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## Aim and Scope

*Operative Dentistry* publishes articles that advance the practice of operative dentistry. The scope of the journal includes conservation and restoration of teeth; the scientific foundation of operative dental therapy; dental materials; dental education; and the social, political, and economic aspects of dental practice. Review papers and letters also are published.

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# EDITORIAL

# Platinized Gold Foil to be Available Again

The market for specialized goods that are used infrequently may be exceedingly limited. It may be small enough to induce a manufacturer to discontinue producing an item, especially if the manufacturing process is difficult, complicated, or requires new investment in capital goods. As a consequence we discover that a particularly good instrument or piece of equipment or a good brand of material is no longer available. Some recent examples are the Wizard and Woodbury rubber dam holders, Snap-on rubber cups for polishing, True separators, and the complete set of Ferrier separators, though numbers 1 to 3 are now available.

Another example is platinized gold foil, an excellent material for surfacing restorations of cohesive gold that are subject to heavy masticatory stress. Only a small quantity is needed for each restoration but the platinized gold, being harder than pure gold, reduces the rate of wear of the restoration and prolongs its form and life as well as that of the tooth. The commercial supply of this useful material has been exhausted for several years. It is now a great pleasure to announce that the Williams Gold Refining Company, Incorporated, is planning to make a special run of platinized gold foil. The size of the run will depend on the size of the demand, and it is not likely the run will be repeated soon. The foil is to be produced in the form of sheets four inches square, packaged in books, and supplied in quantities of a tenth of an ounce. Those interested in acquiring platinized gold foil should notify the Williams Gold Refining Company, Incorporated, of their requirements by telephoning (800) 828-1003.

This is an excellent example of cooperation between a manufacturer and customers. The executive vice-president of the company, R V Williams, Jr, is to be commended for his willingness to satisfy a small but worthwhile demand. Now if more dentists could be persuaded to use gold foil in providing a superior service for their patients, that would be splendid.

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*OPERATIVE DENTISTRY, 1981,* **6**, *82–89.*

ORIGINAL ARTICLE

# Cement Bases under Amalgam Restorations: Effect of Thickness

Bases of zinc phosphate and polycarboxylate support amalgam better than do bases of zinc oxide and eugenol or calcium hydroxide. Calcium hydroxide should be limited to a thickness of 0.5 mm.

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Presented at the annual meeting of the American Association for Dental Research (AADR) 21-23 March 1980 in Los Angeles.

**Summary**

**The effect of four cement bases, namely, calcium hydroxide (Dycal), reinforced zinc oxide and eugenol (IRM), polycarboxylate (Tylok), and zinc phosphate (Tenacin) on the fracture of amalgam, both conventional (Velvalloy) and copper-rich (Tytin), was determined at one hour and at 24 hours after condensation.**

**The bases and amalgam were placed in class 1 cavities prepared in extracted teeth, the thickness of the bases varying from 0 mm (no base) to 3.0 mm (no amalgam). The fracture load was determined by applying a compressive load at the rate of 0.2 mm · $min^{-1}$ to each restoration. At 24 hours the load causing fracture was reduced by 50% as the thickness of calcium hydroxide was increased from 0.5 to 1.0 mm for both conventional and copper-rich amalgam, whereas the load causing fracture decreased by less than 40% as the thickness of zinc phosphate increased from 0 to 2.5 mm. The results of the study point to the important role played by the modulus of elasticity of the base supporting amalgam restorations.**

## Introduction

Placing an intermediary base in deep preparations for amalgam restorations is recommended in restorative dentistry to protect the pulp from thermal shock. Besides its low thermal conductivity the base must have sufficient strength to withstand the forces of both condensation and mastication transmitted to it through the amalgam restoration. A minimum compressive strength of 170 pounds force per square inch ($lbf \cdot in^{-2}$), or 11.8 MPa, is necessary to prevent displacement of the base during condensation of amalgam (Chong, Swartz & Phillips, 1967).

The deflection in an amalgam restoration has been found to be four times greater when it is supported by a 2 mm base of zinc oxide and eugenol cement than when supported by a 2 mm base of zinc phosphate cement (Farah, Hood & Craig, 1975). These authors also found the layer of amalgam immediately above the cement base to be in tension, not compression.

This investigation will determine the effect of the thickness of a cement base on the support of a class 1 amalgam restoration at one hour and at 24 hours after condensation of the amalgam.

## Materials and Methods

Extracted molar teeth were mounted in clear polyester casting resin (Hill Supply Co, Gainesville, FL 32601, USA). The resin base was 12 mm in height and 1-2 mm below the cementoenamel junction (Fig 1). The occlusal surface was ground flat and a class 1 cavity prepared with a bur in a high-speed handpiece. The preparation was 3.0 mm deep, 2.5 mm wide faciolingually, and 9.0 mm long mesiodistally. In most cases the pulpal floor of the preparation was approximately 1.0 mm above the pulp chamber.

