

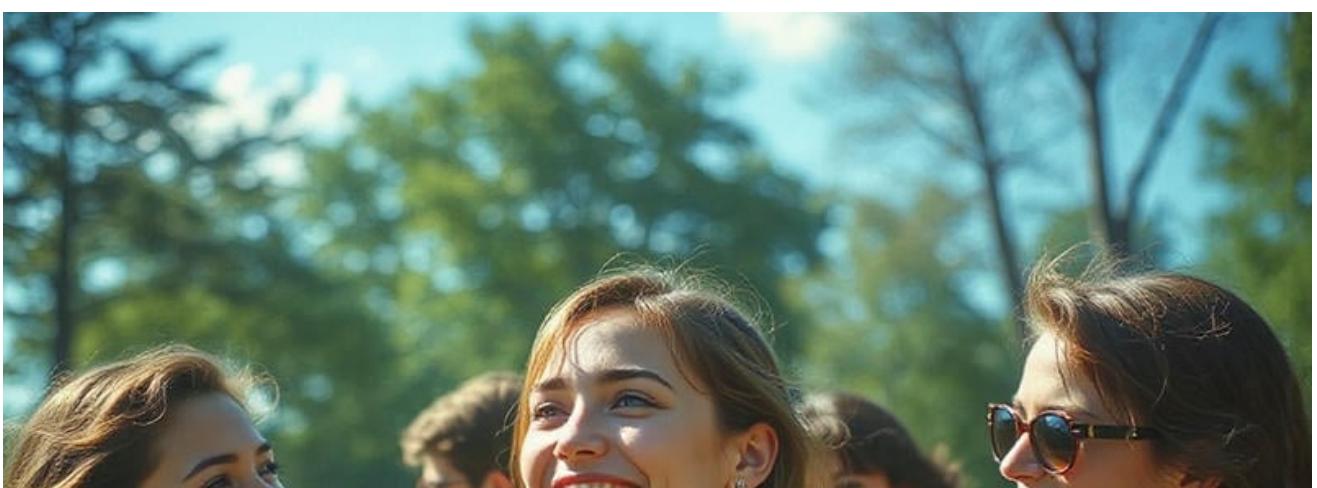
- **The Role of Brackets in Tooth Alignment**

**The Role of Brackets in Tooth Alignment** Archwires and Their Influence on Dental Movement Elastics for Adjusting Bite and Spacing The Use of Expanders for Growth Modification Introducing Temporary Anchorage Devices in Treatment Rubber Bands and Their Compliance Challenges Headgear in Orthodontics for Jaw Correction Exploring Digital Scanners for Accurate Impressions Adhesive Innovations for Long Lasting Bonds Light Cure Technologies and Bonding Efficiency Understanding Indirect Bonding Techniques How Instrument Sterilization Protects Patient Safety

- **Using Panoramic Radiographs in Orthodontic Assessments**

**Using Panoramic Radiographs in Orthodontic Assessments** Cephalometric Analysis for Better Treatment Decisions Intraoral Scanning and Its Advantages Exploring 3D Imaging in Treatment Planning Understanding Facial Profile Evaluations Combining Visual Examinations with Advanced Tools The Role of CBCT in Complex Orthodontic Cases Orthodontic Case Simulations with Digital Software Clinical Records That Inform Effective Care Predicting Growth Patterns in Younger Patients The Importance of Accurate Patient History Balancing Data and Clinical Judgment in Orthodontics

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# Understanding Indirect Bonding Techniques

## Understanding brackets: Types and functions in orthodontic treatment

Understanding brackets: Types and functions in orthodontic treatment

In the realm of orthodontic treatment, bonding brackets to teeth is a crucial step in applying braces. There are two primary methods for this process: direct bonding and indirect bonding. Understanding these techniques, particularly the nuances of indirect bonding, can significantly enhance the efficiency and comfort of orthodontic treatment for kids.

Direct bonding involves placing each bracket individually on the teeth during a single appointment. The orthodontist manually positions each bracket and then cures the adhesive to secure it. This method is straightforward but can be time-consuming, especially if there are many teeth to be treated. Some kids may require early intervention to correct bite issues [Dental braces for children](#) thumb sucking. Additionally, maintaining precision can be challenging due to factors like saliva and patient movement, which can compromise accuracy.

