

- **Linking Orthodontics with Periodontal Health**

Linking Orthodontics with Periodontal Health Coordinating with Oral Surgeons for Jaw Corrections Integrating Pediatric Dentistry for Early Intervention Combining Endodontic Care in Complex Cases Collaborative Planning with Prosthodontists Sharing Diagnostic Data Across Multiple Specialists Addressing Aesthetic and Functional Goals Together Communication Strategies Among Dental Teams Balancing Orthodontic Solutions and Restorative Needs Encouraging Holistic Treatment Approaches Managing Patients with Special Medical Conditions Efficient Referrals That Improve Patient Outcomes

- **AI Driven Aligners That Predict Movement**

AI Driven Aligners That Predict Movement Cloud Based Case Tracking for Efficient Management Digital Impressions That Replace Traditional Molds Virtual Consultations for Remote Care 3D Printing Applications in Orthodontic Appliances Teledentistry and Its Impact on Patient Convenience Software Innovations for Treatment Simulations Aligning Treatment Goals with Technological Advances Advantages of Using Digital Models in Planning Modern Approaches to Virtual Monitoring Reducing Errors Through Computerized Analysis The Future of Orthodontics in a Digital Era

- **About Us**



Okay, so let's talk about remote monitoring for young ortho patients – a topic that's pretty cool when you think about it. I mean, picture being a kid with braces. You're already dealing with the whole metal-mouth situation, and then you have to factor in all those trips to the orthodontist. Now, imagine if some of those appointments could happen from your own home. That's where remote monitoring comes in.

Orthodontic treatment can help improve your child's smile Pediatric orthodontic care tooth.

For these young patients, think about the biggest benefit: convenience. Less time spent in the ortho's chair means more time for school, sports, hanging out with friends, or just being a kid. It cuts down on missed school days, which is a win for everyone, especially parents who are juggling work and family. Plus, let's be honest, sometimes getting to the orthodontist is a logistical nightmare, especially if you live far away or have a packed schedule. Remote monitoring just makes life easier.

But it's not just about convenience. There's also the potential for better treatment. With regular remote check-ins, the orthodontist can spot potential issues early on, like a bracket that's come loose or a problem with the alignment. Catching these things early can prevent bigger problems down the road and maybe even shorten the overall treatment time. That's a big deal when you're a kid counting down the days until you can finally ditch the braces.

Of course, there are some things to consider. It takes a bit of tech-savviness, both from the patient and their parents, to use the monitoring system correctly. But honestly, most kids these days are practically born with a smartphone in their hand, so that's usually not a huge hurdle. And it's important to remember that remote monitoring isn't a replacement for all in-person appointments. You'll still need to see your orthodontist regularly.

But all in all, remote monitoring is a really promising tool for making orthodontic treatment more convenient, efficient, and maybe even a little less stressful for young patients. It's all about using technology to make things a little bit easier for kids going through a pretty significant life change.

*** Common periodontal issues in children undergoing orthodontic treatment. —**

- * The interplay between orthodontic forces and periodontal tissues in young patients.

- * Common periodontal issues in children undergoing orthodontic treatment.
- * Preventive measures to maintain periodontal health during orthodontic treatment.
- * The role of oral hygiene instructions for children and parental involvement.
- * Early detection and management of periodontal problems during orthodontic care.
- * Collaboration between orthodontists and periodontists for optimal outcomes.

Okay, let's talk tech behind keeping an eye on your teeth straightening from afar. Virtual orthodontic monitoring, it's not just waving a magic wand, right? It's a blend of a few key technologies working together to give orthodontists a good view of your progress without you having to trek to the office every other week.

Think of it like this: at the heart of it all, you've got the intraoral scanner or a smartphone with a pretty decent camera. These are your image capturing tools. The scanner, especially, creates highly detailed 3D models of your teeth. That's gold for an orthodontist because it's like having a virtual cast they can manipulate and examine closely on their computer. Smartphone images, while maybe not quite as precise, are increasingly sophisticated and, when used with the right software and guidance, can provide valuable visual information.

Then comes the crucial part: the software. This isn't just any old photo editing program. We're talking about sophisticated platforms designed specifically for orthodontics. These programs can analyze the images, compare them to previous scans or photos, and even highlight potential issues. They can measure tooth movement, assess aligner fit, and flag things that might need closer attention. Some even use AI to help with the analysis, learning from thousands of cases to identify patterns and predict potential problems.

And finally, you need a secure and reliable communication platform. This allows you to easily upload your images or scans, and for your orthodontist to provide feedback and instructions. This might be a dedicated app, a secure web portal, or even just encrypted email. The key is that it needs to be user-friendly and protect your privacy.

So, it's not just one whiz-bang gadget, but a combination of imaging technology, specialized software, and a secure communication channel that makes virtual orthodontic monitoring a viable and effective approach. And as these technologies continue to improve, virtual monitoring is only going to become more accurate, efficient, and convenient for both patients and orthodontists.

*** Preventive measures to maintain periodontal health during orthodontic treatment.**

Okay, so you're thinking about virtual monitoring, right? And a big part of that is the virtual consultation. It's not just about slapping a sensor on someone and staring at a screen. It's about a real conversation, even if it's happening remotely. Think of it like this: you wouldn't just hand someone a prescription without understanding their symptoms, would you? Virtual consultations are the same principle, just adapted for the digital age.

The whole thing usually kicks off with some kind of preparation. Maybe the patient fills out a questionnaire online, or uploads some basic health data. This gives you, the practitioner, a head start. Step two is the actual virtual meeting. It could be a video call, a phone call, or even a secure messaging thread. The important thing is that you're actively listening, asking questions, and building a rapport. You're trying to understand their specific needs and challenges.

Next comes the assessment phase. This is where that pre-collected data comes in handy, alongside anything you've gleaned from the conversation. You might look at their activity levels, sleep patterns, or blood pressure readings, all gathered remotely. But it's crucial to remember that these are just data points. They need to be interpreted in the context of the individual's overall health and lifestyle.

Then comes the plan. Based on the assessment, you work *with* the patient to create a personalized monitoring and management strategy. This could involve setting goals, adjusting medication, or recommending lifestyle changes. The key is collaboration. They need to feel like they're an active participant in their own care. Finally, there's the ongoing monitoring and follow-up. This isn't a one-and-done deal. It's about regularly checking in, reviewing progress, and making adjustments as needed. It's about using the data to inform the conversation, and the conversation to improve their health. It's a human-centered approach, just delivered virtually.

*** The role of oral hygiene instructions for children and parental involvement.**

Let's be honest, when we talk about virtual monitoring, it all boils down to two big questions: Can we trust it? And how well does it actually work? That boils down to accuracy and reliability, right? I mean, what's the point of a fancy virtual system telling you everything's sunshine and roses if your actual servers are melting down?