Four materials were used as bases: 1) calcium hydroxide (Dycal, L D Caulk Co, Milford, DE 19963, USA); 2) reinforced zinc oxide and eugenol (IRM, L D Caulk Co); 3) polycarboxylate (Tylok, L D Caulk Co); and 4) zinc phosphate (Tenacin, L D Caulk Co). Conventional amalgam (Velvalloy, S S White, Philadelphia, PA 19102, USA), as well as copper-rich amalgam (Tytin, S S White), was condensed on each of these bases. The thickness of the base was varied from 0 mm (no base) to 3.0 mm (no amalgam) by increments of 0.5 mm. For example, when a base of 1.0 mm was used, an amalgam restoration of 2.0 mm

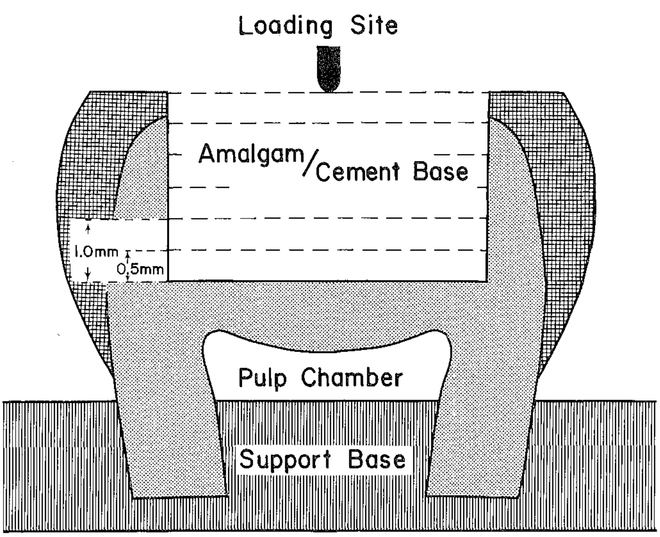


FIG 1. *Mounted molar with a prepared class 1 cavity.*

filled the remaining cavity. Four teeth were used for each 0.5 mm increment of the base. This was repeated for each base and each of the two types of amalgam.

The bases were mixed according to manufacturer's instructions. After each base had been placed, the desired final thickness was obtained by reducing the excess with a plain fissure bur in a high-speed handpiece and with various hand instruments. The thickness of the base was measured at several points with a vernier caliper having an accuracy of 0.1 mm. The flat occlusal surface of the tooth was used as the point of reference. The amalgam was condensed with heavy overlapping forces.

The completed restorations were then tested in compression on a universal testing machine (Model 1125, Instron Corporation, Canton, MA 02021, USA) at a rate of 0.2 mm · min$^{-1}$. The tip of the loader had a radius of curvature of 0.5 mm to simulate an opposing cusp in a clinical situation. Some specimens were tested at one hour because amalgam is most susceptible to fracture within the first hour after condensation and thus it is crucial to know how a base affects the strength of an amalgam restoration one hour after placement. The samples tested at 24 hours included only two bases, calcium hydroxide and zinc phosphate. These bases represent the lower and upper limits, respectively, of the loads required to fracture the amalgam; the moduli of elasticity of the other bases are probably between these extremes.

Preliminary trials had shown that at one hour the loader penetrated the amalgam slowly until failure occurred. There was no definite point of failure but the graph exhibited a marked change in slope (Fig 2). It was hypothesized that at this stage the load was supported mainly by the base and the tooth. The failure load was estimated from the tangents of these two slopes.