Indirect bonding, on the other hand, offers a more streamlined approach. This technique involves creating a custom tray that holds all the brackets in their precise positions beforehand. The tray is fabricated using models or digital scans of the patient's teeth, ensuring highly accurate placement when applied in one go during an appointment.

The advantages of indirect bonding are numerous, particularly for children undergoing orthodontic treatment. Firstly, it significantly reduces chair time during appointments because all brackets are placed simultaneously rather than individually. This makes the process faster and less stressful for young patients who may find prolonged sessions uncomfortable or anxiety-inducing.

Secondly, indirect bonding provides superior precision compared to direct bonding. The custom trays ensure that each bracket is placed exactly where it needs to be, reducing the likelihood of errors and subsequent adjustments. This precision leads to more effective tooth movement and potentially shorter overall treatment time—a significant benefit for children eager to complete their orthodontic journey as quickly as possible.

Additionally, since indirect bonding minimizes patient discomfort by reducing chair time and ensuring accurate placement from the start; it can lead to better compliance from young patients who might otherwise become restless or uncooperative during longer procedures. Enhanced patient comfort often translates into better treatment outcomes as well as a more positive experience overall for both child and parent alike!

In conclusion, while both direct and indirect bonding techniques have their merits; indirect bonding stands out as an advantageous method for pediatric orthodontics due to its efficiency; accuracy; reduction of chair time; and improvement of overall patient comfort; leading towards smoother; more effective orthodontic treatment experiences!

## **The process of fitting brackets on children's teeth —**

- [Understanding brackets: Types and functions in orthodontic treatment](#)

- **The process of fitting brackets on children's teeth**
- **How brackets contribute to the alignment and movement of teeth**
- **Benefits of early orthodontic intervention with brackets for kids**
- **Common issues and solutions related to brackets in pediatric orthodontics**
- **The role of parental support during orthodontic treatment with brackets**
- **Long-term effects and maintenance after bracket removal**

Indirect bonding is a precise and efficient technique used in orthodontics to position brackets on teeth. This method involves several steps that take place both in the lab and in the patient's mouth. Here's a step-by-step breakdown of the process, presented in a simple and engaging manner:

Firstly, we kickstart the process by taking impressions of the patient's teeth. This is done using a dental alginate or silicone material to create an accurate mold. The impression captures the unique topography of the patient's teeth and surrounding soft tissues.

Next, we move to the lab where the impressions are used to create plaster or stone models. These models are exact replicas of the patient's dental arches, serving as a foundation for precise bracket placement.

Once the models are ready, it's time for bracket placement. This step is crucial as it determines the final position of the teeth. The orthodontist carefully positions each bracket on the model, ensuring they are in the ideal spot to achieve the desired tooth movement.

After bracket placement, we fabricate a transfer tray. This tray is made using a clear, flexible material that fits snugly over the model with the brackets. The tray serves as a carrier for the brackets, allowing them to be transferred accurately onto the patient's teeth.

Now comes the bonding part—the climax of our procedure. We apply a special adhesive to the base of each bracket within the transfer tray. Then, we seat this tray securely onto the patient's teeth. A curing light is used to harden the adhesive, firmly bonding each bracket to its corresponding tooth surface. Once set, we gently remove from transfer tray leaving behind perfectly positioned brackets! Any excess adhesive is cleaned up and voila! Our indirect bonding procedure is complete!

Indirect bonding might seem like a lengthy process, but it truly enhances efficiency and accuracy when placing orthodontic brackets compared to direct bonding techniques where each bracket placed singularly without preparation!

## **How brackets contribute to the alignment and movement of teeth**

Indirect bonding is a technique used in orthodontics to place brackets on teeth using a custom tray, rather than placing each bracket individually. When it comes to treating children, this method offers several compelling benefits that make it an attractive option for orthodontists and parents alike.

One of the most significant advantages of indirect bonding is the reduced chair time. Traditional direct bonding involves placing each bracket on the tooth individually, which can be time-consuming and often requires multiple appointments. With indirect bonding,

a model of the child's teeth is created digitally or physically using impressions or scans taken beforehand .The brackets are then placed on this model precisely where they need to be positioned before being transferred simultaneously onto the child's teeth using custom trays designed specifically for them . This process significantly cuts down on chair time, making it easier for children to sit through appointments without becoming restless or anxious.