Modern approaches to virtual monitoring are trying to tackle these challenges head-on. We're not just talking about simple ping checks anymore. Now, we've got AI-powered anomaly detection that can learn the normal behavior of your systems and flag anything that seems off, even if it's not a hard-and-fast error. That's a big step up in accuracy because it catches subtle problems before they snowball.

But accuracy alone isn't enough. A system can be incredibly precise in measuring something, but if it crashes every five minutes, it's utterly unreliable. That's where things like distributed architectures and redundant data collection come in. Modern virtual monitoring is often spread across multiple locations, so if one part fails, the rest keeps chugging along. Data is duplicated, so you don't lose crucial information if a server hiccups. These things significantly boost reliability.

The cool part is how the technology is evolving. Think about things like eBPF, which allows you to monitor kernel-level events without adding a ton of overhead. Or the increasing sophistication of log analysis tools that can sift through mountains of data to pinpoint the root cause of an issue. All of these things contribute to making virtual monitoring more accurate and more reliable.

Of course, it's not a perfect world. Virtual monitoring is still just that – virtual. It's an abstraction of reality. You're relying on the accuracy of the sensors and the integrity of the network. But the modern approaches, with their focus on intelligent analysis and robust infrastructure, are getting closer to offering a truly reliable and accurate view of what's happening in your virtual environment. And that, in turn, gives you more confidence in your systems and helps you sleep a little easier at night.

*** Early detection and management of periodontal problems during orthodontic care.**

Let's be honest, moving healthcare into the digital realm can feel a little, well, unsettling. Especially when we're talking about our kids. Parents are naturally wired to be protective, and the idea of relying on virtual monitoring, instead of face-to-face appointments, can trigger a whole host of anxieties. And kids? They might just miss the stickers!

One of the biggest concerns I hear is about connection. Will a doctor truly be able to understand my child's needs through a screen? Will they pick up on subtle cues, the way they do in person? It's a valid worry. The warmth and empathy of a human touch can seem irreplaceable. So, we need to emphasize the 'human' in virtual care. This means training healthcare providers in effective virtual communication – actively listening, making eye contact (through the camera, of course!), and reassuring both parent and child. It's about fostering a strong, trusting relationship, even from a distance.

Then there's the tech itself. Some parents are intimidated by the technology, worried they won't be able to set up the monitoring devices correctly or troubleshoot issues. And kids? Well, they might be more tech-savvy than us, but they still need guidance. Simplifying the technology is key. Making it user-friendly, with clear instructions and readily available technical support, can alleviate a lot of stress. Think simple interfaces, helpful tutorials, and readily accessible support lines manned by real, patient people.

Privacy and data security are, rightfully, also top of mind. Parents need to know their child's information is safe and secure. Transparency is paramount. We need to be upfront about how data is collected, stored, and used. Emphasizing the safeguards in place – robust encryption, strict access

controls, and adherence to privacy regulations – can help build trust.

Finally, let's not forget the kids themselves. Explain to them, in age-appropriate terms, what virtual monitoring is and why it's being used. Make it fun! Gamify the experience, perhaps offering virtual rewards for consistent participation. Involve them in the process, letting them help set up the devices or track their progress. When kids feel empowered and engaged, they're more likely to embrace virtual care.

Ultimately, addressing concerns about virtual care is about communication, transparency, and empathy. It's about acknowledging the anxieties, providing reassurance, and building trust. By focusing on the human element and simplifying the technology, we can make virtual monitoring a positive and effective experience for both parents and children.

*** Collaboration between orthodontists and periodontists for optimal outcomes.**

Okay, so picture this: you've got a well-oiled machine, a traditional medical practice humming along, seeing patients face-to-face, doing things the way they've always been done. But the world's changing, right? And sometimes, sticking *only* to the old ways means missing out. That's where virtual monitoring comes in. It's not about replacing the traditional, it's about layering in something new, something that can actually *boost* what you're already doing.

Think of it as giving your patients a little digital lifeline between appointments. Instead of waiting for that quarterly check-up to flag a concerning blood pressure spike, you can have a device at their home gently keeping watch. A smart scale tracking weight, a wearable monitoring heart rate – simple tools that feed information back to your team. Suddenly, you're not just reacting to problems, you're proactively seeing potential issues *before* they become big problems.

Now, I know what some might think: too much tech, too impersonal. But it doesn't have to be! It's about finding the right balance. Virtual monitoring can actually free up time during those face-to-face appointments. You're not spending as much time gathering basic data because it's already there, waiting for you. You can focus on the real stuff: listening to the patient, understanding their concerns, and tailoring a plan that truly works for them.

And honestly, for some patients, especially those with chronic conditions or those who struggle to get to the clinic regularly, virtual monitoring can be a game-changer. It empowers them to take a more active role in their own health, knowing they're being watched over, even from afar. It's not just about the data; it's about building a stronger, more connected relationship, even with a little bit of tech in the mix. It's about taking the best of the old and blending it seamlessly with the promise of the new.

Okay, so picture this: it's not too far off from what we're already seeing, but instead of dragging your kiddo to the orthodontist every few weeks, a whole chunk of their check-ups happen...virtually. We're talking about the future of virtual monitoring in pediatric orthodontics, and honestly, it's pretty exciting.

Think about it. For busy parents, the convenience factor alone is huge. No more missed work, no more scrambling for childcare, just a quick scan of their teeth with a smartphone app at home. The orthodontist can then review the images, track progress, and provide feedback remotely. This could really streamline treatment, especially for simpler cases.

But it's not just about convenience. Virtual monitoring could also lead to earlier detection of potential problems. Imagine catching a minor issue before it balloons into something that requires way more intervention. That's a win for everyone, right? Plus, it could potentially lower the cost of treatment in the long run, with fewer in-office appointments needed.

Of course, there are challenges. Making sure the technology is user-friendly for both parents and kids is key. And we need to ensure the quality of the scans is good enough for accurate assessment. Data

privacy and security are also crucial considerations.

But overall, the future looks bright. Virtual monitoring has the potential to make orthodontic treatment more accessible, convenient, and efficient for kids and their families. It's about leveraging technology to improve their experience and ultimately, their smiles. And that's something to smile about, indeed.

