orthodontic treatment

- **Understanding Common Fee Structures in Orthodontics**
  Understanding Common Fee Structures in Orthodontics Insurance Coverage That Reduces Out of Pocket Costs Exploring Payment Plans and Financing Arrangements Differences Between Flexible Spending and Health Savings Factors Influencing Variations in Treatment Pricing Asking the Right Questions During Cost Consultations Allocation of Funds for Long Term Orthodontic Care Prioritizing Necessary Treatments Within a Budget Navigating Claims and Reimbursements Step by Step How Location Affects Orthodontic Expenses Educating Patients on Financial Planning for Treatment Strategies to Keep Future Costs Predictable
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Here's the article outline for 'Understanding Common Fee Structures in Orthodontics' focusing on orthodontic treatment for kids:

Insurance Coverage That Reduces Out of Pocket Costs for Orthodontic Treatment

Some children may need space maintainers to prevent crowding **Braces for kids and teens** dentist.

Navigating the world of orthodontic care for children can be financially challenging for many families. Fortunately, there are several insurance options and strategies that can help reduce the significant out-of-pocket expenses associated with braces and other orthodontic treatments.

Dental insurance plans often provide some level of coverage for orthodontic work, though the extent varies widely. Many plans offer partial coverage for children's orthodontic treatment, typically ranging from 25% to 50% of the total cost. Some employers offer specialized orthodontic riders that can significantly lower expenses, making treatment more accessible for families.

Health savings accounts (HSAs) and flexible spending accounts (FSAs) are another excellent way to manage orthodontic costs. These accounts allow families to set aside pre-tax dollars specifically for medical and dental expenses, effectively reducing the financial burden. By carefully planning and maximizing these accounts, parents can save hundreds or even thousands of dollars on treatment.

Some families might also explore alternative options like dental discount plans or orthodontic payment plans offered directly by practices. Many orthodontists now provide flexible financing options that break down the total cost into manageable monthly payments, making treatment more affordable for families with budget constraints.

It's worth noting that some insurance plans have age restrictions or specific requirements for orthodontic coverage. Children with documented medical necessity - such as severe bite misalignments or jaw issues - may qualify for more comprehensive coverage. Parents should carefully review their existing insurance policies and consult with their providers to understand the full range of available benefits.

By researching options, understanding insurance benefits, and exploring alternative payment strategies, families can significantly reduce the financial stress of orthodontic treatment. The key is to be proactive, ask questions, and carefully compare different coverage options to find the most cost-effective solution for their child's dental health needs.

Traditional Fee Structures: Per-Treatment Pricing Models

Understanding Orthodontic Coverage: A Parent's Guide to Dental Health and Financial Planning

As a parent, navigating the world of children's healthcare can feel like walking through a maze blindfolded. Orthodontic coverage is one of those critical areas that often gets overlooked, but can have significant implications for both your child's dental health and your family's financial well-being.

Let's be real - braces aren't just about creating a Hollywood smile. They're about correcting alignment issues that can impact speech, eating, and even long-term oral health. Misaligned teeth can lead to problems like uneven wear, difficulty cleaning, and potential jaw complications down the road.

Insurance plans that include robust orthodontic coverage can be a total game-changer for families. Without proper coverage, the cost of braces can range from $3,000 to $7,000 - a hefty price tag that can send most parents into sticker shock. By choosing an insurance plan with comprehensive orthodontic benefits, you're essentially creating a financial safety net that can save thousands of dollars.

But it's not just about the money. Early intervention can prevent more complex and expensive dental issues later in life. Think of orthodontic coverage as an investment in your child's health and confidence. Straight teeth aren't just cosmetic - they're a foundation for better overall oral hygiene and self-esteem.

When shopping for insurance, look for plans that offer significant orthodontic coverage, preferably with low out-of-pocket maximums. Some plans cover up to 50% of orthodontic treatment, which can make a massive difference in your family's budget.

The bottom line? Don't underestimate the importance of orthodontic coverage. It's not just an expense - it's a strategic investment in your child's health and future.

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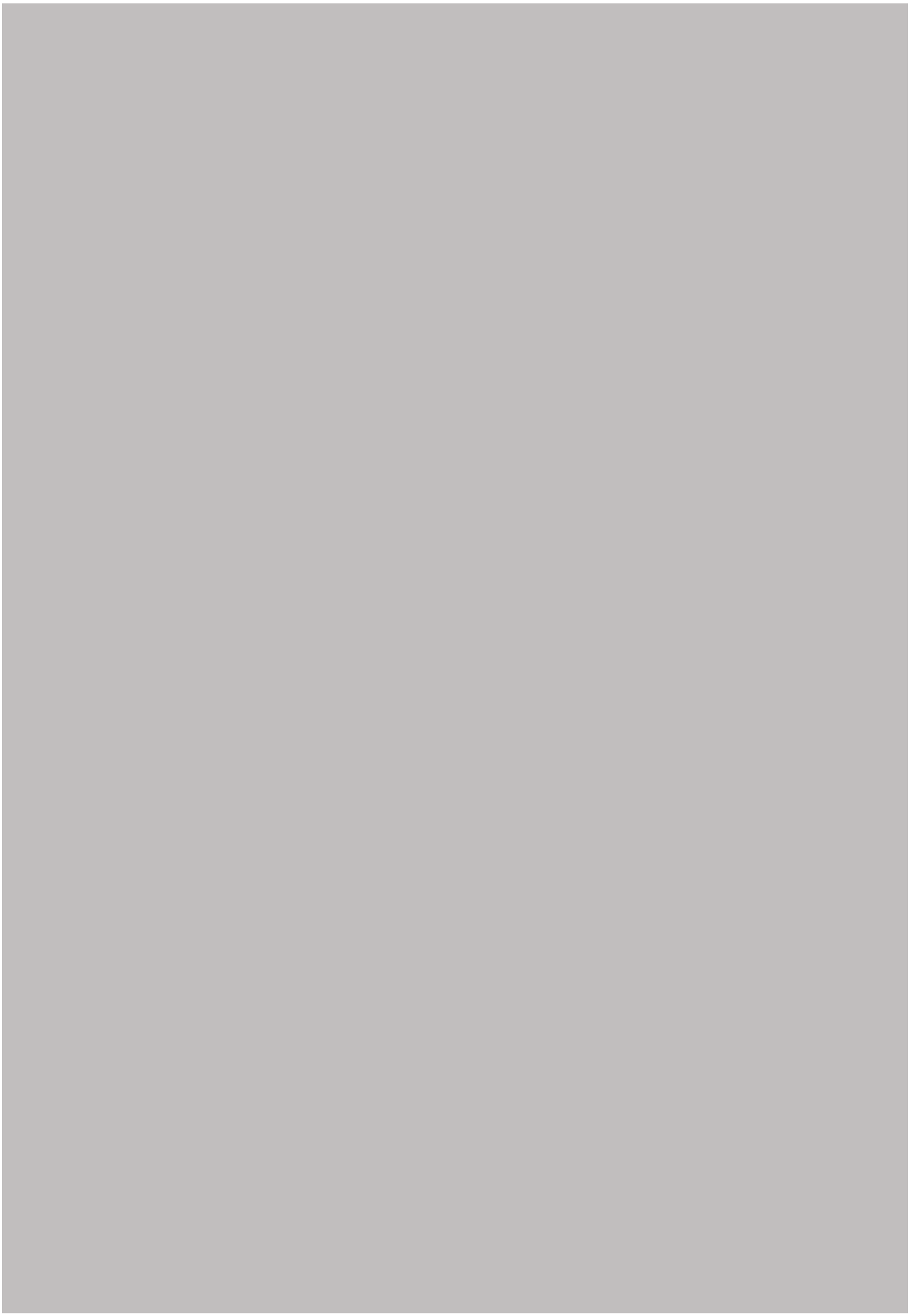