Another key benefit is improved accuracy. The indirect bonding process allows orthodontists to plan and visualize the exact placement of each bracket beforehand on models away from patient environment . This ensures optimal positioning and reduces the chances of error compared to direct bonding methods where adjustments are made directly in the mouth . By having precise control over bracket positioning, orthodontists can achieve better treatment outcomes, leading to more effective and efficient tooth movement..

Indirect bonding also offers less discomfort for young patients during their visit . As all brackets are positioned simultaneously with a transfer tray , there is no need for prolonged periods of keeping their mouths open while clinicians work on individual teeth one by one .. This minimizes patient discomfort and makes the experience more pleasant overall .Additionally , since precise placement reduces adjustment needs , subsequent appointments may also be shorter and more comfortable .

Moreover ,indirect bonding can also help improve communication between orthodontist , patients and their guardians . Seeing a visual representation beforehand helps explain intended movements and expected results clearly .. This understanding fosters cooperation from young patients during their treatment journey ..

In conclusion ,indirect bonding techniques offer numerous benefits when used in orthodontic treatment for kids .. These include reduced chair time ,improved accuracy ,less discomfort during procedures along with better communication avenues .. All these

factors combined contribute towards creating positive experiences while achieving desired clinical outcomes effectively .. Hence incorporating this technique into paediatric orthodontic practices should be considered strongly by dental professionals .

# **Benefits of early orthodontic intervention with brackets for kids**

Indirect bonding techniques in pediatric orthodontic treatment have gained popularity due to their precision and efficiency. However, like any other method, they come with their own set of challenges and limitations.

One of the primary challenges is the learning curve for orthodontists. Indirect bonding requires a different approach compared to traditional direct bonding. Orthodontists need to familiarize themselves with new procedures such as impression taking, model pouring, bracket positioning on models, and transfer tray fabrication. This learning process can be time-consuming and may initially lead to longer treatment times until the orthodontist becomes proficient.

Another significant challenge is the potential for errors during the transfer process. Any discrepancies in impression taking or tray fabrication can lead to inaccuracies in bracket placement, which can ultimately affect treatment outcomes. Additionally, the multi-step laboratory process involved in indirect bonding can introduce more opportunities for

human error compared to direct bonding methods.

Cost is another limitation that cannot be overlooked. Indirect bonding often involves additional laboratory fees for model pouring and tray fabrication. These added expenses can make the overall treatment more costly for patients or their families. Furthermore, if errors occur during the indirect bonding process, there may be additional costs associated with correcting these mistakes.

Patient cooperation is also a crucial factor to consider. Pediatric patients may find it challenging to tolerate the longer chair time required for impression taking and tray fitting. Movement during these procedures can compromise accuracy, leading to less than ideal bracket positioning.

Moreover, indirect bonding techniques might not be suitable for all types of malocclusions or individual tooth positions. For instance, severely rotated or impacted teeth may not lend themselves well to this method due to difficulties in accurate bracket placement on models.

In conclusion, while indirect bonding techniques offer several advantages such as improved accuracy and efficiency once mastered, they also present unique challenges and limitations that must be considered by orthodontists when planning pediatric orthodontic treatments. Addressing these challenges through continuous education and technological advancements can help mitigate some of these drawbacks and enhance treatment outcomes for young patients.

# Common issues and solutions related to brackets in pediatric orthodontics

Indirect bonding techniques have emerged as an effective approach within orthodontics for kids when precision placement is desired without needing multiple lengthy sessions directly inside their mouth which can cause discomfort especially among anxious patients who require extra reassurance during treatment process . This method involves creating customized bracket transfers outside oral cavity which ensures optimal accuracy thus enhancing overall efficiency by reducing chairside adjustments later required during actual procedure itself maximizing comfortability levels experienced by young patients involved throughout entire healthcare journey . Below are real examples illustrating successful usage indirect bondies applied towards orthodontic therapy aimed specifically target younger demographic : Case Study One : A young patient aged nine years old presented malocclusion issues characterized primarily upper arch crowding alongside noticeable overjet problem affecting self esteem negatively causing social interactions become challenging task due visible dental misalignment apparent whenever smiled broadly revealing uneven teeth arrangement beneath lips resulting feel conscious appearance whenever interact public settings without covering mouth constantly hands whenever laughing openly amongst peers . Orthodontist decided utilize indirect bonding instead traditional direct method because child expressed significant anxiety regarding prolonged treatments done directly inside oral cavity making alternative choice better suited current emotional state needed address effectively while ensuring minimal stress inducing factors present throughout entire corrective phase . Customized bracket system created based detailed impressions taken initially prior beginning actual braces placement

