

History of Pulp Capping

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Dr. Forrai Judit, DSc,

Semmelweis University, Institute of Public Health, Department of History of Medicine, Budapest, Hungary
forrajud@gmail.com

Dr. Andrew I Spielman, DMD, PhD, Professor of Molecular Pathobiology, Director Rare-book Library and Historical Archives,

New York University College of Dentistry, New York, NY, USA.

ais1@nyu.edu

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Abstract: Pulp capping is the treatment to preserve the vitality of the pulp when a deep carious lesion reaches but does not penetrate the pulp

Keywords: caries, toothache, dentin, pulp, conservative treatment

When deep caries reached close to the pulp chamber, early attempts to save the dental pulp emerged as far back as the 18th century. However, understanding the tooth's anatomical structure was essential to address such issues. Phillip Pfaff (1713-1766), the Royal Prussian Court dentist to Frederick the Great, was the first to describe a dental procedure in his 1756 book, "*Abhandlung von den Zähnen des menschlichen Körpers*" (1) to preserve the pulp. It involved directly capping the open dental pulp using a gold foil or a lead cap, sealing off the blood vessels and nerves under physiological conditions. Following this, Leonard Koecher (1826) used a hot wire to cauterize the exposed coronal pulp, stave off any bleeding, and then covered the area with gold foil. In 1848, Joseph Linderer, a Prussian dentist from Berlin, desensitized the pulp and placed a concave gold plate over it (2).

Subsequently, various modifications of these techniques emerged. Practitioners like D. Mackenzie (1856), E. Albrecht (1858), J.A. Taft (1859), and T. Underwood (1859) used substances such as tannin, zinc chloride, silver nitrate, camphor, and *Hyoscyamus niger* to necrotize the pulp. King applied a paste made from zinc oxide and 20% carbolic acid, believing it would not harm the pulp during the pulp-capping process. Instead of Pfaff's original gold cap, other materials like gutta-percha or wax were used as the sealing layer. According to A. F. zur Nedden (3), the coverage of the exposed pulp was intended to stimulate reparative dentin production, correctly identified in 1852 by A. Kölliker as the dentin-secreting odontoblastic cells. Nedden even recommended a foot bath for comprehensive treatment. French practitioners proposed St. Sorel's zinc oxide chloride cement in 1855.

In 1885, Hungarian dentist J. Árkövy (4) became the first to classify various pulp diseases, recognizing that many pulpal pathologies were linked to infections. Disinfection procedures were integrated into dentistry with the antiseptic principles popularized by Ignaz Semmelweis and Joseph Lister. Dental cavities were

rinsed with a variety of disinfectants before restoration. Alfred Witzel disinfected the cavity with tannin and creosote, while Fletcher and Miller sealed it with "artificial cement," reporting a 98% success rate. Others used carbolic acid (Keep), iodoform-phenol ether (A. Witzel), clove oil (J. Tomes), carbolic baths (Metnitz), and 30% eugenol cement (Wessler). Several materials were used for pulp capping, with rubber dams and sterile instruments already in use by the late 19th century. Dentin disinfection involved carbolic acid, liquid cinnamon, and Lysol (1889). However, by 1900, D. Dalma (Hungary) had rejected all materials containing formaldehyde, bromoaldehyde, trichloroaldehyde, as well as those with eugenol and clove oil, deeming them cytotoxic.

In 1897, Stovel recommended hydro naphthol, while two years later, Árkövy Joseph indicated that there was no scientific basis for healing damaged pulp despite emphasizing the need to maintain aseptic conditions. By the end of the 19th century, new materials were recommended for direct pulp capping of the exposed pulp, including gold caps or foil, zinc oxide sulfate cement, gutta-percha dissolved in chloroform, carbolic acid-soaked paper, adhesive tape, asbestos, cork, wax, and even glass.

As the 20th century unfolded, renowned dentist G.V. Black defined contraindications for pulp capping. New substances were proposed based on insights from the chemical industry and research lab experiments. For instance, Alfred Gysi's Tripaste, a blend of paraformaldehyde, tricresol, and creolin, was tested along with eugenol, thymol, iodoform-chlorophenol, turpentine, formaldehyde-gelatin, and Vuzin paste (a quinine derivative). Calxyl, Tiranal (Schröder), and Citronellol (Bernhard) (5) were also explored for indirect pulp capping where the pulp chamber has no direct exposure.

Throughout the 20th century, innovative techniques and approaches in dental care opened a new chapter in pulp capping. The development of better devitalization, extirpation, and root-filling techniques lessened the reliance on pulp capping. New materials were designed to foster cell proliferation and maintain pulp cell vitality for new dentin mineralization. Today, efforts are focused on regenerating the entire pulp, offering the potential for improved dental outcomes.

References

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Figure 1. Pulp capping, as proposed by Adolph Witzel in 1886. *a.* cement paste, *b.* metal cap, *c.* restorative material, from ref. 5.