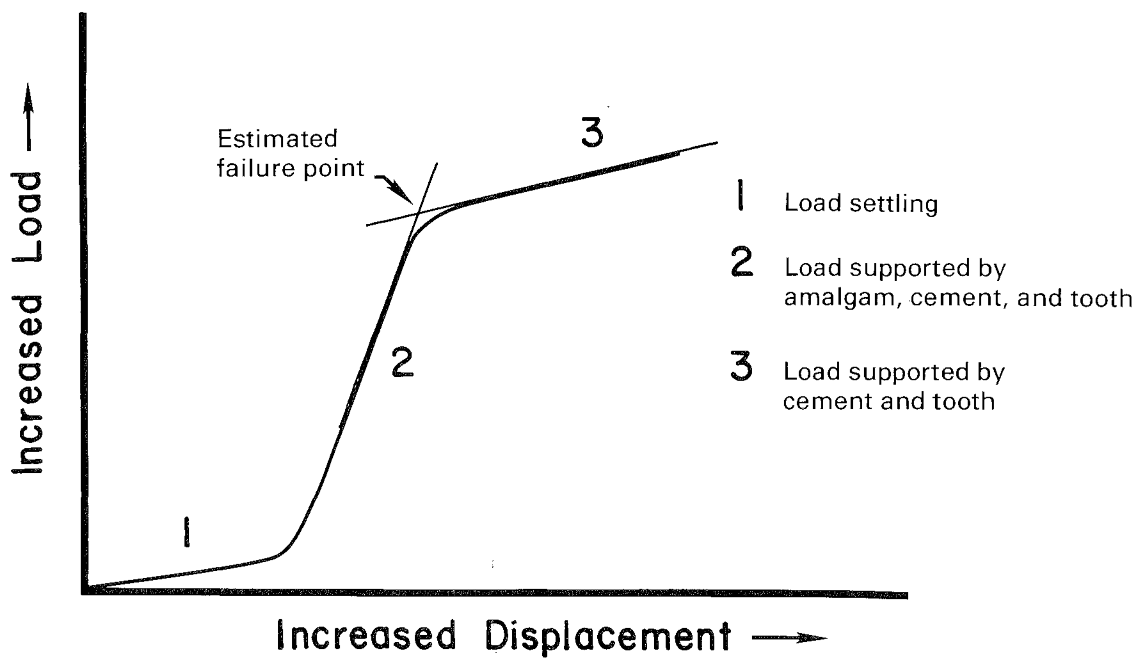


FIG 2. *Method of estimating failure point of amalgam restoration one hour after condensation.*

## Results

The estimated load causing failure at one hour, plotted as a function of the thickness of the various bases, is shown in Figure 3 (conventional amalgam) and Figure 4 (copper-rich amalgam). As the thickness of base was incrementally increased a gradual decrease occurred in the amount of load needed to cause failure. The decrease is

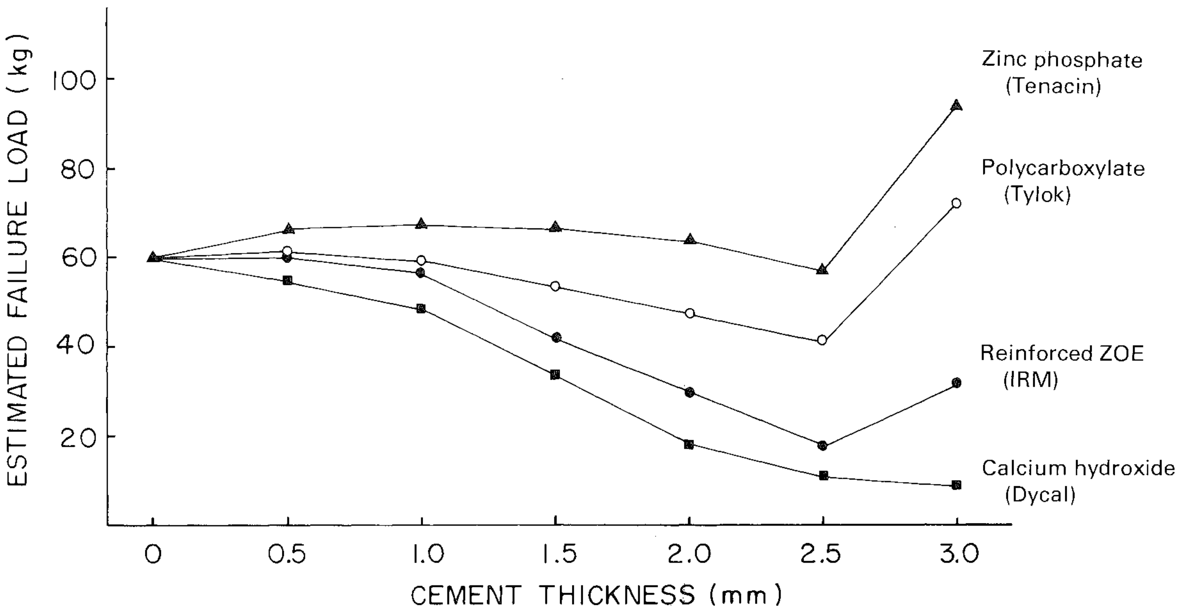


FIG 3. *Effect of cement bases on the estimated failure load on conventional amalgam (Velvalloy) one hour after condensation.*