procedure allowing precise transfer appliances onto surface enamel accurately aligning positions predetermined treatment plan . As result entire bonding process completed efficiently single appointment minimizing further extended visits traditional methods might entail providing child positive experience fostering trust relationship healthcare provider ensuring continued compliance rest treatment duration until desired outcome achieved finally yielding beautifully aligned smile boosting confidence levels exponentially once braces removed post completion successful intervention demonstrating effectiveness indirect techniques deployed effectively throughout corrective journey . Case Study Two : Another example involves ten year old patient exhibiting severe crowding lower arch coupled deep bite causing functional difficulties chewing foods properly impacting nutritional intake adversely besides hindering proper speech articulation due misaligned dentition affecting tongue placement necessary produce certain phonetic sounds correctly . Given complexity case requiring highly accurate bracket positioning coupled young age involved which made prolonged direct bonding session challenging option both patient caregiver alike , indirect techniques employed instead after obtaining comprehensive diagnostic records including detailed impressions used fabricate custom transfer trays ensuring precision fitment brackets onto teeth surfaces predetermined optimal positions based precise measurements taken initially during preparatory stages planning phase prior actual bonding appointment itself . Outcome resulted efficient single visit placement braces minimizing discomfort patient might experience otherwise if subjected lengthy direct sessions while achieving desired alignment goals ultimately transforming crowded lower arch into well balanced functional occlusion enabling improved chewing abilities alongside enhanced speech clarity due corrected alignment pattern observed post completion successful treatment course again highlighting benefits gained utilizing advanced indirect bonding methods tailored specifically cater needs young orthodontic patients efficiently delivering effective results without compromising comfort levels required ensure positive overall healthcare journey experienced throughout entire duration .

# **The role of parental support during orthodontic treatment with brackets**

Indirect bonding techniques have long been a cornerstone of orthodontic treatment, offering a precise and efficient way to position brackets on teeth. As we look towards the future, several advancements and trends are poised to revolutionize this field, with digital innovations leading the charge.

One of the most significant advancements is the integration of 3D printing technology. Traditional indirect bonding methods involve creating physical impressions of teeth, which can be time-consuming and prone to errors. With 3D printing, orthodontists can now create highly accurate digital models of a patient's dentition. These models are then used to fabricate custom trays that perfectly fit over the teeth, ensuring that brackets are placed with unparalleled precision. This not only improves the accuracy of bracket placement but also streamlines the workflow, reducing chair time and enhancing patient comfort.

Another key trend is the use of Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) technology. CAD/CAM systems allow orthodontists to design

and manufacture custom appliances with exceptional detail and accuracy. By digitally planning the placement of each bracket, orthodontists can achieve more predictable outcomes and reduce the need for mid-treatment adjustments. This technology also enables better communication with patients, as they can visualize their treatment plan through detailed digital simulations.

The rise of Artificial Intelligence (AI) and machine learning is also set to transform indirect bonding techniques. AI algorithms can analyze vast amounts of patient data to suggest optimal bracket positions based on previous successful cases. This data-driven approach can lead to more personalized treatment plans that take into account individual variations in tooth shape, size, and alignment. Additionally, AI can assist in predicting treatment outcomes more accurately, helping orthodontists make informed decisions from the outset.

In terms of materials science, there is ongoing research into developing new adhesives that provide stronger bonds while being gentler on tooth enamel. Advances in biocompatible materials could lead to less invasive bonding procedures that reduce damage to teeth during both application and removal phases. This is particularly important for patients who may require multiple rounds of orthodontic treatment over their lifetime.

Furthermore, augmented reality (AR) is emerging as a tool for enhancing both training and clinical practice in indirect bonding techniques. AR can provide real-time guidance during bracket placement by overlaying digital information onto physical structures viewed through AR glasses or mobile devices. This technology holds promise for improving precision and consistency in bracket positioning while also serving as an educational tool for new practitioners learning complex techniques.

