

History of direct dental fillings

As technology evolves and materials become more sophisticated, it is certainly good to know the origins and history of today's filling materials.

History of dental fillings until 1812

It's not just today that we're having trouble with tooth decay, but in the past, this problem has plagued many people. It is incredible how dentistry has gone from a very low level to almost the top in just a few decades. In earlier times, doctors did not know about fillings (the general term for tooth-colored fillings) and therefore used various materials to fill the "holes" left by tooth decay. They used a variety of materials (cork, coral and stone fragments, waxes, resins, cements or textiles) that would last at least a short time on the tooth. However, these temporary fillings were very unstable and did not stay in the mouth for long.^[1]

The first recorded "dentist" ever is **Hesi-Re**, an Egyptian scribe from 2,600 BC, on whose tomb was inscribed "Doctor of Teeth". The Egyptians themselves were fond of treating toothaches with a mixture of cumin, frankincense and onions.^[2]

The Etruscans 700 years before Christ even found a way to replace the lost or damaged teeth completely. Known as masters of precious metalworking, they knew perfectly **properties of gold**. They processed the gold bars into very fine strips 5 mm wide and 1 mm thick, which acted as "holders". The "third teeth" were usually animal teeth, which had to be ground down to fit well in the mouth. The gold bands also fastened the natural teeth. They were mainly used on the front teeth (incisors) and served more as an aesthetic treatment than as a necessity.

It was not until **1484** that **dental fillings were born**. Italian professor **Giovanni d'Arcoli** (Johannes Arculanus) was the first to propose filling a tooth with a thin layer of gold. In the sixteenth century, the French physician **Ambroise Paré** began using lead and cork.^[3]

The father of modern dentistry is considered to be the Frenchman **Pierre Fauchard** (1678-1761), the author of *Le chirurgien dentiste*, in which, for example, he argues that the cause of tooth decay is mainly sugar and recommends reducing the proportion of sugar in the diet. This well-known dentist used staniol or lead. He preferred lead over other metals because of its softness, malleability and easy compressibility.^[3] At the beginning of the 19th century, **the production of thin slices of gold** specially designed for dentists proliferated. The idea was conceived by **Marcus Bull** of Connecticut in 1812.^[3]

History of amalgam fillings

In **1603** the German **Tobias Dorn Kreilius** produced amalgam fillings by dissolving copper sulfide in strong acid, adding mercury, bringing it to a boil, and then pouring the mixture directly into the patient's tooth. In France, D'Arcet (Mineral Cement) used a similar mixture. Louis Regnart is considered to be the 'father of amalgam', who added copper to the mixture.^[4]

One of the most important dentists using amalgam since **1826** was the Frenchman **Auguste Tavenu** (but he discovered it already in 1816). He made it from an alloy of silver and mercury. The mercury had to be heated so that the silver could dissolve in it. This form of filling was much cheaper than the gold foil preferred at the time, and thus became more widely available. However, this amalgam had one drawback. Once placed in the "hole" after a cavity, it began to gain volume. So there were two possible options - either the tooth broke due to internal stress or it prevented a good bite. This is why people in Europe did not like it very much.^[1]

At that moment, an idea was born in the minds of the **Crawcour brothers**. They went to America and opened their own dental practice (although they were not dentists), where they created a huge advertisement for amalgam. They soon reaped fame, but they also sowed seeds of envy among other dentists. They eventually accused them of immorality and announced that amalgam was very harmful to human health and mercury was known to be one of the most dangerous metals. The first-ever dispute (the so-called **Amalgam War**, 1840-1850) over whether amalgam in this form was actually safe for humans began, and some still continue to this day. People became afraid and all dentists eventually stopped using the compound.^[1] In **1843**, the **American Dental Association** also weighed in on the case, declaring that anyone using amalgam would be charged with providing poor care. Between 1860 and 1890, many experiments were conducted regarding the harmfulness and safety of this substance.^[1]

A major turning point came in the **1870s**, when dentist **Joseph Foster Flag** advocated the use of amalgam and confirmed its safety through his many years of practice. He proved by many experiments that these fillings last the longest of all and that their properties are incomparable to others (e.g. gold). Since then, amalgam fillings have held the first place in the world of all available fillings. After 1855, anyone who wanted a cheap, quick and fairly painless filling required amalgam.^[1]

Greene Vardiman Black (1836-1915), an American born dentist considered **the founder of modern dentistry in America**, was also involved with amalgam and his great contribution was the correct ratio of substances in the mixture. He stated that dentists only mixed the mixture by guesswork, not realizing the impact that a disproportion

of substances could cause (increase in volume and subsequent tooth breakage). Black developed a formula for the correct ratio of substances and created a mixture that had the properties to properly and healthily fill the cavity of a tooth decayed.^{[5][6]}

Black was also the first person to invent **the foot-powered drill**. He used nitrous oxide, or paradise gas, to relieve patients' pain. He is the author of **Black's classification of cavities**.