About dentistry

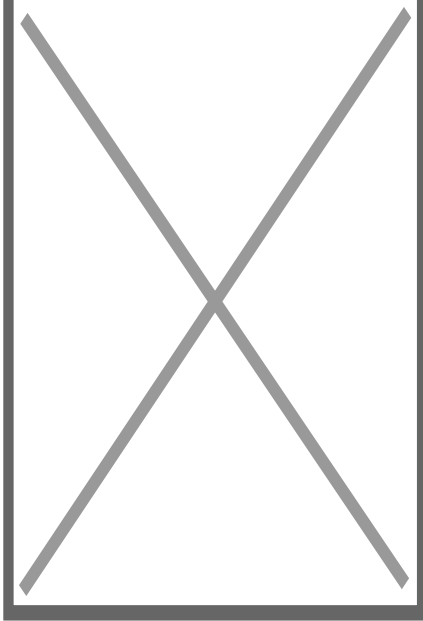
- Sub-Millimeter Surgical Dexterity
- Knowledge of human health, disease, pathology, and anatomy
- Communication/Interpersonal Skills
- Analytical Skills
- Critical Thinking
- Empathy/Professionalism

- Private practices
- Primary care clinics
- Hospitals

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

Dentistry

Image not found or type unknown



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

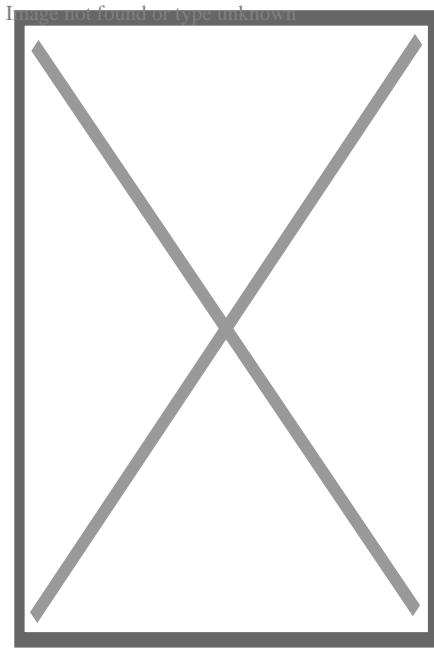
Fields of employment

Related jobs

ICD-9-CM 23-24

MeSH D003813

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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

[edit]

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:

ὀδοντολογία, *odon* 'tooth' + *logia* 'study') – the study of the structure, development, and abnormalities of the teeth.

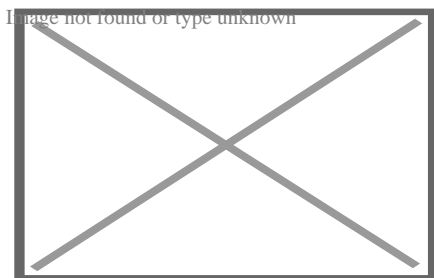
Dental treatment

[edit]

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.



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

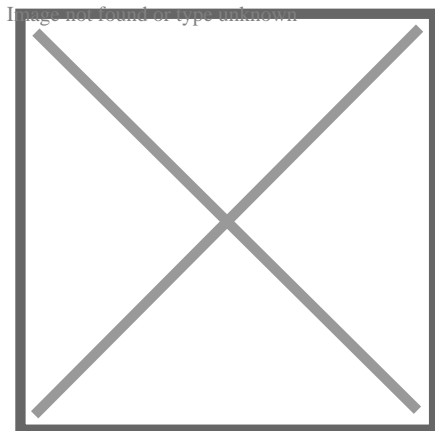
confused with fluorosis, tetracycline discoloration, acid reflux or other causes.^{[10][11][12]}
] The National Institutes of Health include a dental exam in the diagnostic protocol of celiac disease.^[10]

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".

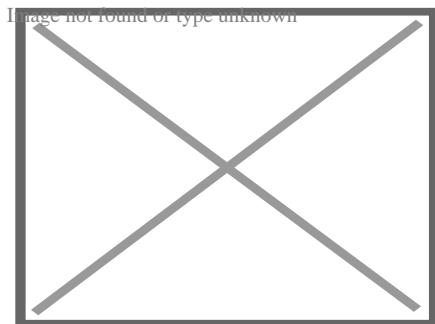
Education and licensing

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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.^[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.

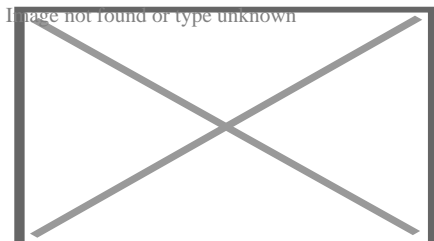
In many countries, dentists usually complete between five and eight years of post-secondary education before practising. Though not mandatory, many dentists choose to complete an internship or residency focusing on specific aspects of dental care after they have received their dental degree. In a few 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, BDSd) 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

[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^[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

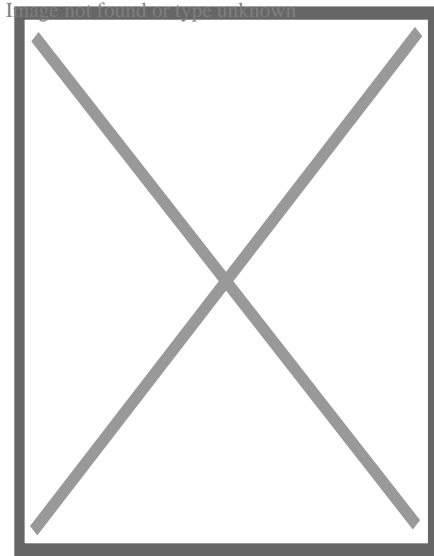
works as an individual consultant or as a member of the Sports Medicine Team.

- Veterinary dentistry – The field of dentistry applied to the care of animals. It is a specialty of veterinary medicine.^[30]^[31]

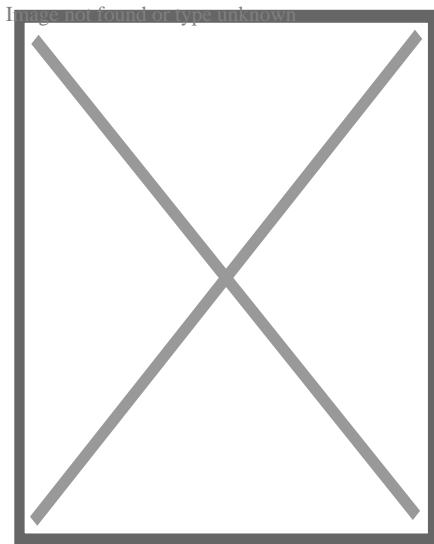
History

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See also: History of dental treatments



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).^[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]

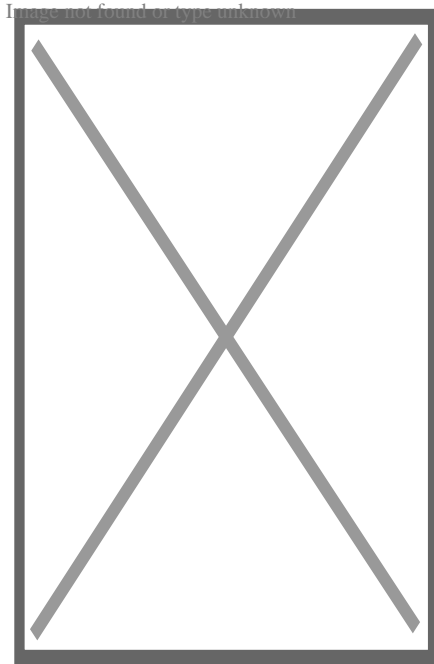
Recipes for the treatment of toothache, infections and loose teeth are spread throughout the Ebers Papyrus, Kahun Papyri, Brugsch Papyrus, and Hearst papyrus of Ancient Egypt.^[44] The Edwin Smith Papyrus, written in the 17th century BC but which may reflect previous manuscripts from as early as 3000 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]