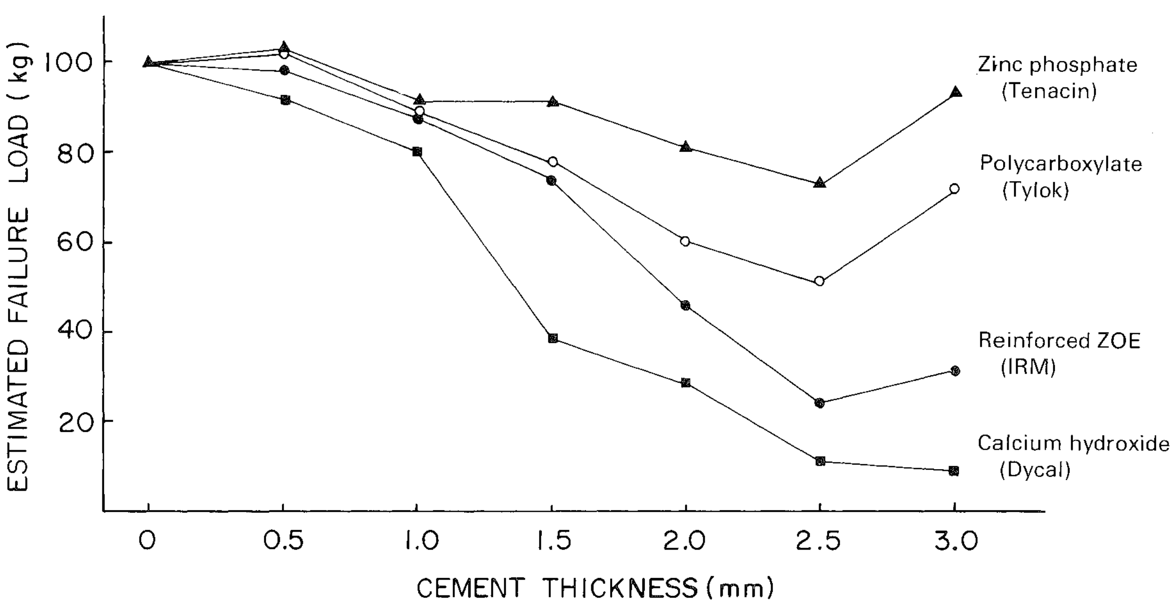


FIG 4. *Effect of cement bases on the estimated failure load on copper-rich amalgam (Tytin) one hour after condensation.*

especially prominent for the bases of calcium hydroxide and reinforced zinc oxide and eugenol.

For conventional amalgam there was a modest decrease in the fracture load at one hour as the thickness of the bases of calcium hydroxide and reinforced zinc oxide and eugenol increased from 0 to 1.0 mm, but a 33% reduction in fracture load resulted as the thickness of the bases was further increased from 1 to 1.5 mm. The trend was the same but less pronounced when a polycarboxylate base was used. Also at one hour the bases of zinc phosphate and of polycarboxylate resisted the penetration of the load better than did the amalgam.

At one hour the estimated failure load of the copper-rich amalgam without a base was 100 kg compared with 60 kg for the conventional amalgam. With copper-rich amalgam a drop of 50% in fracture load occurred when the thickness of the base of calcium hydroxide was increased from 1.0 to 1.5 mm; when the thickness was kept at or under 1.0 mm, the drop in fracture load for both the conventional and copper-rich amalgams did not exceed 18% of the fracture load of amalgam without a base. As with conventional amalgam, a much more moderate drop in fracture load in the amalgam restoration resulted when a base of either polycarboxylate or zinc phosphate was used.

Placement of a layer of calcium hydroxide covered by a stronger base is often recommended in treating carious lesions close to the pulp. Figure 5 shows the effect of placing 0.5 and 1.0 mm of calcium hydroxide followed by 1.0 mm of zinc phosphate. The rest of the preparation was filled with either conventional or copper-rich amalgam. Lower estimated loads of failure were obtained as the thickness of the calcium hydroxide was increased and when conventional amalgam was used in place of copper-rich amalgam.

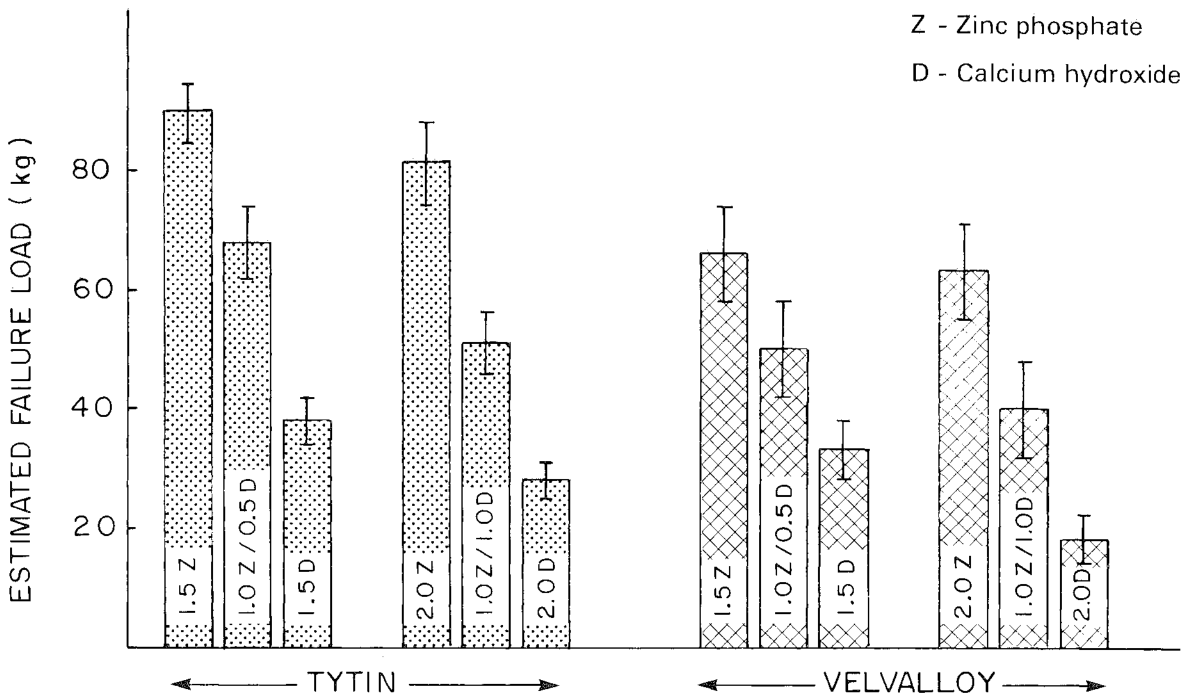


FIG 5. *Effect of a combination of cement bases on the estimated failure load on conventional and copper-rich amalgams one hour after condensation.*

