sucking.
- Only if these tips are ineffective, remind the child of the habit by bandaging the thumb or putting a sock/glove on the hand at night.
- Other orthodontics[12] for appliances are available.

The British Orthodontic Society recommends the same advice as ADA.[13]

A Cochrane review was conducted to review the effectiveness of a variety of clinical interventions for stopping thumb-sucking. The study showed that orthodontic appliances and psychological interventions (positive and negative reinforcement) were successful at preventing thumb sucking in both the short and long term, compared to no treatment.[14] Psychological interventions such as habit reversal training and decoupling have also proven useful in body focused repetitive behaviors.[15]

Clinical studies have shown that appliances such as TGuards can be 90% effective in breaking the thumb or finger sucking habit. Rather than use bitterants or piquants, which are not endorsed by the ADA due to their causing of discomfort or pain, TGuards break the habit simply by removing the suction responsible for generating the feelings of comfort and nurture.[16] Other appliances are available, such as fabric thumb guards, each having their own benefits and features depending on the child's age, willpower and motivation. Fixed intraoral appliances have been known to create problems during eating as children when removing their appliances may have a risk of breaking them. Children with mental illness may have reduced compliance.[10]

Some studies mention the use of extra-oral habit reminder appliance to treat thumb sucking. An alarm is triggered when the child tries to suck the thumb to stop the child from this habit.[10][17] However, more studies are required to prove the effectiveness of external devices on thumb sucking.

Children's books

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- In Heinrich Hoffmann's *Struwwelpeter*, the "thumb-sucker" Konrad is punished by having both of his thumbs cut off.
- There are several children's books on the market with the intention to help the child break the habit of thumb sucking. Most of them provide a story the child can relate to and some coping strategies.[18] Experts recommend to use only books in which the topic of thumb sucking is shown in a positive and respectful way.[19]

See also

[edit]

- Stereotypic movement disorder
- Prognathism

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[edit]

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Further reading

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External links

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- *"Oral Health Topics: Thumbsucking". American Dental Association. Archived from the original on 2010-06-19.*
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