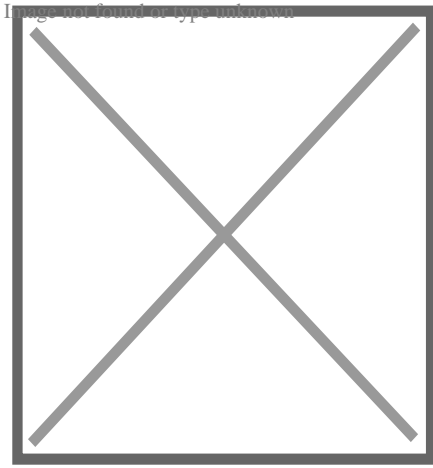
Dental needle-nose pliers designed by Fauchard in the late 17th century to use in prosthodontics

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

[edit]

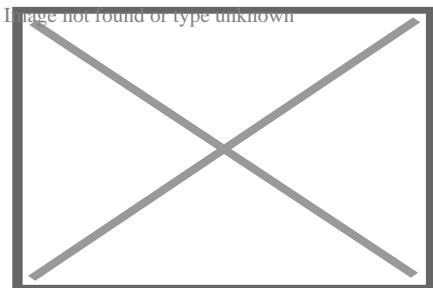


A microscopic device used in dental analysis, c. 1907

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.

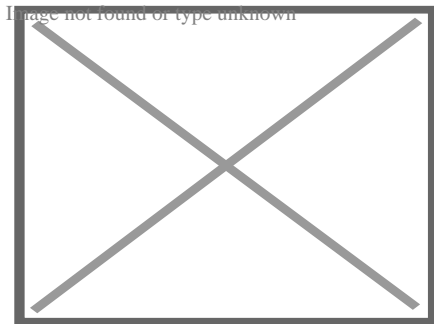
The French surgeon Pierre Fauchard became known as the "father of modern dentistry". Despite the limitations of the primitive surgical instruments during the late 17th and early 18th century, Fauchard was a highly skilled surgeon who made remarkable improvisations of dental instruments, often adapting 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]



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.

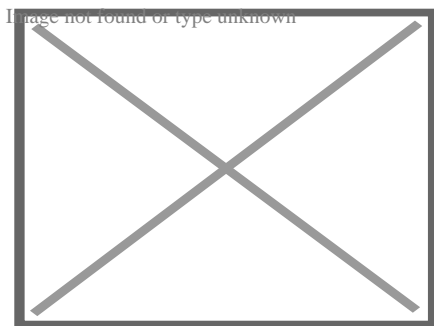
Within the field of dentistry, a variety of cleaning tools are used including piezoelectric and sonic scalers, and ultrasonic scalers and cleaners.^[69] While a majority of the tools do not exceed 75 dBA,^[70] prolonged exposure over many years can lead to hearing loss or complaints of tinnitus.^[71] 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.



A dental chair at the University of Michigan School of Dentistry

Ethical and medicolegal issues

[edit]

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

[edit]

-  [Medicine portal](#) Image found on a page unknown
- 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

[edit]

- [^] 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).
- [^] 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

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- 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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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
- Pacific Northwest
- Rutgers
- South Carolina

**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






- Radiology
 - Interventional radiology

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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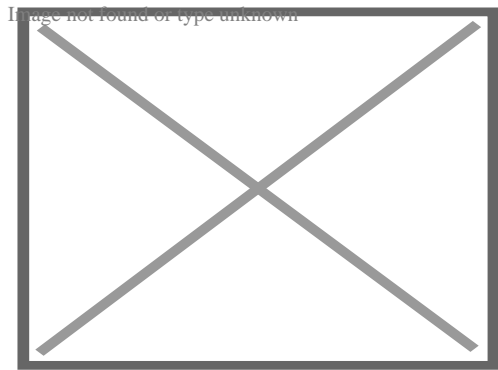
- Germany
- United States
- France
- BnF data
- Czech Republic
- Latvia
- Israel

Other

- Historical Dictionary of Switzerland
- NARA

About orthodontics

Orthodontics



Connecting the arch-wire on brackets with wire

Occupation	
Names	Orthodontist
Occupation type	Specialty
Activity sectors	Dentistry
Description	
Education required	Dental degree, specialty training
Fields of employment	Private practices, hospitals

Orthodontics^[a]^[b] is a dentistry specialty that addresses the diagnosis, prevention, management, and correction of mal-positioned teeth and jaws, as well as misaligned bite patterns.^[2] It may also address the modification of facial growth, known as **dentofacial orthopedics**.

Abnormal alignment of the teeth and jaws is very common. The approximate worldwide prevalence of malocclusion was as high as 56%.^[3] However, conclusive scientific evidence for the health benefits of orthodontic treatment is lacking, although patients with completed treatment have reported a higher quality of life than that of untreated patients undergoing orthodontic treatment.^[4]^[5] The main reason for the prevalence of these malocclusions is diets with less fresh fruit and vegetables and overall softer foods in childhood, causing smaller jaws with less room for the teeth to erupt.^[6] Treatment may require several months to a few years and entails using dental braces and other appliances to gradually adjust tooth position and jaw alignment. In cases where the malocclusion is severe, jaw surgery may be incorporated into the treatment plan. Treatment usually begins before a person reaches adulthood, insofar as pre-adult bones may be adjusted more easily

before adulthood.

History

[edit]

Though it was rare until the Industrial Revolution,^[7] there is evidence of the issue of overcrowded, irregular, and protruding teeth afflicting individuals. Evidence from Greek and Etruscan materials suggests that attempts to treat this disorder date back to 1000 BC, showcasing primitive yet impressively well-crafted orthodontic appliances. In the 18th and 19th centuries, a range of devices for the "regulation" of teeth were described by various dentistry authors who occasionally put them into practice.^[8] As a modern science, orthodontics dates back to the mid-1800s.^[9] The field's influential contributors include Norman William Kingsley^[9] (1829–1913) and Edward Angle^[10] (1855–1930). Angle created the first basic system for classifying malocclusions, a system that remains in use today.^[9]

Beginning in the mid-1800s, Norman Kingsley published *Oral Deformities*, which is now credited as one of the first works to begin systematically documenting orthodontics. Being a major presence in American dentistry during the latter half of the 19th century, not only was Kingsley one of the early users of extraoral force to correct protruding teeth, but he was also one of the pioneers for treating cleft palates and associated issues. During the era of orthodontics under Kingsley and his colleagues, the treatment was focused on straightening teeth and creating facial harmony. Ignoring occlusal relationships, it was typical to remove teeth for a variety of dental issues, such as malalignment or overcrowding. The concept of an intact dentition was not widely appreciated in those days, making bite correlations seem irrelevant.^[8]