In contrast to the one-hour specimens, those that were subjected to a load 24 hours after condensation of the amalgam exhibited a point of fracture as shown in Figure 6. The load, plotted as a function of the thickness of the bases, is shown in Figure 7 (conventional amalgam) and Figure 8 (copper-rich amalgam). The load did not decrease immediately after the fracture of the amalgam because it was well con-

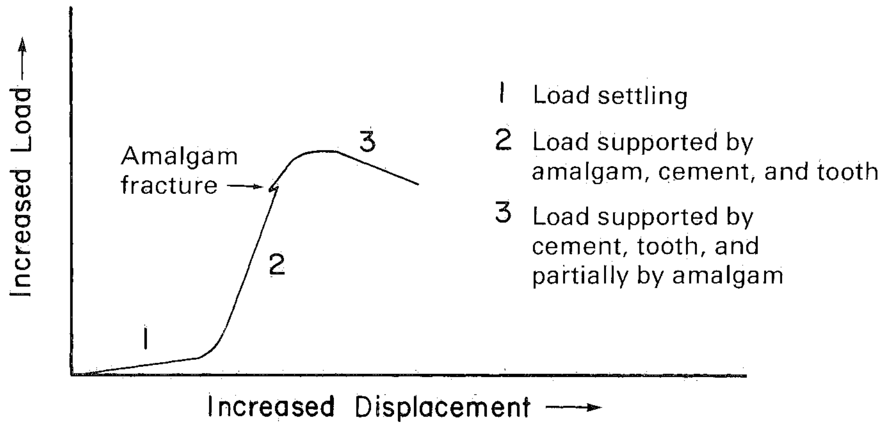


FIG 6. *Determination of the fracture of an amalgam restoration 24 hours after condensation.*

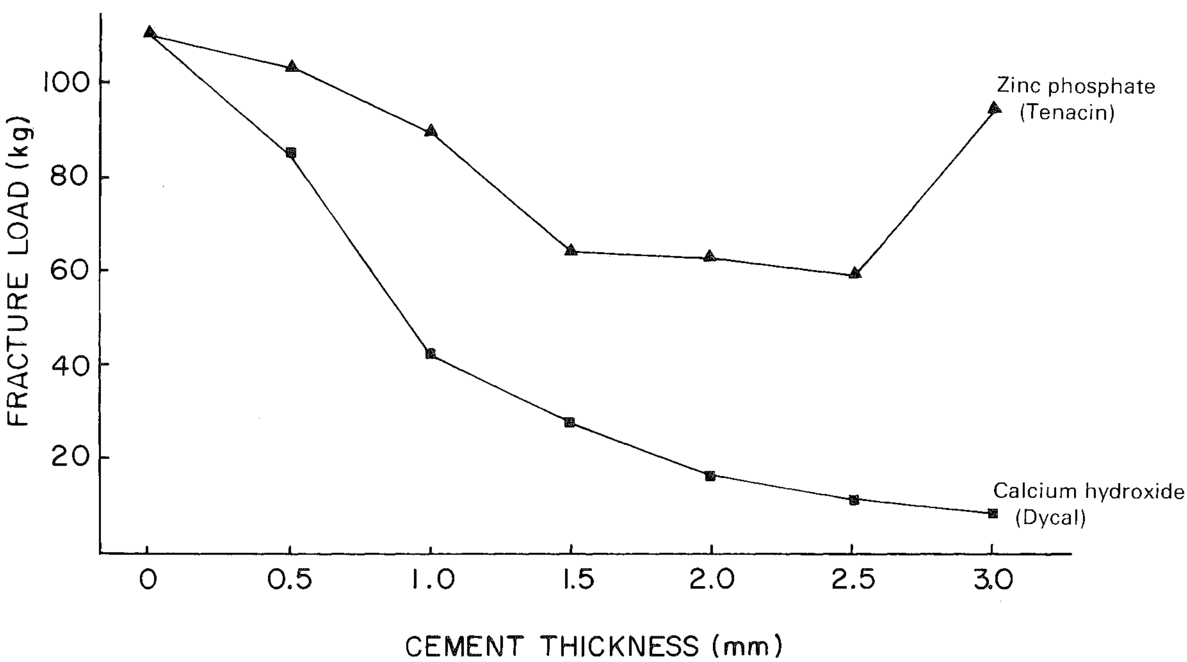


FIG 7. *Effect of cement bases on the fracture of conventional amalgam (Velvalloy) 24 hours after condensation.*