Insurance Coverage and Impact on Orthodontic Expenses

Navigating Orthodontic Insurance Coverage: Your Guide to Reducing Out-of-Pocket Costs

When it comes to orthodontic treatment, the cost can be overwhelming for many families and individuals. Fortunately, several types of dental insurance plans can help make straightening your teeth more affordable.

Traditional health insurance plans sometimes offer limited orthodontic coverage, but dental-specific plans tend to provide more comprehensive options. Many people find that dedicated dental insurance with orthodontic benefits can significantly reduce their out-of-pocket expenses. These plans typically cover a percentage of orthodontic treatment, which can range from 25% to 50% of total costs.

Supplemental orthodontic insurance is another smart option for those seeking additional financial support. These specialized plans can be purchased separately and often provide extra coverage beyond standard dental insurance. They're particularly useful for individuals who need more extensive orthodontic work but have limited coverage through their primary insurance.

When exploring your options, it's crucial to carefully review each plan's specifics. Some plans have age restrictions, waiting periods, or maximum lifetime benefits for orthodontic treatment. For instance, many plans offer better coverage for children and teenagers, with more limited options for adult orthodontics.

Employer-sponsored plans can also be an excellent source of orthodontic coverage. Some companies include robust dental benefits as part of their overall health insurance package, which can significantly reduce your personal expenses.

The key is to research and compare different plans, understand their specific terms, and choose the option that best meets your individual or family's orthodontic needs. Don't be afraid to ask insurance providers detailed questions about coverage, exclusions, and potential out-of-pocket costs.

By taking the time to understand your insurance options, you can make orthodontic treatment more financially manageable and achieve the smile you've always wanted.

Payment Plan Options for Pediatric Orthodontic Care

Navigating Orthodontic Insurance Coverage: Maximizing Your Benefits

When it comes to managing the costs of orthodontic treatment, understanding your employer-sponsored insurance options can be a game-changer. Many people don't realize the potential savings hidden within their workplace insurance plans, especially when it comes to dental and orthodontic coverage.

First, it's crucial to take a close look at your current insurance policy. Not all employer-sponsored plans are created equal, and some offer more comprehensive orthodontic benefits than others. Start by scheduling a meeting with your HR department or carefully reviewing your insurance documentation to understand exactly what's covered.

Many companies offer dental plans with orthodontic riders that can significantly reduce out-of-pocket expenses. These plans typically cover a percentage of orthodontic treatment, often

ranging from 25% to 50% of the total cost. Some employers even provide lifetime orthodontic benefits that can be used for both children and adults, which is a fantastic opportunity many people overlook.

Flexible spending accounts (FSAs) and health savings accounts (HSAs) can be powerful tools in your orthodontic coverage strategy. These accounts allow you to set aside pre-tax dollars specifically for medical and dental expenses, effectively reducing your overall treatment costs. If your employer offers these options, it's worth considering how they can complement your existing insurance coverage.

Timing is everything when it comes to maximizing your benefits. Some insurance plans have waiting periods or specific enrollment windows, so planning ahead is key. Consider discussing treatment options with your orthodontist and insurance provider to create a strategic approach that minimizes your out-of-pocket expenses.

Don't be afraid to ask questions and explore all available options. Many employees simply accept their initial insurance offering without investigating additional ways to reduce costs. Take the time to compare different plans, speak with insurance representatives, and understand the full scope of your coverage.

Ultimately, a proactive approach can save you thousands of dollars in orthodontic expenses. By carefully examining your employer-sponsored insurance options and understanding the nuances of your coverage, you can make informed decisions that significantly reduce your financial burden.

Remember, the goal is to make orthodontic treatment as accessible and affordable as possible. With a little research and strategic planning, you can unlock hidden savings and make your dream smile a reality without breaking the bank.

Factors Influencing Orthodontic Treatment Costs

Navigating the World of Pediatric Orthodontic Costs: A Parent's Guide to Insurance Savings

When it comes to children's dental health, orthodontic treatments can be a significant financial concern for many families. The cost of braces or other corrective dental procedures can feel overwhelming, but understanding insurance options can make a world of difference.

Typically, pediatric orthodontic treatments range from $3,000 to $7,000, depending on the complexity of the case and the type of treatment needed. Traditional metal braces tend to be on the lower end of the price spectrum, while more advanced options like clear aligners can push costs toward the higher end.

The good news is that many insurance plans now offer substantial coverage for orthodontic work. Dental insurance can often cover 25% to 50% of orthodontic expenses, which can translate to significant savings for families. Some employer-provided plans even offer specialized orthodontic riders that can reduce out-of-pocket costs even further.