In the late 1800s, the concept of occlusion was essential for creating reliable prosthetic replacement teeth. This idea was further refined and ultimately applied in various ways when dealing with healthy dental structures as well. As these concepts of prosthetic occlusion progressed, it became an invaluable tool for dentistry.^[8]

It was in 1890 that the work and impact of Dr. Edwards H. Angle began to be felt, with his contribution to modern orthodontics particularly noteworthy. Initially focused on prosthodontics, he taught in Pennsylvania and Minnesota before directing his attention towards dental occlusion and the treatments needed to maintain it as a normal condition, thus becoming known as the "father of modern orthodontics".^[8]

By the beginning of the 20th century, orthodontics had become more than just the straightening of crooked teeth. The concept of ideal occlusion, as postulated by Angle and incorporated into a classification system, enabled a shift towards treating malocclusion, which is any deviation from normal occlusion.^[8] Having a full set of teeth on both arches was highly sought after in orthodontic treatment due to the need for exact relationships between them. Extraction as an orthodontic procedure was heavily opposed by Angle and those who followed him. As occlusion became the key priority, facial proportions and aesthetics were neglected. To achieve ideal occlusals without using external forces, Angle postulated that having perfect occlusion was the best way to gain optimum facial aesthetics.^[8]

With the passing of time, it became quite evident that even an exceptional occlusion was not suitable when considered from an aesthetic point of view. Not only were there issues related to aesthetics, but it usually proved impossible to keep a precise occlusal relationship achieved by forcing teeth together over extended durations with the use of robust elastics, something Angle and his students had previously suggested. Charles Tweed^[11] in America and Raymond Begg^[12] in Australia (who both studied under Angle) re-introduced dentistry extraction into orthodontics during the 1940s and 1950s so they could improve facial esthetics while also ensuring better stability concerning occlusal relationships.^[13]

In the postwar period, cephalometric radiography^[14] started to be used by orthodontists for measuring changes in tooth and jaw position caused by growth and treatment.^[15] The x-rays showed that many Class II and III malocclusions were due to improper jaw relations as opposed to misaligned teeth. It became evident that orthodontic therapy could adjust mandibular development, leading to the formation of functional jaw orthopedics in Europe and extraoral force measures in the US. These days, both functional appliances and extraoral devices are applied around the globe with the aim of amending growth patterns and forms. Consequently, pursuing true, or at least improved, jaw relationships had become the main objective of treatment by the mid-20th century.^[8]

At the beginning of the twentieth century, orthodontics was in need of an upgrade. The American Journal of Orthodontics was created for this purpose in 1915; before it, there were no scientific objectives to follow, nor any precise classification system and brackets that lacked features.^[16]

Until the mid-1970s, braces were made by wrapping metal around each tooth.^[9] With advancements in adhesives, it became possible to instead bond metal brackets to the teeth.^[9]

In 1972, Lawrence F. Andrews gave an insightful definition of the ideal occlusion in permanent teeth. This has had meaningful effects on orthodontic treatments that are administered regularly,^[16] and these are: 1. Correct interarchal relationships 2. Correct crown angulation (tip) 3. Correct crown inclination (torque) 4. No rotations 5. Tight contact points 6. Flat Curve of Spee (0.0–2.5 mm),^[17] and based on these principles, he discovered a treatment system called the straight-wire appliance system, or the pre-adjusted edgewise system. Introduced in 1976, Larry Andrews' pre-adjusted edgewise appliance, more commonly known as the straight wire appliance, has since revolutionized fixed orthodontic treatment. The advantage of the design lies in its bracket and archwire combination, which requires only minimal wire bending from the orthodontist or clinician. It's aptly named after this feature: the angle of the slot and thickness of the bracket base ultimately determine where each tooth is situated with little need for extra manipulation.^{[18][19][20]}

Prior to the invention of a straight wire appliance, orthodontists were utilizing a non-programmed standard edgewise fixed appliance system, or Begg's pin and tube system. Both of these systems employed identical brackets for each tooth and necessitated the bending of an archwire in three planes for locating teeth in their desired positions, with these bends dictating ultimate placements.^[18]

Evolution of the current orthodontic appliances

[edit]

When it comes to orthodontic appliances, they are divided into two types: removable and fixed. Removable appliances can be taken on and off by the patient as required. On the other hand, fixed appliances cannot be taken off as they remain bonded to the teeth during treatment.

Fixed appliances

[edit]

Fixed orthodontic appliances are predominantly derived from the edgewise appliance approach, which typically begins with round wires before transitioning to rectangular archwires for improving tooth alignment. These rectangular wires promote precision in the positioning of teeth following initial treatment. In contrast to the Begg appliance, which was based solely on round wires and auxiliary springs, the Tip-Edge system emerged in the early 21st century. This innovative technology allowed for the utilization of rectangular archwires to precisely control tooth movement during the finishing stages after initial treatment with round wires. Thus, almost all modern fixed appliances can be considered variations on this edgewise appliance system.

Early 20th-century orthodontist Edward Angle made a major contribution to the world of dentistry. He created four distinct appliance systems that have been used as the basis for many orthodontic treatments today, barring a few exceptions. They are E-arch, pin and tube, ribbon arch, and edgewise systems.

E-arch

[edit]

Edward H. Angle made a significant contribution to the dental field when he released the 7th edition of his book in 1907, which outlined his theories and detailed his technique. This approach was founded upon the iconic "E-Arch" or 'the-arch' shape as well as inter-maxillary elastics.^[21] This device was different from any other appliance of its period as it featured a rigid framework to which teeth could be tied effectively in order to recreate an arch form that followed pre-defined dimensions.^[22] Molars were fitted with braces, and a powerful labial archwire was positioned around the arch. The wire ended in a thread, and to move it forward, an adjustable nut was used, which allowed for an increase in circumference. By ligation, each individual tooth was attached to this expansive archwire.^[8]

Pin and tube appliance

[edit]

Due to its limited range of motion, Angle was unable to achieve precise tooth positioning with an E-arch. In order to bypass this issue, he started using bands on other teeth combined with a vertical tube for each individual tooth. These tubes held a soldered pin, which could be repositioned at each appointment in order to move them in place.^[8] Dubbed the "bone-growing appliance", this

contraption was theorized to encourage healthier bone growth due to its potential for transferring force directly to the roots.^[23] However, implementing it proved troublesome in reality.