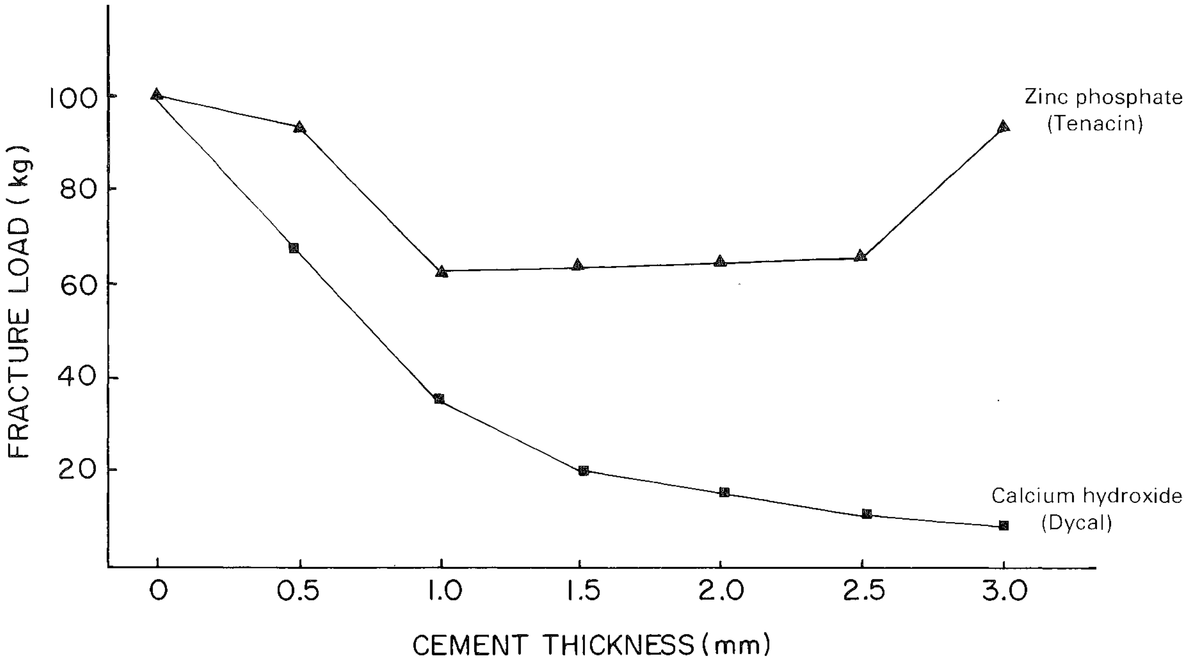


FIG 8. *Effect of cement bases on the fracture of copper-rich amalgam (Tytin) 24 hours after condensation.*

tained in a class 1 cavity and could still sustain some load past the fracture point.

At 24 hours the fracture loads of both types of amalgam with bases of calcium hydroxide decreased 50% when the thickness of the base was increased from 0.5 to 1.0 mm. The use of calcium hydroxide as a base at any thickness greater than 0.5 mm resulted in a fracture load under 50 kg.

The fracture load of amalgam supported by a zinc phosphate base, compared with calcium hydroxide, is not affected as seriously at 24 hours by an increase in the thickness of the base. For conventional amalgam the fracture load dropped by about 40% as the thickness of the base was increased from 0.5 to 2.5 mm and for copper-rich amalgam the fracture load dropped 33% for the same increase in thickness. For both amalgams the lowest fracture load attained at any thickness of zinc phosphate occurred at about 60 kg.

## Discussion

The supporting ability of a base depends on its modulus of elasticity (Powers, Farah & Craig, 1976). Therefore, knowing the modulus of elasticity of a certain cement base enables one to determine its estimated failure load as a function of thickness. For example, the modulus of elasticity of zinc oxide and eugenol preparations like Cavitec (Kerr Mfg Co, Romulus, MI 48174, USA) that are not reinforced is approximately half that of calcium hydroxide (Dycal). Thus one would expect Cavitec to lend less support to an amalgam restoration than would calcium hydroxide. The results of this study suggest that the thickness of a base with a low modulus of elasticity, such as calcium hydroxide, should not exceed 0.5 mm. Thicker bases can be placed when cements with higher moduli of elasticity, such as zinc phosphate or polycarboxylate, are used.

## Conclusions

1. At one hour the effect of the thickness of the cement base on the fracture of the amalgam was not as pronounced as its effect at 24 hours.
2. At 24 hours the amount of load needed to fracture amalgam was lowered by 50% when the thickness of the calcium hydroxide base was increased from 0.5 to 1.0 mm for both the conventional and the copper-rich amalgam. Thus calcium hydroxide should be used only when necessary and limited to a thin lining.
3. At 24 hours the amount of load needed to fracture amalgam was reduced from 35 to 40% as the thickness of the zinc phosphate cement base was increased from 0 to 2.5 mm.
4. The results of the study point to the important role played by the modulus of elasticity of the base in supporting amalgam restorations.

Dr Farah thanks the L D Caulk and S S White companies for providing the dental materials for this study.