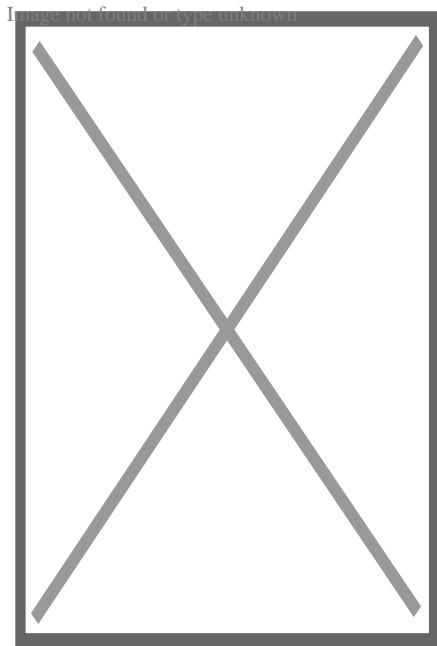
Lastly, teleorthodontics—the remote monitoring and management of orthodontic treatment—is becoming increasingly popular due to advances in communication technologies. Patients equipped with smartphones or tablets can send progress photos or videos directly to their orthodontist for evaluation without needing frequent office visits. This trend not only increases convenience for patients but also allows practitioners to track progress more closely than ever before, ensuring timely interventions if needed during indirect bonding treatments or adjustments thereafter.

In conclusion, future trends in indirect bonding techniques are shaped by rapid advancements in digital technologies such as

## **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



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

**Occupation**

- Dentist
- Dental Surgeon
- Doctor

**Names**

[1][nb 1]

**Occupation type** Profession

**Activity sectors** Health care, Anatomy, Physiology, Pathology, Medicine, Pharmacology, Surgery

**Description**

**Competencies**

**Education required** Dental Degree

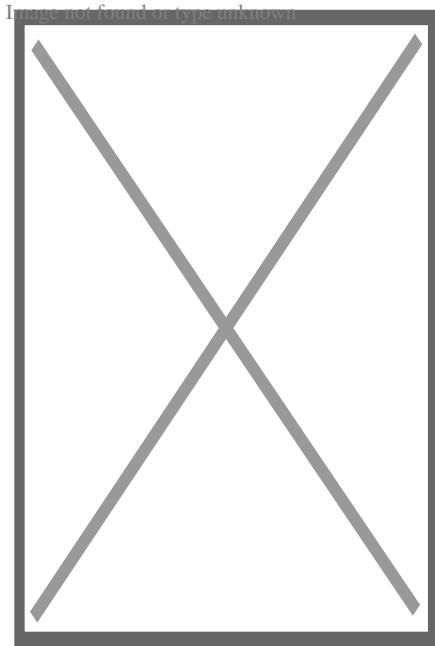
**Fields of  
employment**

**Related jobs**

**ICD-9-CM** 23-24

**MeSH** D003813

[edit on Wikidata]



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.<sup>[2]</sup> 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.<sup>[3]</sup> 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.<sup>[4]</sup> 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.<sup>[5]</sup>

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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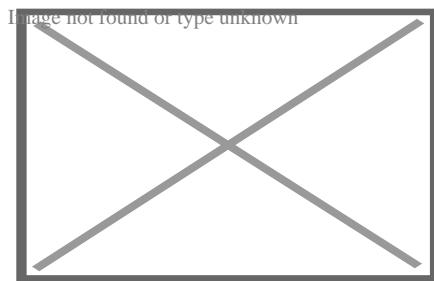
## Dental treatment

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Dentistry usually encompasses practices related to the oral cavity.<sup>7</sup> 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.<sup>8</sup>

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<sup>[9]</sup>

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.



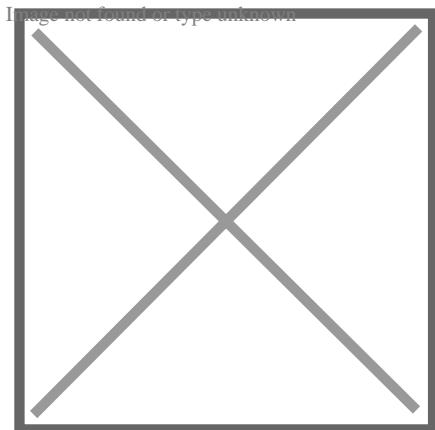
Irreversible enamel defects caused by an untreated celiac disease. They may be the only clue to its diagnosis, even in absence of gastrointestinal symptoms, but are often confused with fluorosis, tetracycline discoloration, acid reflux or other causes.<sup>[10][11][12]</sup> The National Institutes of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

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.<sup>[7][10][13][14]</sup> 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".