Ribbon arch

[edit]

Realizing that the pin and tube appliance was not easy to control, Angle developed a better option, the ribbon arch, which was much simpler to use. Most of its components were already prepared by the manufacturer, so it was significantly easier to manage than before. In order to attach the ribbon arch, the occlusal area of the bracket was opened. Brackets were only added to eight incisors and mandibular canines, as it would be impossible to insert the arch into both horizontal molar tubes and the vertical brackets of adjacent premolars. This lack of understanding posed a considerable challenge to dental professionals; they were unable to make corrections to an excessive Spee curve in bicuspid teeth.^[24] Despite the complexity of the situation, it was necessary for practitioners to find a resolution. Unparalleled to its counterparts, what made the ribbon arch instantly popular was that its archwire had remarkable spring qualities and could be utilized to accurately align teeth that were misaligned. However, a major drawback of this device was its inability to effectively control root position since it did not have enough resilience to generate the torque movements required for setting roots in their new place.^[8]

Edgewise appliance

[edit]

In an effort to rectify the issues with the ribbon arch, Angle shifted the orientation of its slot from vertical, instead making it horizontal. In addition, he swapped out the wire and replaced it with a precious metal wire that was rotated by 90 degrees in relation—henceforth known as Edgewise.^[25] Following extensive trials, it was concluded that dimensions of 22 × 28 mils were optimal for obtaining excellent control over crown and root positioning across all three planes of space.^[26] After debuting in 1928, this appliance quickly became one of the mainstays for multibanded fixed therapy, although ribbon arches continued to be utilized for another decade or so beyond this point too.^[8]

Labiolingual

[edit]

Prior to Angle, the idea of fitting attachments on individual teeth had not been thought of, and in his lifetime, his concern for precisely positioning each tooth was not highly appraised. In addition to using fingersprings for repositioning teeth with a range of removable devices, two main appliance systems were very popular in the early part of the 20th century. Labiolingual appliances use bands on the first molars joined with heavy lingual and labial archwires affixed with soldered fingersprings

to shift single teeth.

Twin wire

[edit]

Utilizing bands around both incisors and molars, a twin-wire appliance was designed to provide alignment between these teeth. Constructed with two 10-mil steel archwires, its delicate features were safeguarded by lengthy tubes stretching from molars towards canines. Despite its efforts, it had limited capacity for movement without further modifications, rendering it obsolete in modern orthodontic practice.

Begg's Appliance

[edit]

Returning to Australia in the 1920s, the renowned orthodontist, Raymond Begg, applied his knowledge of ribbon arch appliances, which he had learned from the Angle School. On top of this, Begg recognized that extracting teeth was sometimes vital for successful outcomes and sought to modify the ribbon arch appliance to provide more control when dealing with root positioning. In the late 1930s, Begg developed his adaptation of the appliance, which took three forms. Firstly, a high-strength 16-mil round stainless steel wire replaced the original precious metal ribbon arch. Secondly, he kept the same ribbon arch bracket but inverted it so that it pointed toward the gums instead of away from them. Lastly, auxiliary springs were added to control root movement. This resulted in what would come to be known as the Begg Appliance. With this design, friction was decreased since contact between wire and bracket was minimal, and binding was minimized due to tipping and uprighting being used for anchorage control, which lessened contact angles between wires and corners of the bracket.

Tip-Edge System

[edit]

Begg's influence is still seen in modern appliances, such as Tip-Edge brackets. This type of bracket incorporates a rectangular slot cutaway on one side to allow for crown tipping with no incisal deflection of an archwire, allowing teeth to be tipped during space closure and then uprighted through auxiliary springs or even a rectangular wire for torque purposes in finishing. At the initial stages of treatment, small-diameter steel archwires should be used when working with Tip-Edge brackets.

Contemporary edgewise systems

[edit]

Throughout time, there has been a shift in which appliances are favored by dentists. In particular, during the 1960s, when it was introduced, the Begg appliance gained wide popularity due to its efficiency compared to edgewise appliances of that era; it could produce the same results with less investment on the dentist's part. Nevertheless, since then, there have been advances in technology and sophistication in edgewise appliances, which led to the opposite conclusion: nowadays, edgewise appliances are more efficient than the Begg appliance, thus explaining why it is commonly used.

Automatic rotational control

[edit]

At the beginning, Angle attached eyelets to the edges of archwires so that they could be held with ligatures and help manage rotations. Now, however, no extra ligature is needed due to either twin brackets or single brackets that have added wings touching underneath the wire (Lewis or Lang brackets). Both types of brackets simplify the process of obtaining moments that control movements along a particular plane of space.

Alteration in bracket slot dimensions

[edit]

In modern dentistry, two types of edgewise appliances exist: the 18- and 22-slot varieties. While these appliances are used differently, the introduction of a 20-slot device with more precise features has been considered but not pursued yet.^[27]

Straight-wire bracket prescriptions

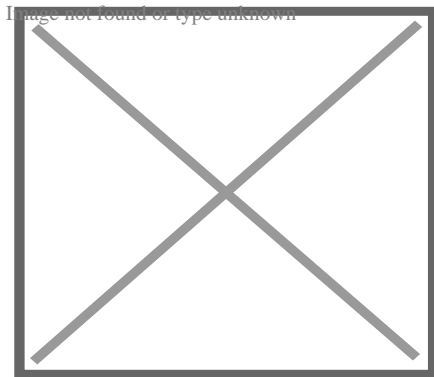
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Rather than rely on the same bracket for all teeth, L.F. Andrews found a way to make different brackets for each tooth in the 1980s, thanks to the increased convenience of bonding.^[28] This adjustment enabled him to avoid having multiple bends in archwires that would have been needed to make up for variations in tooth anatomy. Ultimately, this led to what was termed a "straight-wire appliance" system – an edgewise appliance that greatly enhanced its efficiency.^[29] The modern edgewise appliance has slightly different construction than the original one. Instead of relying on faciolingual bends to accommodate variations among teeth, each bracket has a correspondingly varying base thickness depending on the tooth it is intended for. However, due to individual differences between teeth, this does not completely eliminate the need for compensating bends.^[30]] Accurately placing the roots of many teeth requires angling brackets in relation to the long axis of the tooth. Traditionally, this mesiodistal root positioning necessitated using second-order, or tip, bends along the archwire. However, angling the bracket or bracket slot eliminates this need for bends.

Given the discrepancies in inclination of facial surfaces across individual teeth, placing a twist, otherwise known as third-order or torque bends, into segments of each rectangular archwire was initially required with the edgewise appliance. These bends were necessary for all patients and wires, not just to avoid any unintentional movement of suitably placed teeth or when moving roots facially or lingually. Angulation of either brackets or slots can minimize the need for second-order or tip bends on archwires. Contemporary edgewise appliances come with brackets designed to adjust for any facial inclinations, thereby eliminating or reducing any third-order bends. These brackets already have angulation and torque values built in so that each rectangular archwire can be contorted to form a custom fit without inadvertently shifting any correctly positioned teeth. Without bracket angulation and torque, second-order or tip bends would still be required on each patient's archwire.