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*OPERATIVE DENTISTRY, 1981,* **6**, *90–94.*

DENTAL PRACTICE

# Restoration of Mutilated Posterior Teeth: Periodontal, Restorative, and Endodontic Considerations

Multilated posterior teeth can be restored by a combination of periodontal, endodontic, and restorative treatment.

JAMES R MURRIN • WAYNE W BARKMEIER

**Summary**

**This paper describes a technique for restoring an extensively carious tooth. The technique includes periodontal surgery, placing an amalgam retained with pins, and endodontic treatment.**

## INTRODUCTION

Posterior teeth requiring endodontic treatment frequently show extensive coronal destruction. Such teeth may be difficult to isolate with the rubber dam for endodontic therapy and may appear nonrestorable due to large defective restorations, subgingival extension of caries, or fracture of the tooth (Fig 1). Sometimes periodontal surgery and a restoration of amalgam retained by pins and covering all the cusps facilitates endodontic therapy.

This article reviews a sequence of treatment for the rehabilitation of teeth with extensive coronal destruction requiring both periodontal surgery and endodontic treatment.

## PREOPERATIVE EVALUATION

Preoperative evaluation of mutilated posterior teeth should include:

- the feasibility of a final restoration that is in harmony with the periodontium
- favorable endodontic prognosis

Periodontal considerations should include an evaluation of both the zone of attached gingiva and the relation of the attachment to the alveolar crest and the gingival margin of the restoration. The zone of attached gingiva should be at least 2 mm to resist the spread of inflammation (Lang & Löe, 1972). The level of the alveolar crest, relative to the position of the gingiva and the remaining tooth structure, must be evaluated by carefully

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FIG 1A. *Appearance of mutilated mandibular first molar; restoration questionable due to subgingival extension of caries on the lingual aspect.*

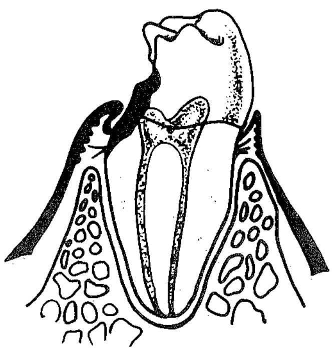

FIG 1B. *Diagramatic representation of subgingival extension of caries and disruption of gingival attachment on lingual surface.*

sounding bone with a periodontal probe. Surgery should provide 3 mm of sound tooth structure from the alveolar crest to the gingival margin of the restoration (Ingber, Rose & Coslet, 1977). This allows for the approximately 2 mm of sound tooth structure that is needed for the reattachment of the gingiva and the maintenance of periodontal health (Cohen, 1962; Ingber & others, 1977). If this space cannot be provided by periodontal surgery because of a poor ratio of crown to root, involvement of the furcation, or problems of esthetics (Palomo & Kopczyk, 1978), then extraction of the tooth and replacement by a prosthesis, or forced eruption of the tooth to increase the length of the clinical crown should be considered (Ingber, 1976; Bales & Thurmond, 1980).

## CLINICAL TECHNIQUE

### Periodontal Surgery

The flap for periodontal surgery must be designed to give adequate access and include the extent of caries or fracture. An envelope flap usually provides excellent access for osseous surgery and restorative procedures (Fig 2) and is well tolerated by the gingiva

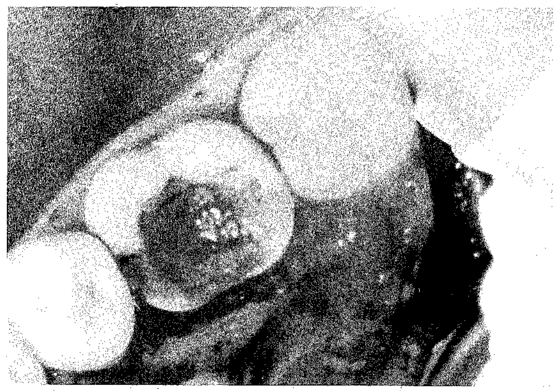

FIG 2. *Envelope flap extending from mesial of first premolar to distal of second molar provides access for osseous surgery and operative procedures.*

(Barkmeier & Williams, 1978). After a mucoperiosteal flap is reflected, the alveolar bone is easily visualized and the necessary osseous surgery can be completed to expose 3 mm of sound tooth structure between the height of the alveolar bone and the gingival margin of the prepared tooth (Fig 3).

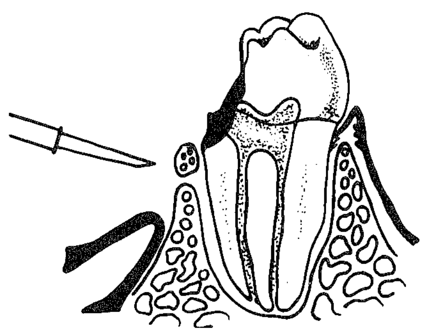

FIG 3. *Diagram depicting osseous surgery to provide 3 mm of sound tooth structure for a new gingival attachment and placement of the margin of the restoration.*

## Amalgam Restoration

Immediately after surgery a rubber dam is placed and the tooth prepared for an amalgam retained by pins (Fig 4). If there have been symptoms of pulpitis, or if the pulp is exposed, the pulp may be removed. After pulpectomy, a pledget of cotton is placed in the pulp chamber to block the orifices of the canals and a base placed over the pledget. This permits condensation of amalgam and facilitates access for future endodontic treatment. The restoration is completed (Fig 5) by placing self-threading or cemented pins and amalgam (Barkmeier, Murrin & Anderson, 1980; Brown, Barkmeier & Anderson, 1979).