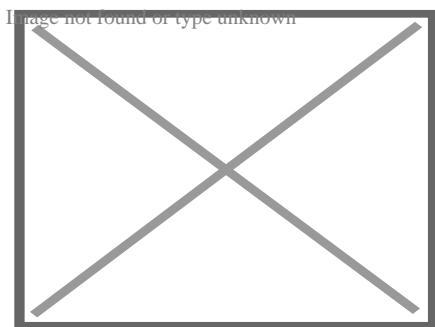
## Education and licensing

[edit]

Main article: Dentistry throughout the world



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.<sup>[15]</sup> 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.<sup>[16]</sup> The Philadelphia College of Dental Surgery followed in 1852.<sup>[17]</sup> In 1907, Temple University accepted a bid to incorporate the school.

Studies show that dentists that graduated from different countries<sup>[18]</sup> or even from different dental schools in one country<sup>[19]</sup> 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.<sup>[20]</sup>

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<sup>[21]</sup>. The British Dentists Act of 1878 and the 1879 Dentists Register limited the title of "dentist" and "dental surgeon" to qualified and registered practitioners.<sup>[22][23]</sup> However, others could legally describe themselves as "dental experts" or "dental consultants".<sup>[24]</sup> The practice of dentistry in the United Kingdom became fully regulated with the 1921 Dentists Act, which required the registration of anyone practising dentistry.<sup>[25]</sup> The British Dental Association, formed in 1880 with Sir John Tomes as president, played a major role in prosecuting dentists practising illegally.<sup>[22]</sup> 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.<sup>[26]</sup> 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.

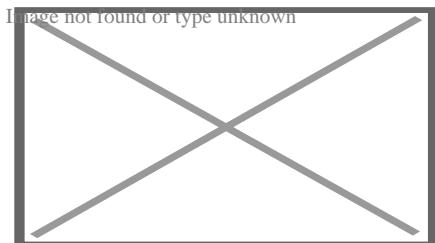
All dentists in the United States undergo at least three years of undergraduate studies, but nearly all complete a bachelor's degree. This schooling is followed by four years of dental school to qualify as a "Doctor of Dental Surgery" (DDS) or "Doctor of Dental Medicine" (DMD). Specialization in dentistry 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.<sup>[27]</sup>

## Specialties

[edit]

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:

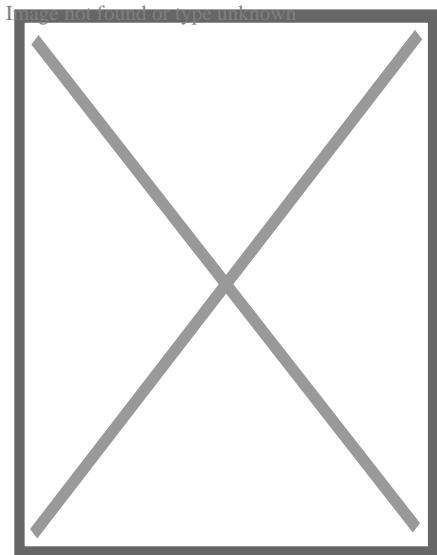
- Anesthesiology<sup>[28]</sup> – The specialty of dentistry that deals with the advanced use of general anesthesia, sedation and pain management to facilitate dental procedures.
- Cosmetic dentistry – Focuses on improving the appearance of the mouth, teeth and smile.
- Dental public health – The study of epidemiology and social health policies relevant to oral health.
- Endodontics (also called *endodontontology*) – 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.<sup>[nb 2]</sup>
- 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.<sup>[29]</sup> 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.<sup>[30][31]</sup>

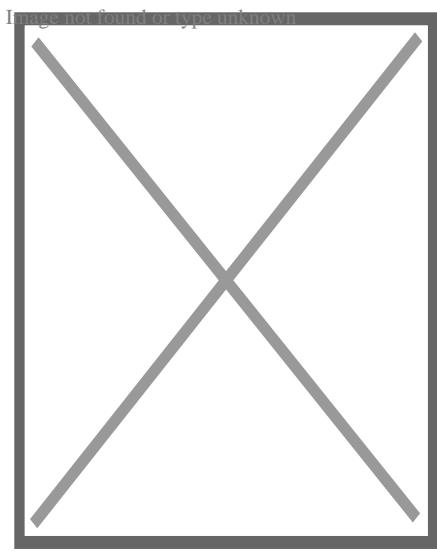
## History

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See also: History of dental treatments