Parents should carefully review their existing insurance policies and consider additional dental coverage. Many plans have waiting periods and specific age restrictions, so it's crucial to plan ahead. Some flexible spending accounts (FSAs) and health savings accounts (HSAs) can also be used to cover orthodontic expenses, providing additional financial relief.

For families without comprehensive insurance, there are still options. Many orthodontic offices offer payment plans, and some provide discounts for upfront payments or multiple family members receiving treatment. Some dental schools and community health centers also offer more affordable orthodontic services.

The key is to be proactive. Start by consulting with your dentist, getting a comprehensive evaluation, and then exploring insurance options. While the cost of pediatric orthodontics can seem daunting, strategic planning and understanding available coverage can make the process much more manageable.

Remember, investing in your child's dental health early can prevent more expensive treatments down the line. It's not just about aesthetics – proper orthodontic care can prevent future dental complications and support overall health and confidence.

Comparing Different Orthodontic Practices and Their Pricing Strategies

Navigating the world of dental insurance can be overwhelming, especially when it comes to managing out-of-pocket expenses for orthodontic treatments. Fortunately, there are several strategic approaches that can help families and individuals reduce their financial burden while still accessing quality dental care.

Flexible spending accounts (FSAs) offer a smart way to set aside pre-tax dollars specifically for medical and dental expenses. These accounts allow you to allocate funds throughout the year, effectively lowering your taxable income while creating a dedicated pool of money for orthodontic treatments. The beauty of FSAs is that they provide immediate financial relief, letting you use pre-tax dollars to cover everything from braces to related dental procedures.

Health savings accounts (HSAs) present another powerful option for those with high-deductible health plans. Unlike FSAs, HSAs offer more long-term flexibility, allowing you to roll over unused funds from year to year. This means you can strategically save for more extensive orthodontic treatments, building a financial cushion that grows tax-free.

Orthodontic payment plans have also become increasingly sophisticated, with many providers offering customized financing options. These plans often feature low or zero-interest rates, making it easier for families to spread out the cost of treatment over several months or even years. Some orthodontists even provide sliding scale options or discounts for upfront payments, giving patients multiple ways to manage their expenses.

By combining these strategies with existing insurance coverage, patients can significantly reduce their out-of-pocket costs. The key is to be proactive, research available options, and work closely with both insurance providers and orthodontic offices to create a comprehensive financial approach.

Ultimately, investing in these alternative payment strategies can make orthodontic care more accessible and less financially stressful. With careful planning and the right approach, families can ensure beautiful, healthy smiles without breaking the bank.

Additional Fees and Potential Hidden Expenses in Orthodontic Treatment

When it comes to navigating the complex world of orthodontic insurance coverage, understanding the nuanced differences between providers can save you significant money and stress. Not all insurance plans are created equal, and the details can make a substantial difference in your out-of-pocket expenses.

Different insurance providers approach orthodontic coverage with varying strategies. Some plans are more comprehensive, while others have strict limitations that can catch patients off guard. Age restrictions are particularly important to consider. Many providers have specific age caps for orthodontic coverage, typically ranging from 18 to 26 years old. This means adults might face more challenges in getting coverage for braces or other dental alignment treatments.

Lifetime maximum benefits are another critical factor to examine. These caps can range from $1,000 to $3,500, depending on the specific plan. This means once you hit your lifetime maximum, you're responsible for all additional orthodontic expenses. Savvy consumers should carefully review these limits before committing to a treatment plan.

Waiting periods can also significantly impact your orthodontic journey. Some insurance providers impose waiting periods of 6-12 months before allowing full orthodontic coverage. This means you'll need to have the insurance policy in place well before starting any treatment.

To minimize out-of-pocket costs, consider these strategies:

- Compare multiple insurance providers
- Look for plans with more flexible age restrictions
- Check lifetime maximum benefits
- Understand waiting period requirements
- Consider supplemental dental insurance

By doing thorough research and carefully comparing different insurance options, patients can find coverage that significantly reduces their orthodontic expenses. It's not just about finding the cheapest plan, but the most comprehensive one that meets your specific needs.

Remember, knowledge is power when it comes to managing healthcare costs. Take the time to read the fine print and ask questions. Your wallet will thank you.

Navigating the world of orthodontic insurance can feel like trying to solve a complex puzzle, but understanding pre-authorization processes can save you both time and money. Let me break down the essentials in a way that's actually helpful and easy to understand.

First off, pre-authorization is basically your insurance company's way of saying, "Yes, we'll consider covering this treatment." Before you get braces or clear aligners, you'll want to submit detailed documentation from your orthodontist. This typically includes x-rays, treatment plans, and diagnostic records that explain why the treatment is medically necessary.

The key is being thorough and proactive. Most insurance plans have specific criteria for orthodontic coverage. Some will only cover treatments for significant medical issues, while others might have age restrictions or require documentation of severe misalignment. I've learned that the more comprehensive your initial submission, the smoother the process goes.

When submitting claims, pay close attention to the details. Make sure every form is filled out completely, include all supporting medical documentation, and keep copies of everything. Insurance companies are notorious for requesting additional information, so being prepared can prevent frustrating delays.

Another pro tip: always verify your specific plan's coverage beforehand. Some plans cover a percentage of orthodontic treatment, while others have a lifetime maximum benefit. Understanding these nuances can help you budget and avoid unexpected out-of-pocket expenses.

Don't be afraid to communicate directly with your insurance provider. A quick phone call can clarify coverage details, potential reimbursement amounts, and any specific requirements unique to your plan. Patient advocacy can make a significant difference in reducing your overall costs.

Ultimately, successfully navigating orthodontic insurance claims is about being informed, organized, and persistent. With the right approach, you can maximize your coverage and minimize your financial stress.

Navigating the world of pediatric orthodontic insurance can feel like walking through a complex maze, especially when you're trying to understand how state-specific regulations can impact your child's dental care costs. Each state has its own unique set of insurance mandates and

guidelines that can significantly influence what coverage is available and how much financial assistance families might receive.

For parents looking to manage orthodontic expenses, it's crucial to dive deep into your state's specific insurance landscape. Some states have more comprehensive mandates that require insurance providers to offer more robust coverage for pediatric orthodontic treatments. These regulations can make a substantial difference in out-of-pocket expenses, potentially saving families hundreds or even thousands of dollars.