Methods

[edit]



Upper and lower jaw functional expanders

A typical treatment for incorrectly positioned teeth (malocclusion) takes from one to two years, with braces being adjusted every four to 10 weeks by orthodontists,^[31] while university-trained dental specialists are versed in the prevention, diagnosis, and treatment of dental and facial irregularities. Orthodontists offer a wide range of treatment options to straighten crooked teeth, fix irregular bites, and align the jaws correctly.^[32] There are many ways to adjust malocclusion. In growing patients, there are more options to treat skeletal discrepancies, either by promoting or restricting growth using functional appliances, orthodontic headgear, or a reverse pull facemask. Most orthodontic work begins in the early permanent dentition stage before skeletal growth is completed. If skeletal growth has completed, jaw surgery is an option. Sometimes teeth are extracted to aid the orthodontic treatment (teeth are extracted in about half of all the cases, most commonly the premolars).^[33]

Orthodontic therapy may include the use of fixed or removable appliances. Most orthodontic therapy is delivered using appliances that are fixed in place,^[34] for example, braces that are adhesively bonded to the teeth. Fixed appliances may provide greater mechanical control of the teeth; optimal treatment outcomes are improved by using fixed appliances.

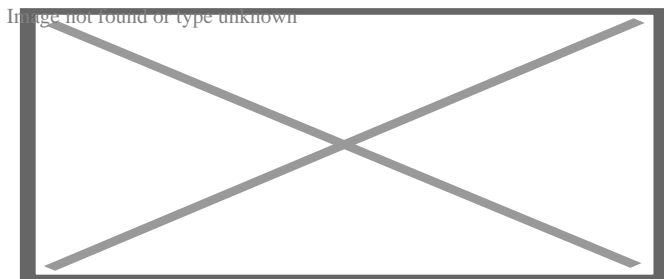
Fixed appliances may be used, for example, to rotate teeth if they do not fit the arch shape of the other teeth in the mouth, to adjust multiple teeth to different places, to change the tooth angle of

teeth, or to change the position of a tooth's root. This treatment course is not preferred where a patient has poor oral hygiene, as decalcification, tooth decay, or other complications may result. If a patient is unmotivated (insofar as treatment takes several months and requires commitment to oral hygiene), or if malocclusions are mild.

The biology of tooth movement and how advances in gene therapy and molecular biology technology may shape the future of orthodontic treatment.[³⁵]

Braces

[edit]



Dental braces

Braces are usually placed on the front side of the teeth, but they may also be placed on the side facing the tongue (called lingual braces). Brackets made out of stainless steel or porcelain are bonded to the center of the teeth using an adhesive. Wires are placed in a slot in the brackets, which allows for controlled movement in all three dimensions.

Apart from wires, forces can be applied using elastic bands,[³⁶] and springs may be used to push teeth apart or to close a gap. Several teeth may be tied together with ligatures, and different kinds of hooks can be placed to allow for connecting an elastic band.[³⁷][³⁶]

Clear aligners are an alternative to braces, but insufficient evidence exists to determine their effectiveness.[³⁸]

Treatment duration

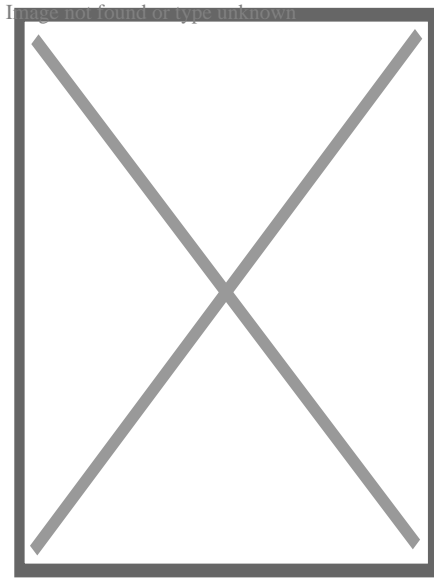
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The time required for braces varies from person to person as it depends on the severity of the problem, the amount of room available, the distance the teeth must travel, the health of the teeth, gums, and supporting bone, and how closely the patient follows instructions. On average, however, once the braces are put on, they usually remain in place for one to three years. After braces are removed, most patients will need to wear a retainer all the time for the first six months, then only during sleep for many years.[³⁹]

Headgear

[edit]

Orthodontic headgear, sometimes referred to as an "extra-oral appliance", is a treatment approach that requires the patient to have a device strapped onto their head to help correct malocclusion—typically used when the teeth do not align properly. Headgear is most often used along with braces or other orthodontic appliances. While braces correct the position of teeth, orthodontic headgear—which, as the name suggests, is worn on or strapped onto the patient's head—is most often added to orthodontic treatment to help alter the alignment of the jaw, although there are some situations in which such an appliance can help move teeth, particularly molars.



Full orthodontic headgear with headcap, fitting straps, facebow, and elastics

Whatever the purpose, orthodontic headgear works by exerting tension on the braces via hooks, a facebow, coils, elastic bands, metal orthodontic bands, and other attachable appliances directly into the patient's mouth. It is most effective for children and teenagers because their jaws are still developing and can be easily manipulated. (If an adult is fitted with headgear, it is usually to help correct the position of teeth that have shifted after other teeth have been extracted.) Thus, headgear is typically used to treat a number of jaw alignment or bite problems, such as overbite and underbite.^[40]

Palatal expansion

[edit]

Palatal expansion can be best achieved using a fixed tissue-borne appliance. Removable appliances can push teeth outward but are less effective at maxillary sutural expansion. The effects of a removable expander may look the same as they push teeth outward, but they should not be confused with actually expanding the palate. Proper palate expansion can create more space for teeth as well as improve both oral and nasal airflow.^[41]

Jaw surgery

[edit]

Jaw surgery may be required to fix severe malocclusions.^[42] The bone is broken during surgery and stabilized with titanium (or bioresorbable) plates and screws to allow for healing to take place.^[43] After surgery, regular orthodontic treatment is used to move the teeth into their final position.^[44]

During treatment

[edit]

To reduce pain during the orthodontic treatment, low-level laser therapy (LLLT), vibratory devices, chewing adjuncts, brainwave music, or cognitive behavioral therapy can be used. However, the supporting evidence is of low quality, and the results are inconclusive.^[45]

Post treatment

[edit]

After orthodontic treatment has been completed, there is a tendency for teeth to return, or relapse, back to their pre-treatment positions. Over 50% of patients have some reversion to pre-treatment positions within 10 years following treatment.^[46] To prevent relapse, the majority of patients will be offered a retainer once treatment has been completed and will benefit from wearing their retainers. Retainers can be either fixed or removable.

Removable retainers

[edit]

Removable retainers are made from clear plastic, and they are custom-fitted for the patient's mouth. It has a tight fit and holds all of the teeth in position. There are many types of brands for clear retainers, including Zendura Retainer, Essix Retainer, and Vivera Retainer.^[47] A Hawley retainer is also a removable orthodontic appliance made from a combination of plastic and metal that is custom-molded to fit the patient's mouth. Removable retainers will be worn for different periods of time, depending on the patient's need to stabilize the dentition.^[48]

Fixed retainers

[edit]

Fixed retainers are a simple wire fixed to the tongue-facing part of the incisors using dental adhesive and can be specifically useful to prevent rotation in incisors. Other types of fixed retainers can include labial or lingual braces, with brackets fixed to the teeth.^[48]

Palatal expander

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Palatal expander
Orthodontic headgear

○

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Orthodontic headgear
An X-ray taken for skull analysis

○

Image not found or type unknown

An X-ray taken for skull analysis

Top (left) and bottom retainers

○

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Top (left) and bottom retainers

Clear aligners

[edit]

Clear aligners are another form of orthodontics commonly used today, involving removable plastic trays. There has been controversy about the effectiveness of aligners such as Invisalign or Byte; some consider them to be faster and more freeing than the alternatives.^[49]

Training

[edit]

There are several specialty areas in dentistry, but the specialty of orthodontics was the first to be recognized within dentistry.^[50] Specifically, the American Dental Association recognized orthodontics as a specialty in the 1950s.^[50] Each country has its own system for training and registering orthodontic specialists.