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



*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).<sup>[32]</sup> An infected tooth from Italy partially cleaned with flint tools, between 13,820 and 14,160 years old, represents the oldest known dentistry.<sup>[33]</sup> although a 2017 study suggests that 130,000 years ago the Neanderthals already used rudimentary dentistry tools.<sup>[34]</sup> In Italy evidence dated to the Paleolithic, around 13,000 years ago, points to bitumen used to fill a tooth.<sup>[35]</sup> and in Neolithic Slovenia, 6500 years ago, beeswax was used to

close a fracture in a tooth.<sup>[36]</sup> The Indus valley has yielded evidence of dentistry being practised as far back as 7000 BC, during the Stone Age.<sup>[37]</sup> 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.<sup>[3]</sup> The reconstruction of this ancient form of dentistry showed that the methods used were reliable and effective.<sup>[38]</sup> The earliest dental filling, made of beeswax, was discovered in Slovenia and dates from 6500 years ago.<sup>[39]</sup> 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.<sup>[40]</sup>

An ancient Sumerian text describes a "tooth worm" as the cause of dental caries.<sup>[41]</sup> 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*,<sup>[42]</sup> and as late as the 14th century AD the surgeon Guy de Chauliac still promoted the belief that worms cause tooth decay.<sup>[43]</sup>

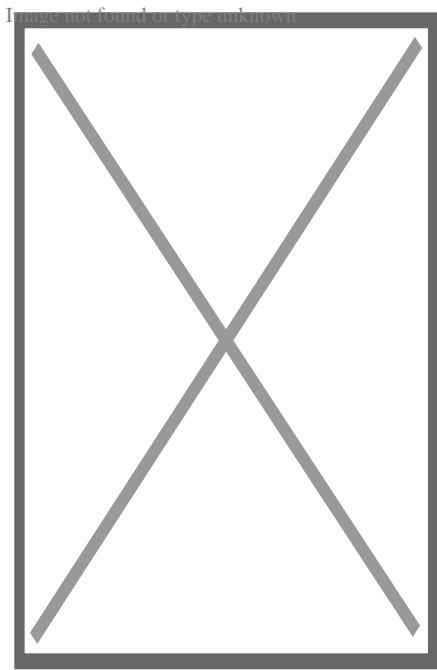
Recipes for the treatment of toothache, infections and loose teeth are spread throughout the Ebers Papyrus, Kahun Papyri, Brugsch Papyrus, and Hearst papyrus of Ancient Egypt.<sup>[44]</sup> The Edwin Smith Papyrus, written in the 17th century BC but which may reflect previous manuscripts from as early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

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.<sup>[48]</sup> 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.<sup>[49][50][51]</sup> The Romans had likely borrowed this technique by the 5th century BC.<sup>[50][52]</sup> The Phoenicians crafted dentures during the 6th–4th century BC, fashioning them from gold wire and incorporating two ivory teeth.<sup>[53]</sup> 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.<sup>[54]</sup> 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.<sup>[55]</sup><sup>[56]</sup>

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.<sup>[57]</sup> 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.<sup>[58]</sup>

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<sup>[59]</sup> (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<sup>[60]</sup> which, in turn, was replaced by modern forceps in the 19th century.<sup>[61]</sup>



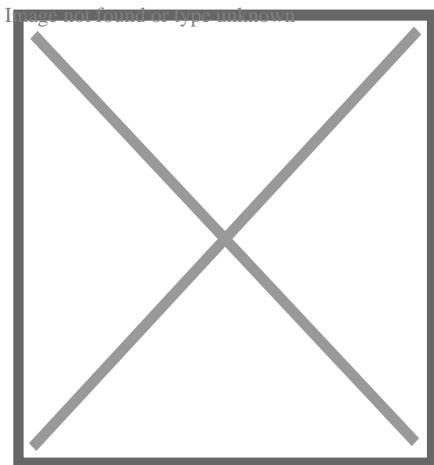
Dental needle-nose pliers designed by Fauchard in the late 17th century to use in prosthodontics