Many states have implemented programs designed to help families manage the financial burden of orthodontic care. These might include state-sponsored assistance programs, sliding scale payment options, or specific insurance requirements that force providers to offer more affordable coverage for children's dental treatments.

The key is to do your homework. Contact your state's insurance commissioner's office, speak with local insurance agents, and thoroughly research available programs. Some states offer additional support for families with lower incomes or those facing specific medical challenges that require orthodontic intervention.

It's also worth noting that insurance regulations can change frequently, so what might have been true a few years ago could be different today. Annual reviews of your insurance options and state-specific mandates can help you identify new opportunities for reducing your out-of-pocket costs.

Ultimately, understanding these state-specific nuances can make a significant difference in managing the financial aspects of pediatric orthodontic care. While it may seem overwhelming at first, taking the time to investigate your options can lead to substantial savings and better dental care for your child.

About tooth

This article is about teeth in general. For specifically human teeth, see Human tooth. For other uses, see Tooth (disambiguation).

Tooth

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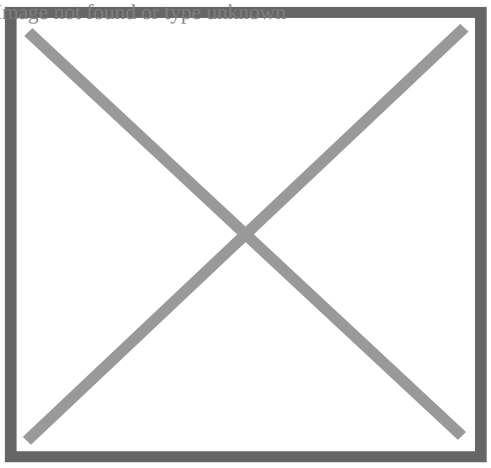

A chimpanzee displaying his teeth

Details	
Identifiers	
Latin	*dens*
MeSH	D014070
FMA	12516

Anatomical terminology

[edit on Wikidata]

A **tooth** (pl.: **teeth**) is a hard, calcified structure found in the jaws (or mouths) of many vertebrates and used to break down food. Some animals, particularly carnivores and omnivores, also use teeth to help with capturing or wounding prey, tearing food, for defensive purposes, to intimidate other animals often including their own, or to carry prey or their young. The roots of teeth are covered by gums. Teeth are not made of bone, but rather of multiple tissues of varying density and hardness that originate from the outermost embryonic germ layer, the ectoderm.

The general structure of teeth is similar across the vertebrates, although there is considerable variation in their form and position. The teeth of mammals have deep roots, and this pattern is also found in some fish, and in crocodilians. In most teleost fish, however, the teeth are attached to the outer surface of the bone, while in lizards they are attached to the inner surface of the jaw by one side. In cartilaginous fish, such as sharks, the teeth are attached by tough ligaments to the hoops of cartilage that form the jaw.[1]

Monophyodonts are animals that develop only one set of teeth, while diphyodonts grow an early set of deciduous teeth and a later set of permanent or "adult" teeth. Polyphyodonts grow many sets of teeth. For example, sharks, grow a new set of teeth every two weeks to replace worn teeth. Most extant mammals including humans are

diphyodonts, but there are exceptions including elephants, kangaroos, and manatees, all of which are polyphyodonts.

Rodent incisors grow and wear away continually through gnawing, which helps maintain relatively constant length. The industry of the beaver is due in part to this qualification. Some rodents, such as voles and guinea pigs (but not mice), as well as lagomorpha (rabbits, hares and pikas), have continuously growing molars in addition to incisors.[2][3] Also, tusks (in tusked mammals) grow almost throughout life.[4]

Teeth are not always attached to the jaw, as they are in mammals. In many reptiles and fish, teeth are attached to the palate or to the floor of the mouth, forming additional rows inside those on the jaws proper. Some teleosts even have teeth in the pharynx. While not true teeth in the usual sense, the dermal denticles of sharks are almost identical in structure and are likely to have the same evolutionary origin. Indeed, teeth appear to have first evolved in sharks, and are not found in the more primitive jawless fish – while lampreys do have tooth-like structures on the tongue, these are in fact, composed of keratin, not of dentine or enamel, and bear no relationship to true teeth.[1] Though "modern" teeth-like structures with dentine and enamel have been found in late conodonts, they are now supposed to have evolved independently of later vertebrates' teeth.[5][6]

Living amphibians typically have small teeth, or none at all, since they commonly feed only on soft foods. In reptiles, teeth are generally simple and conical in shape, although there is some variation between species, most notably the venom-injecting fangs of snakes. The pattern of incisors, canines, premolars and molars is found only in mammals, and to varying extents, in their evolutionary ancestors. The numbers of these types of teeth vary greatly between species; zoologists use a standardised dental formula to describe the precise pattern in any given group.[1]

Etymology

[edit]

The word *tooth* comes from Proto-Germanic **tanþs*, derived from the Proto-Indo-European **hÃ¢â€šÂ•dent-*, which was composed of the root **hÃ¢â€šÂ•ed-*'to eat' plus the active participle suffix **-nt*, therefore literally meaning 'that which eats'.[7]

The irregular plural form *teeth* is the result of Germanic umlaut whereby vowels immediately preceding a high vocalic in the following syllable were raised. As the nominative plural ending of the Proto-Germanic consonant stems (to which **tanþs* belonged) was **-iz*, the root vowel in the plural form **tanþiz* (changed by this point to **tÃ„â€¦ÃŒâ€žþi* via unrelated phonological processes) was raised to /œÃ‹Â•/, and later unrounded to /eÃ‹Â•/, resulting in the*tÃ…Â•þ/tÃ„â€œþ*alternation attested from Old

English. Cf. also Old English *bÃ…Â•c/bÃ„â€œÃ„â€¹*'book/books' and 'mÃ…Â«s/mÃˆÂ³s' 'mouse/mice', from Proto-Germanic **bÃ…Â•ks/bÃ…Â•kiz* and **mÃ…Â«s/mÃ…Â«siz* respectively.

Cognate with Latin *dÃ„â€œens*, Greek Ã¡Â½â‚¬??Ã•Â•?*odous*), and Sanskrit *dát*.