In 1959, **Dr. Wilmer Eames** proposed a change in **the ratio of mercury** to other amalgam components from 8 : 5 to 1 : 1. **A further change** took place in **1963**, when a better amalgam with a higher copper content was introduced, which was less subject to corrosion (**non-gamma-2 phase**). This amalgam is still in use today and has much better properties than the gamma-2 phase amalgam, which has a copper content reduced to only 6%.

History of newer fillings

The American Bowen Radar Loop in 1962 developed **composite filling** in the search for a material that would be aesthetically similar to the tooth and at the same time resistant to the processes in the oral cavity. This material consisted of an additive epoxy resin, methyl acrylic acid and silica powder.

In 1972, they were first introduced **glass ionomer cements** invented by Alan D. Wilson and John W. McLean. It was a mixture of liquid (polycarboxylic acid) and powder (silica glass mixed with other elements) solidified by acid-base reactions.^[7]

Both materials have undergone many changes in the last twenty years and their composition today depends only on the manufacturer. There are many different modifications.^[7]

Nowadays, dentists use amalgam, glass ionomer and composite fillings for their good properties, durability and aesthetics. In some dental offices, we can still find gold hammered fillings, but their use is really rare anymore.^[8]

Links

Reference

1. MONDOK, David. Amalgám - nejsledovanější kauza dentálního světa. StomaTip [online]. 05.06.2004, 2, [cit. 2012]. Dostupný z WWW: <<http://www.i-zuby.cz/zubni-kaz-a-vyplne/amalgam---nejsledovanejsi-kauza-dentalniho-sveta/>>
2. Dentistry Through Time. Dentists Canada [online]. 6.2.2009, 2, [cit. 2012]. Dostupný z WWW: <<https://www.canpages.ca/blog/?cat=11>>.
3. Old and sold [online]. 1911 [cit. 2012]. Medieval Dentistry - Giovanni Of Arcoli. Dostupné z WWW: <<http://health.yodelout.com/medieval-dentistry-giovanni-of-arcoli/>>.
4. VITALE, Arthur. AdsFlick [online]. 12.10.2009 [cit. 2012]. Silver Fillings: The History of Amalgam. Dostupné z WWW: <<http://www.adsflick.com/Art/41398/144/Silver-Fillings-The-History-of-Amalgam.html>>.
5. HENDERSON, D.. Medical History [online]. 1961 [cit. 2012]. GREENE VARDIMAN BLACK (1836-1915), THE GRAND OLD MAN OF DENTISTRY. Dostupné z WWW: <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1034601/>>.
6. Pierre Fauchard academy [online]. 2009 [cit. 2012]. Dr. G.V. Black. Dostupné z WWW: <<https://www.fauchard.org/>>.
7. BARAN, Marek. Stomateam [online]. 10.12.2003 [cit. 2012]. Skloionomery očima českého lékaře - Kavitan PRO / Kavitan Plus. Dostupné z WWW: <<http://www.stomateam.cz/index.php?clanek=16>>.
8. NEUMANN, Martin. Stomatologická ordinace Dr. Neumanna [online]. 2007 [cit. 2012]. Zubní kazy, bílé plomby, výplně. Dostupné z WWW: <<http://www.mujzubar.cz/zubni-kazy-bile-plomby-vyplne.htm>>.

Literature used

- SCHOTT, Heinz. Kronika medicíny. Vyd. 1. Praha : Fortuna print, spol s.r.o., 1994. 648 s.
- American Dental Association. Amalgam. Jada. 1998, 129, s. 2. Dostupný také z WWW: <<http://jada.ada.org/cgi/reprint/129/11/1547.pdf>>.
- HELLWIG, Elmar; KLIMEK, Joachim; ATTIN, Thomas. Záchovná stomatologie a parodontologie. Vyd. 1. Praha : Grada Publishing a.s., 2003, str. 107-140