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

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.<sup>[62]</sup>

## Modern dentistry

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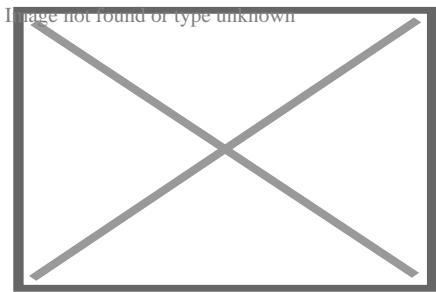


A microscopic device used in dental analysis, c. 1907

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:

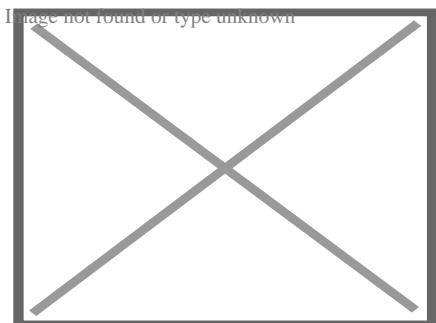
The Egyptian Mummies that I have seen, have had their Mouths open, and somewhat gaping, which affordeth a good opportunity to view and observe their Teeth, wherein 'tis not easie to find any wanting or decayed: and therefore in Egypt, where one Man practised but one Operation, or the Diseases but of 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.<sup>[63][64]</sup>



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".<sup>[63]</sup><sup>[64]</sup>



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.<sup>[65]</sup>

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.<sup>[66]</sup>

## 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.<sup>[67]</sup> 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.<sup>[68]</sup> 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.<sup>[69]</sup> While a majority of the tools do not exceed 75 dBA,<sup>[70]</sup> prolonged exposure over many years can lead to hearing loss or complaints of tinnitus.<sup>[71]</sup> Few dentists have reported using personal hearing

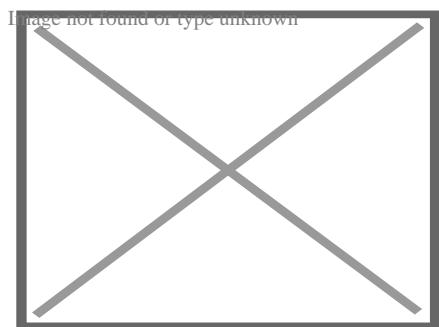
protective devices,[<sup>72</sup>][<sup>73</sup>] which could offset any potential hearing loss or tinnitus.

## Evidence-based dentistry

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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.[<sup>74</sup>] 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.



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.<sup>[75]</sup> This necessitates the need for a scientific and professional basis of care with a foundation of extensive research-based education.<sup>[76]</sup> According to some experts, the accreditation of dental schools can enhance the quality and professionalism of dental education.<sup>[77][78]</sup>

## See also

[edit]

icon Medicine portal

- 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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Cleft lip and cleft palate

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- Smile Train
- Transforming Faces Worldwide
- Smile Angel Foundation (China)

### **Related specialities**

### **Related syndromes**

### **National and international organisations**

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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

- Emory
- Fairleigh Dickinson
- Georgetown
- Defunct** ○ Harris
- American dental schools** ○ Loyola  
○ Northwestern  
○ Ohio College  
○ Oral Roberts  
○ Pennsylvania College  
○ Wash U  
○ Alberta  
○ British Columbia  
○ Dalhousie  
○ Laval  
○ Manitoba  
○ McGill  
○ Montréal  
○ Saskatchewan  
○ Toronto  
○ Western  
○ 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
- Canadian dental schools**
- British dental schools**

**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

- 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
- Allergy / Immunology
- Angiology
- Cardiology
- Endocrinology
- Gastroenterology
  - Hepatology
- Geriatrics
- Hematology
- Hospital medicine
- Infectious diseases
- Nephrology
- Oncology
- Pulmonology
- Rheumatology

## **Surgery**

## **Internal medicine**

## 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
- Alternative medicine
- Allied health
- Molecular oncology
- Nanomedicine
- Personalized medicine
- Public health

## Related topics

- Rural health
- Therapy
- Traditional medicine
- Veterinary medicine
- Physician
  - Chief physician
- History of medicine

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## Frequently Asked Questions

\*\* Is indirect bonding technique affects orthodontics treatment cost?\*\*

\*\* Indirect bonding technique may affect orthodontics treatment cost slightly more expensive due required lab work involved however cost varies depends upon various factors such region , clinic , extent treatment plan best thing discuss financial aspect concern directly consulting orthodontists

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**Orthodontic treatment for children**

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