Origin

[edit]

Teeth are assumed to have evolved either from ectoderm denticles (scales, much like those on the skin of sharks) that folded and integrated into the mouth (called the "outside–in" theory), or from endoderm pharyngeal teeth (primarily formed in the pharynx of jawless vertebrates) (the "inside–out" theory). In addition, there is another theory stating that neural crest gene regulatory network, and neural crest-derived ectomesenchyme are the key to generate teeth (with any epithelium, either ectoderm or endoderm).[4][8]

The genes governing tooth development in mammals are homologous to those involved in the development of fish scales.[9] Study of a tooth plate of a fossil of the extinct fish *Romundina stellina* showed that the teeth and scales were made of the same tissues, also found in mammal teeth, lending support to the theory that teeth evolved as a modification of scales.[10]

Mammals

[edit]
Main article: Mammal tooth

Teeth are among the most distinctive (and long-lasting) features of mammal species. Paleontologists use teeth to identify fossil species and determine their relationships. The shape of the animal's teeth are related to its diet. For example, plant matter is hard to digest, so herbivores have many molars for chewing and grinding. Carnivores, on the other hand, have canine teeth to kill prey and to tear meat.

Mammals, in general, are diphyodont, meaning that they develop two sets of teeth. In humans, the first set (the "baby", "milk", "primary" or "deciduous" set) normally starts to appear at about six months of age, although some babies are born with one or more visible teeth, known as neonatal teeth. Normal tooth eruption at about six months is known as teething and can be painful. Kangaroos, elephants, and manatees are unusual among mammals because they are polyphyodonts.

Aardvark

[edit]

In aardvarks, teeth lack enamel and have many pulp tubules, hence the name of the order Tubulidentata.[11]

Canines

[edit]

In dogs, the teeth are less likely than humans to form dental cavities because of the very high pH of dog saliva, which prevents enamel from demineralizing.[12] Sometimes called cuspids, these teeth are shaped like points (cusps) and are used for tearing and grasping food.[13]

Cetaceans

[edit]
Main article: Baleen

Like human teeth, whale teeth have polyp-like protrusions located on the root surface of the tooth. These polyps are made of cementum in both species, but in human teeth, the protrusions are located on the outside of the root, while in whales the nodule is located on the inside of the pulp chamber. While the roots of human teeth are made of cementum on the outer surface, whales have cementum on the entire surface of the tooth with a very small layer of enamel at the tip. This small enamel layer is only seen in older whales where the cementum has been worn away to show the underlying enamel.[14]

The toothed whale is a parvorder of the cetaceans characterized by having teeth. The teeth differ considerably among the species. They may be numerous, with some dolphins bearing over 100 teeth in their jaws. On the other hand, the narwhals have a giant unicorn-like tusk, which is a tooth containing millions of sensory pathways and used for sensing during feeding, navigation, and mating. It is the most neurologically complex tooth known. Beaked whales are almost toothless, with only bizarre teeth

found in males. These teeth may be used for feeding but also for demonstrating aggression and showmanship.

Primates

[edit]
Main articles: Human tooth and Dental anatomy

In humans (and most other primates), there are usually 20 primary (also "baby" or "milk") teeth, and later up to 32 permanent teeth. Four of these 32 may be third molars or wisdom teeth, although these are not present in all adults, and may be removed surgically later in life.[15]

Among primary teeth, 10 of them are usually found in the maxilla (i.e. upper jaw) and the other 10 in the mandible (i.e. lower jaw). Among permanent teeth, 16 are found in the maxilla and the other 16 in the mandible. Most of the teeth have uniquely distinguishing features.

Horse

[edit]
Main article: Horse teeth

An adult horse has between 36 and 44 teeth. The enamel and dentin layers of horse teeth are intertwined.[16] All horses have 12 premolars, 12 molars, and 12 incisors.[17] Generally, all male equines also have four canine teeth (called tushes) between the molars and incisors. However, few female horses (less than 28%) have canines, and those that do usually have only one or two, which many times are only partially erupted.[18] A few horses have one to four wolf teeth, which are vestigial premolars, with most of those having only one or two. They are equally common in male and female horses and much more likely to be on the upper jaw. If present these can cause problems as they can interfere with the horse's bit contact. Therefore, wolf teeth are commonly removed.[17]

Horse teeth can be used to estimate the animal's age. Between birth and five years, age can be closely estimated by observing the eruption pattern on milk teeth and then permanent teeth. By age five, all permanent teeth have usually erupted. The horse is then said to have a "full" mouth. After the age of five, age can only be conjectured by

studying the wear patterns on the incisors, shape, the angle at which the incisors meet, and other factors. The wear of teeth may also be affected by diet, natural abnormalities, and cribbing. Two horses of the same age may have different wear patterns.

A horse's incisors, premolars, and molars, once fully developed, continue to erupt as the grinding surface is worn down through chewing. A young adult horse will have teeth, which are 110–130 mm (4.5–5 inches) long, with the majority of the crown remaining below the gumline in the dental socket. The rest of the tooth will slowly emerge from the jaw, erupting about 3 mm (1?8 in) each year, as the horse ages. When the animal reaches old age, the crowns of the teeth are very short and the teeth are often lost altogether. Very old horses, if lacking molars, may need to have their fodder ground up and soaked in water to create a soft mush for them to eat in order to obtain adequate nutrition.

Proboscideans

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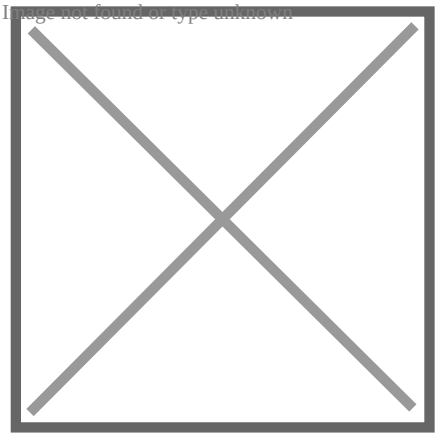

Section through the ivory tusk of a mammoth

Main article: Elephant ivory

Elephants' tusks are specialized incisors for digging food up and fighting. Some elephant teeth are similar to those in manatees, and elephants are believed to have undergone an aquatic phase in their evolution.

