

History of the Dental Cement

This is part of the Encyclopedia of the History of Dentistry.

Dr. Andrew I. Spielman, D.M.D., Ph.D., Professor of Molecular Pathobiology, Director of the Rare Book Library and Historical Archives, New York University College of Dentistry, New York, NY, USA.

ais1@nyu.edu

Dr. Forrai Judit, D.Sc.,

Semmelweis University, Institute of Public Health, Department of History of Medicine, Budapest, Hungary

forraijud@gmail.com

Initially submitted March 25, 2024; accepted for publication 15 April 2024

Please cite this article as: History of the Dental Cement. In: Encyclopedia of the History of Dentistry. Forrai J, Spielman AI eds. 2023. Doi: [10.32558/encyclopedia.dentistry.51](https://doi.org/10.32558/encyclopedia.dentistry.51)

Abstract: The history of adhesives in dentistry dates back to the first millennium when Mayans used to attach semiprecious stones to teeth as dental jewelry. The first dental cement was introduced in 1796 and, as demand for esthetics and bonding strength increased, was perfected throughout the next 150 years. Since 1955, new adhesives using bonding agents were developed.

Keywords: Cements, adhesives, teeth, restoration, esthetics.

Throughout history, humans have utilized various materials as adhesives for different purposes. Simple adhesives, such as tar derived from burning birch-bark, were employed as early as the middle Stone Age, around 280,000 to 25,000 years ago (1, 2). Complex adhesives including bitumen were found in the Sibudu Cave, South Africa, 70,000 years ago (3) or Syria 40,000 years ago. Animal glues favored by ancient civilizations like the Egyptians, Greeks, and Romans were in use until the beginning of the 20th century. Synthetic bonding agents emerged only in the first half of the 20th century, marking a significant milestone in adhesive technology.



Figure 1. Decorative semi-precious stones (jade) attached to incisors in a Mayan skull. The stones were glued using a cement adhesive. (Image in Wikimedia Commons).

The history of adhesives in dentistry dates back to the first millennium. One of the earliest pieces of evidence of dental cements comes from the Mayans of Yucatan (250 C.E.-1690s), who used them to attach semiprecious stones to teeth for decorative purposes. Analysis of Mayan dental cements revealed unique compositions, including calcium (23.5%), phosphorus (30.4%), and small amounts of aluminum, silicon, iron, magnesium, manganese, copper and strontium (4), along with trace amounts of pine resin, sclareolide, and mint-like oils, agents with antibacterial, antifungal and anti-inflammatory properties.

In 1796, Frederick Hirsch (1750-1827), a German court dentist from Göttingen introduced a cement-like restorative material made of quicklime, which was not particularly successful (5). Subsequently, in 1840, Wolfsohn of Berlin developed a quick-setting restorative material using Sandarac, chalk, mastic, and ether. However, this material had a foul odor and required frequent replacements (6).

In 1834 Joseph Calmann Linderer used fish-glue cement to secure a “veneer filling”, a walrus bone round peg forced into a cavity using a small hammer, a precursor of the inlay (9). During the 19th century, as the need for temporary restorations increased, gutta-percha, which debuted in the middle of the 19th century, emerged as a suitable material. Its name comes from two Malay words: Getah (gum) and Pertja (name of the gum tree). Derived from trees primarily in Malaysia and Indonesia, gutta-percha was initially used for surgical splints before being employed as a temporary restorative material by Edwin Truman in 1847 and in root canal therapy by Jonathan Taft in 1859.

As demand increased for better restorative materials, in 1840, Charles Sylvester and A. Rostaing, a father-son team from Dresden, developed a new cement containing zinc oxide and phosphoric acid. The secret formula of the *Cäment* was never revealed (4). A much more advanced cement also came from Germany, where in 1892, Otto Hoffmann developed a high-quality zinc phosphate cement. It had a monopoly on the market until World War I. Parallel with the development of dental cements, there was a need for an esthetic restorative material for anterior teeth. In 1878 the “translucent cement” of Thomas Fletcher in London was patented (8). A more successful and esthetically pleasing cement was formulated by Paul Steenbock, a Berlin chemist, in 1903. It contained zinc oxysulfate cement, aluminum beryllium, calcium oxide, and silicic acid.

Cement was also used in root canal treatments. For instance, in 1874, Adolph Witzel (1847-1906), a German dentist, suggested disinfecting the root canal with creosote before filling it (9) with iodoform-containing cement. Willoughby Miller, a student of Robert Koch in Berlin, suggested thymol cement, zinc oxide with iodoform, and gutta-percha.

Because acidic components of several restorative materials caused pulp damage chemically or by transmitted heat, cavity liners were developed. A layer of asbestos under the restorative material was included in 1846 by James Robinson of London, and in 1930, BW Hermann proposed calcium hydroxide to protect the dental pulp. Since then, zinc oxide eugenol, glass ionomers, and resin-based liners have been employed. In 1974, McLean suggested an adhesive glass-ionomer cement. The next generation of restorative materials using *bonding agents* was developed starting with the 1950s and will be covered separately.

Reference

1. Mazza PPP, Martini F, Sala B, et al. (2006). A new Palaeolithic discovery: tar-hafted stone tools in a European Mid-Pleistocene bone-bearing bed. *J. Archaeolog. Sci.*, 33(9):1310-1318. <https://doi.org/10.1016/j.jas.2006.01.006>
2. Kozowyk PRB, Soressi M, Pomstra D, et al. (2017). "Experimental methods for the Palaeolithic dry distillation of birch bark: implications for the origin and development of Neandertal adhesive technology". *Scientific Reports*. 7 (1): 8033. <https://doi.org/10.1038/s41598-017-08106-7>
3. Wadley L, Hodgskiss T, and Michael Grant M (2009). Implications for complex cognition from the hafting of tools with compound adhesives in the Middle Stone Age, South Africa. *PNAS*, 106 (24) 9590-9594. <https://doi.org/10.1073/pnas.0900957106>
4. Hoffmann-Axthelm, Walter (1981). (a) History of Dentistry (Translated from German H.M. Koehler, Chicago: Quintessence Publishing Co., Inc., (the composition of cement used by the Mayan, p.53; the Rostaig father-son description of the dental cement 1858, p.294)
5. Hirsch, Frederick (1796). *Practische Bemerkunde uber die Zahne und einige Krankheiten derselben*, p. 131-132, Jena.
6. Nessel, Franz (1840). *Handbuch der Zahnheilkunde*, p. 237. (Early depiction of dental cement of Wolfsohn)
7. Taft, Jonathan (1859). *A Practical Treatise on Operative Dentistry*. (First attempt to place gutta-percha into the root to hold a Dowel pin.)
8. Fletcher, Thomas (1878). Fletcher's patent porcelain cement. *Brit. J. Dent. Sc.* 21:425-426. (Patent #3028).
9. Linderer, Joseph Calmann (1834). *Lehre von den gesammten Zahnoperation nach den Quellen und eigener vierzigjahrigen Erfahrung*. p 73. (First walrus inlay)