Australia

[edit]

In Australia, to obtain an accredited three-year full-time university degree in orthodontics, one will need to be a qualified dentist (complete an AHPRA-registered general dental degree) with a minimum of two years of clinical experience. There are several universities in Australia that offer orthodontic programs: the University of Adelaide, the University of Melbourne, the University of Sydney, the University of Queensland, the University of Western Australia, and the University of Otago.^[51] Orthodontic courses are accredited by the Australian Dental Council and reviewed by the Australian Society of Orthodontists (ASO). Prospective applicants should obtain information from the relevant institution before applying for admission.^[52] After completing a degree in orthodontics, specialists are required to be registered with the Australian Health Practitioner Regulation Agency (AHPRA) in order to practice.^{[53][54]}

Bangladesh

[edit]

Dhaka Dental College in Bangladesh is one of the many schools recognized by the Bangladesh Medical and Dental Council (BM&DC) that offer post-graduation orthodontic courses.^[55]^[56] Before applying to any post-graduation training courses, an applicant must have completed the Bachelor of Dental Surgery (BDS) examination from any dental college.^[55] After application, the applicant must take an admissions test held by the specific college.^[55] If successful, selected candidates undergo training for six months.^[57]

Canada

[edit]

In Canada, obtaining a dental degree, such as a Doctor of Dental Surgery (DDS) or Doctor of Medical Dentistry (DMD), would be required before being accepted by a school for orthodontic training.^[58] Currently, there are 10 schools in the country offering the orthodontic specialty.^[58] Candidates should contact the individual school directly to obtain the most recent pre-requisites before entry.^[58] The Canadian Dental Association expects orthodontists to complete at least two years of post-doctoral, specialty training in orthodontics in an accredited program after graduating from their dental degree.

United States

[edit]

Similar to Canada, there are several colleges and universities in the United States that offer orthodontic programs. Every school has a different enrollment process, but every applicant is required to have graduated with a DDS or DMD from an accredited dental school.^[59]^[60] Entrance into an accredited orthodontics program is extremely competitive and begins by passing a national or state licensing exam.^[61]

The program generally lasts for two to three years, and by the final year, graduates are required to complete the written American Board of Orthodontics (ABO) exam.^[61] This exam is also broken down into two components: a written exam and a clinical exam.^[61] The written exam is a comprehensive exam that tests for the applicant's knowledge of basic sciences and clinical concepts.^[61] The clinical exam, however, consists of a Board Case Oral Examination (BCOE), a Case Report Examination (CRE), and a Case Report Oral Examination (CROE).^[61] Once certified, certification must then be renewed every ten years.^[61] Orthodontic programs can award a Master of Science degree, a Doctor of Science degree, or a Doctor of Philosophy degree, depending on the school and individual research requirements.^[62]

United Kingdom

[edit]



This section **relies largely or entirely on a single source**. Relevant discussion may be found on the talk page. Please help improve this article by introducing citations to additional sources.

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Throughout the United Kingdom, there are several Orthodontic Specialty Training Registrar posts available.^[63] The program is full-time for three years, and upon completion, trainees graduate with a degree at the Masters or Doctorate level.^[63] Training may take place within hospital departments that are linked to recognized dental schools.^[63] Obtaining a Certificate of Completion of Specialty Training (CCST) allows an orthodontic specialist to be registered under the General Dental Council (GDC).^[63] An orthodontic specialist can provide care within a primary care setting, but to work at a hospital as an orthodontic consultant, higher-level training is further required as a post-CCST trainee.^[63] To work within a university setting as an academic consultant, completing research toward obtaining a Ph.D. is also required.^[63]

See also

[edit]

- Orthodontic technology
- Orthodontic indices
- List of orthodontic functional appliances
- Molar distalization
- Mouth breathing
- Obligate nasal breathing

Notes

[edit]

- ↑ Also referred to as *orthodontia*
- ↑ "Orthodontics" comes from the Greek *orthos* ('correct, straight') and *-odont-* ('tooth').^[1]

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[edit]


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Orthodontics

Diagnosis

- Bolton analysis
- Cephalometric analysis
- Cephalometry
- Dentition analysis
- Failure of eruption of teeth
- Little's Irregularity Index
- Malocclusion
- Scissor bite
- Standard anatomical position
- Tooth ankylosis
- Tongue thrust

Conditions

- Overbite
- Overjet
- Open bite
- Crossbite
- Dental crowding
- Dental spacing
- Bimaxillary Protrusion
- Prognathism
- Retrognathism
- Maxillary hypoplasia
- Condylar hyperplasia
- Overeruption
- Mouth breathing
- Temporomandibular dysfunction

Appliances

- ACCO appliance
- Archwire
- Activator appliance
- Braces
- Damon system
- Elastics
- Frankel appliance
- Invisalign
- Lingual arch
- Lip bumper
- Herbst Appliance
- List of orthodontic functional appliances
- List of palatal expanders
- Lingual braces
- Headgear
- Orthodontic technology
- Orthodontic spacer
- Palatal lift prosthesis
- Palatal expander
- Quad helix
- Retainer
- SureSmile
- Self-ligating braces
- Splint activator
- Twin Block Appliance

Procedures

- Anchorage (orthodontics)
- Cantilever mechanics
- Fiberotomy
- Interproximal reduction
- Intrusion (orthodontics)
- Molar distalization
- SARPE
- Serial extraction

Materials

- Beta-titanium
- Nickel titanium
- Stainless steel
- TiMolium
- Elgiloy
- Ceramic
- Composite
- Dental elastics

- Edward Angle
- Spencer Atkinson
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- Birte Melsen
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- Robert M. Ricketts
- Alfred Paul Rogers
- Ronald Roth
- Everett Shapiro
- L. F. Andrews
- Frederick Lester Stanton
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Organizations

- American Association of Orthodontists
- American Board of Orthodontics
- British Orthodontic Society
- Canadian Association of Orthodontists
- Indian Orthodontic Society
- Italian Academy of Orthodontic Technology
- Society for Orthodontic Dental Technology (Germany)

Journals

- American Journal of Orthodontics and Dentofacial Orthopedics
- The Angle Orthodontist
- Journal of Orthodontics

Institution

- Angle School of Orthodontia

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Dentistry

Specialties

- Endodontics
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- 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

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- 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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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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