At birth, elephants have a total of 28 molar plate-like grinding teeth not including the tusks. These are organized into four sets of seven successively larger teeth which the elephant will slowly wear through during its lifetime of chewing rough plant material. Only four teeth are used for chewing at a given time, and as each tooth wears out,

another tooth moves forward to take its place in a process similar to a conveyor belt. The last and largest of these teeth usually becomes exposed when the animal is around 40 years of age, and will often last for an additional 20 years. When the last of these teeth has fallen out, regardless of the elephant's age, the animal will no longer be able to chew food and will die of starvation.[19][20]

Rabbit

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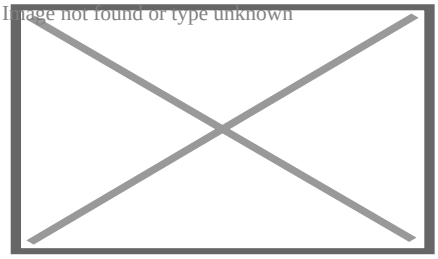
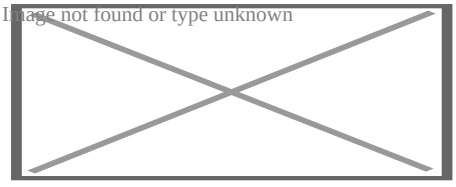
Rabbits and other lagomorphs usually shed their deciduous teeth before (or very shortly after) their birth, and are usually born with their permanent teeth.[21] The teeth of rabbits complement their diet, which consists of a wide range of vegetation. Since many of the foods are abrasive enough to cause attrition, rabbit teeth grow continuously throughout life.[22] Rabbits have a total of six incisors, three upper premolars, three upper molars, two lower premolars, and two lower molars on each side. There are no canines. Dental formula is $\frac{2.0.3.3}{1.0.2.3}$ = 28. Three to four millimeters of the tooth is worn away by incisors every week, whereas the cheek teeth require a month to wear away the same amount.[23]

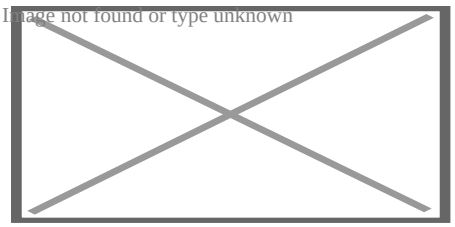
The incisors and cheek teeth of rabbits are called aradicular hypsodont teeth. This is sometimes referred to as an elodent dentition. These teeth grow or erupt continuously. The growth or eruption is held in balance by dental abrasion from chewing a diet high in fiber.



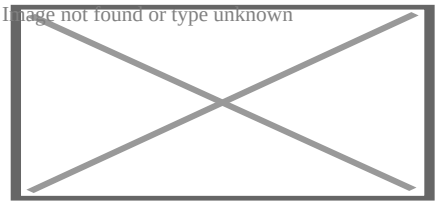
Buccal view of top incisor from *Rattus rattus*. Top incisor outlined in yellow. Molars circled in blue.



Buccal view of the lower incisor from the right dentary of a *Rattus rattus*



Lingual view of the lower incisor from the right dentary of a *Rattus rattus*



Midsagittal view of top incisor from *Rattus rattus*. Top incisor outlined in yellow. Molars circled in blue.

Rodents

[edit]

Rodents have upper and lower hypselodont incisors that can continuously grow enamel throughout its life without having properly formed roots.[24] These teeth are also known as aradicular teeth, and unlike humans whose ameloblasts die after tooth development, rodents continually produce enamel, they must wear down their teeth by gnawing on various materials.[25] Enamel and dentin are produced by the enamel organ, and growth is dependent on the presence of stem cells, cellular amplification, and cellular maturation structures in the odontogenic region.[26] Rodent incisors are used for cutting wood, biting through the skin of fruit, or for defense. This allows for the rate of wear and tooth growth to be at equilibrium.[24] The microstructure of rodent incisor enamel has shown to be useful in studying the phylogeny and systematics of rodents because of its independent evolution from the other dental traits. The enamel on rodent incisors are composed of two layers: the inner portio interna (PI) with Hunter-Schreger bands (HSB) and an outer portio externa (PE) with radial enamel (RE).[27] It usually involves the differential regulation of the epithelial stem cell niche in the tooth of two rodent species, such as guinea pigs.[28][29]

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Lingual view of top incisor from Rattus rattus. Top incisor outlined in yellow. Molars circled in blue.

The teeth have enamel on the outside and exposed dentin on the inside, so they self-sharpen during gnawing. On the other hand, continually growing molars are found in some rodent species, such as the sibling vole and the guinea pig.[28][29] There is variation in the dentition of the rodents, but generally, rodents lack canines and premolars, and have a space between their incisors and molars, called the diastema region.

Manatee

[edit]

Manatees are polyphyodont with mandibular molars developing separately from the jaw and are encased in a bony shell separated by soft tissue.[30][31]

Walrus

[edit]
Main article: Walrus ivory

Walrus tusks are canine teeth that grow continuously throughout life.[32]

Fish

[edit]

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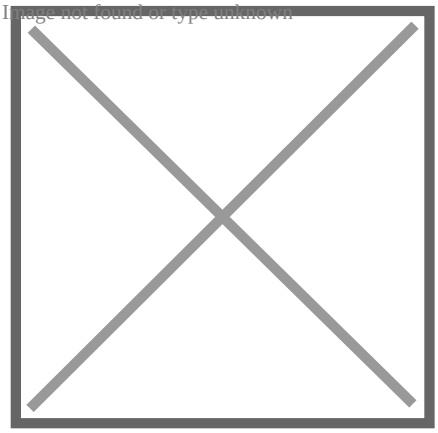


Teeth of a great white shark

See also: Pharyngeal teeth and Shark tooth

Fish, such as sharks, may go through many teeth in their lifetime. The replacement of multiple teeth is known as polyphyodontia.

A class of prehistoric shark are called cladodonts for their strange forked teeth.

Unlike the continuous shedding of functional teeth seen in modern sharks,[33][34] the majority of stem chondrichthyan lineages retained all tooth generations developed throughout the life of the animal.[35] This replacement mechanism is exemplified by the tooth whorl-based dentitions of acanthodians,[36] which include the oldest known toothed vertebrate, *Qianodus duplicis*[37].

Amphibians

[edit]

All amphibians have pedicellate teeth, which are modified to be flexible due to connective tissue and uncalcified dentine that separates the crown from the base of the tooth.[38]

Most amphibians exhibit teeth that have a slight attachment to the jaw or acrodont teeth. Acrodont teeth exhibit limited connection to the dentary and have little enervation.[39] This is ideal for organisms who mostly use their teeth for grasping, but not for crushing and allows for rapid regeneration of teeth at a low energy cost. Teeth are usually lost in the course of feeding if the prey is struggling. Additionally, amphibians that undergo a metamorphosis develop bicuspid shaped teeth.[40]

Reptiles

[edit]

The teeth of reptiles are replaced constantly throughout their lives. Crocodilian juveniles replace teeth with larger ones at a rate as high as one new tooth per socket every month. Once mature, tooth replacement rates can slow to two years and even longer. Overall, crocodilians may use 3,000 teeth from birth to death. New teeth are created within old teeth.[41]

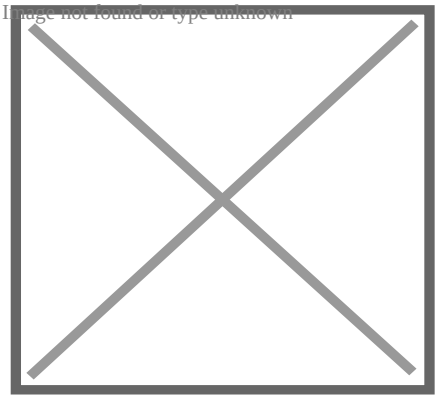
Birds

[edit]
Main article: Ichthyornis

A skull of Ichthyornis discovered in 2014 suggests that the beak of birds may have evolved from teeth to allow chicks to escape their shells earlier, and thus avoid predators and also to penetrate protective covers such as hard earth to access underlying food.[42][43]

Invertebrates

[edit]



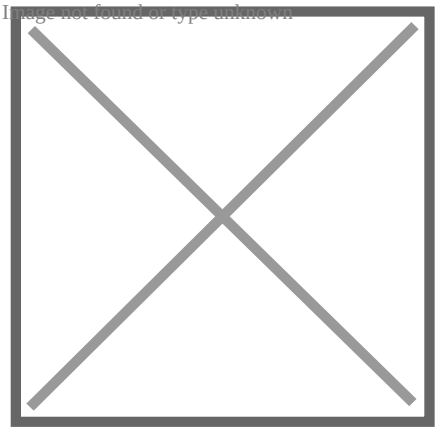
The European medicinal leech has three jaws with numerous sharp teeth which function like little saws for incising a host.

True teeth are unique to vertebrates,[44] although many invertebrates have analogous structures often referred to as teeth. The organisms with the simplest genome bearing such tooth-like structures are perhaps the parasitic worms of the family Ancylostomatidae.[45] For example, the hookworm *Necator americanus* has two dorsal and two ventral cutting plates or teeth around the anterior margin of the buccal capsule. It also has a pair of subdorsal and a pair of subventral teeth located close to the rear.[46]

Historically, the European medicinal leech, another invertebrate parasite, has been used in medicine to remove blood from patients.[47] They have three jaws (tripartite)

that resemble saws in both appearance and function, and on them are about 100 sharp teeth used to incise the host. The incision leaves a mark that is an inverted Y inside of a circle. After piercing the skin and injecting anticoagulants (hirudin) and anaesthetics, they suck out blood, consuming up to ten times their body weight in a single meal.[48]

In some species of Bryozoa, the first part of the stomach forms a muscular gizzard lined with chitinous teeth that crush armoured prey such as diatoms. Wave-like peristaltic contractions then move the food through the stomach for digestion.[49]



The limpet rasps algae from rocks using teeth with the strongest known tensile strength of any biological material.

Molluscs have a structure called a radula, which bears a ribbon of chitinous teeth. However, these teeth are histologically and developmentally different from vertebrate teeth and are unlikely to be homologous. For example, vertebrate teeth develop from a neural crest mesenchyme-derived dental papilla, and the neural crest is specific to vertebrates, as are tissues such as enamel.[44]

The radula is used by molluscs for feeding and is sometimes compared rather inaccurately to a tongue. It is a minutely toothed, chitinous ribbon, typically used for scraping or cutting food before the food enters the oesophagus. The radula is unique to molluscs, and is found in every class of mollusc apart from bivalves.

Within the gastropods, the radula is used in feeding by both herbivorous and carnivorous snails and slugs. The arrangement of teeth (also known as denticles) on the radula ribbon varies considerably from one group to another as shown in the diagram on the left.

Predatory marine snails such as the Naticidae use the radula plus an acidic secretion to bore through the shell of other molluscs. Other predatory marine snails, such as the Conidae, use a specialized radula tooth as a poisoned harpoon. Predatory pulmonate land slugs, such as the ghost slug, use elongated razor-sharp teeth on the radula to

seize and devour earthworms. Predatory cephalopods, such as squid, use the radula for cutting prey.

In most of the more ancient lineages of gastropods, the radula is used to graze by scraping diatoms and other microscopic algae off rock surfaces and other substrates. Limpets scrape algae from rocks using radula equipped with exceptionally hard rasping teeth.[50] These teeth have the strongest known tensile strength of any biological material, outperforming spider silk.[50] The mineral protein of the limpet teeth can withstand a tensile stress of 4.9 GPa, compared to 4 GPa of spider silk and 0.5 GPa of human teeth.[51]

Fossilization and taphonomy

[edit]

Because teeth are very resistant, often preserved when bones are not,[52] and reflect the diet of the host organism, they are very valuable to archaeologists and palaeontologists.[53] Early fish such as the thelodonts had scales composed of dentine and an enamel-like compound, suggesting that the origin of teeth was from scales which were retained in the mouth. Fish as early as the late Cambrian had dentine in their exoskeletons, which may have functioned in defense or for sensing their environments.[54] Dentine can be as hard as the rest of teeth and is composed of collagen fibres, reinforced with hydroxyapatite.[54]

Though teeth are very resistant, they also can be brittle and highly susceptible to cracking.[55] However, cracking of the tooth can be used as a diagnostic tool for predicting bite force. Additionally, enamel fractures can also give valuable insight into the diet and behaviour of archaeological and fossil samples.

Decalcification removes the enamel from teeth and leaves only the organic interior intact, which comprises dentine and cementine.[56] Enamel is quickly decalcified in acids,[57] perhaps by dissolution by plant acids or via diagenetic solutions, or in the stomachs of vertebrate predators.[56] Enamel can be lost by abrasion or spalling,[56] and is lost before dentine or bone are destroyed by the fossilisation process.[57] In such a case, the 'skeleton' of the teeth would consist of the dentine, with a hollow pulp cavity.[56] The organic part of dentine, conversely, is destroyed by alkalis.[57]

See also

[edit]

- icon Medicine portal
- Animal tooth development

- Dragon's teeth (mythology)

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About orthodontics

Orthodontics

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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 rectangluar 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

[edit]

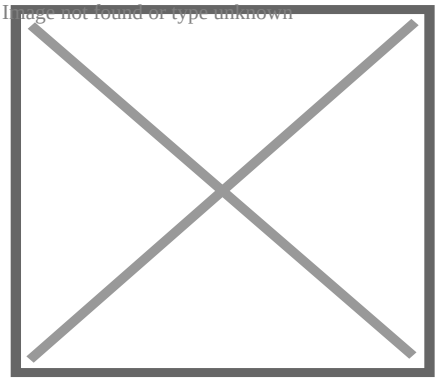
Rather than rely on the same bracket for all teeth, L.F. Andrews found a way to make different brackets for each tooth in the 1980s, thanks to the increased convenience of bonding.[28] This adjustment enabled him to avoid having multiple bends in archwires that would have been needed to make up for variations 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 rectangluar 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]

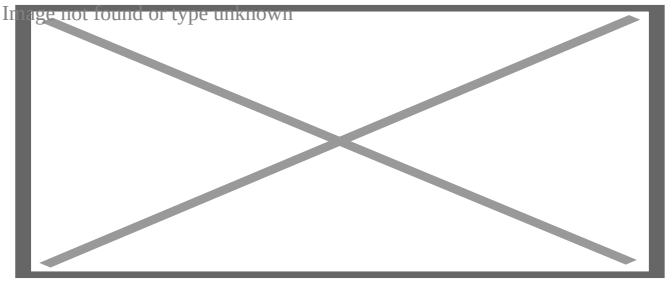
Orthodontic therapy may include the use of fixed or removable appliances. Most orthodontic therapy is delivered using appliances that are fixed in place,[34] for example, braces that are adhesively bonded to the teeth. Fixed appliances may provide greater mechanical control of the teeth; optimal treatment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

[edit]

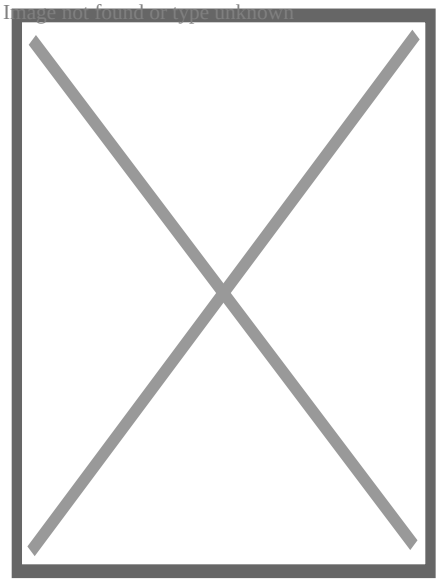
The time required for braces varies from person to person as it depends on the severity of the problem, the amount of room available, the distance the teeth must travel, the health of the teeth, gums, and supporting bone, and how closely the patient follows instructions. On average, however, once the 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

- Image not found or type unknown

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

- Image not found or type unknown

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]

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

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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 ○ Temperomandibular 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

Notable contributors	○ Edward Angle ○ Spencer Atkinson ○ Clifford Ballard ○ Raymond Begg ○ Hans Peter Bimler ○ Samir Bishara ○ Arne Björk ○ Charles B. Bolton ○ Holly Broadbent Sr. ○ Allan G. Brodie ○ Charles J. Burstone ○ Peter Buschang ○ Calvin Case ○ Harold Chapman (Orthodontist) ○ David Di Biase ○ Jean Delaire ○ Terry Dischinger ○ William B. Downs ○ John Nutting Farrar ○ Rolf Frankel ○ Sheldon Friel ○ Thomas M. Graber ○ Charles A. Hawley ○ Reed Holdaway ○ John Hooper (Orthodontist) ○ Joseph Jarabak ○ Harold Kesling ○ Albert Ketcham ○ Juri Kurol ○ Craven Kurz ○ Benno Lischer ○ James A. McNamara ○ Birte Melsen ○ Robert Moyers ○ Hayes Nance ○ Ravindra Nanda ○ George Northcroft ○ Dean Harold Noyes ○ Frederick Bogue Noyes ○ Albin Oppenheim ○ Herbert A. Pullen ○ Earl W. Renfroe ○ Robert M. Ricketts ○ Alfred Paul Rogers ○ Ronald Roth ○ Everett Shapiro ○ L. F. Andrews ○ Frederick Lester Stanton

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

Dental surgery

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

Organisations

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

By country

- Canada
- Philippines
- Israel
- United Kingdom
- United States

See also

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

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Cleft lip and cleft palate

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

Does my dental insurance cover orthodontic treatment for children?

Many dental insurance plans offer partial coverage for orthodontic treatment, typically ranging from 25% to 50% of the total cost, with lifetime maximum benefits between $1,000 and $3,000.

Are there age restrictions for orthodontic coverage?

Most insurance plans cover orthodontic treatment for children and teenagers up to age 18 or 19, with some plans extending coverage until the child is 26 years old.

Can I use a Flexible Spending Account (FSA) or Health Savings Account (HSA) for orthodontic expenses?

Yes, both FSA and HSA can be used to pay for orthodontic treatment with pre-tax dollars, effectively reducing your out-of-pocket costs by your marginal tax rate.

IQDENT - Ortodontska Klinika

Phone : +385953817015

City : Zagreb

State : Hrvatska

Zip : 10000

Address : IQDENT - Ortodontska Klinika

Company Website : **https://iqdent.hr/**

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