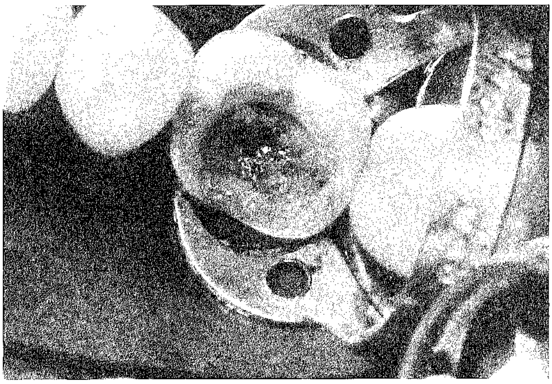

FIG 4. *Rubber dam isolation of tooth after osseous surgery.*

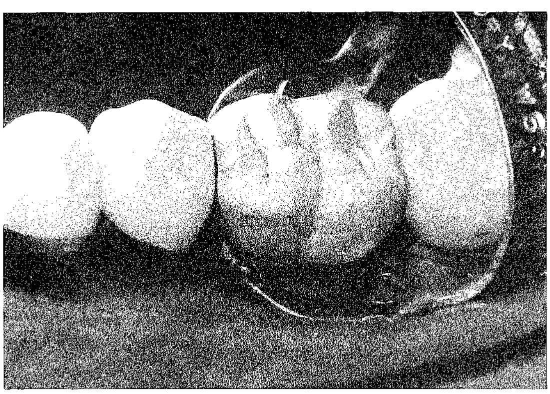

FIG 5. *Amalgam restoration, retained by pins, immediately after placement.*

After the restoration has been carved the rubber dam is removed and the area thoroughly irrigated to remove any debris. The gingiva is positioned at the desired level and sutured (Fig 6). A periodontal dressing may be placed.

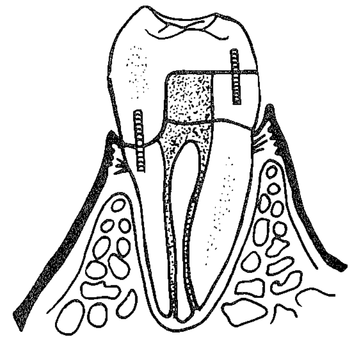

FIG 6. *Diagram depicting new gingival attachment. Adequate space has been provided for placement of margin without impinging on the gingiva.*

## Endodontic Treatment

Endodontic treatment may be initiated as soon as the gingiva has healed. Access is easily made through the amalgam restoration without disturbing the pins (Fig 7). The amalgam provides landmarks for measuring the

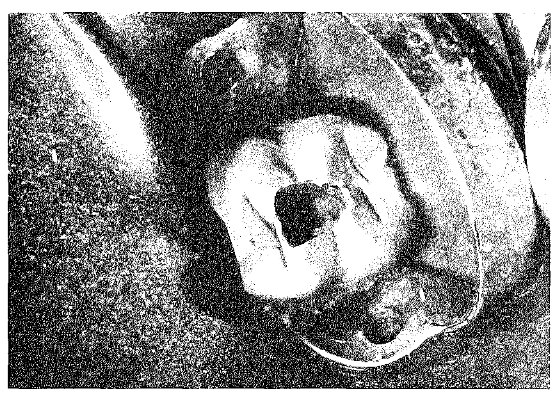

FIG 7. *Preparation for access to root canals.*

working lengths of instruments (Fig 8) and helps retain dressings. After endodontic treat-

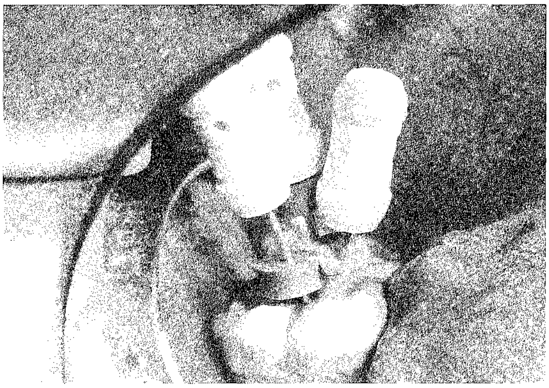

FIG 8. *The amalgam restoration provides landmarks for determining and maintaining working lengths of instruments.*

ment has been completed the amalgam walls of the cavity are burnished with mercury and the cavity is filled with fresh amalgam (Fig 9). This technique bonds fresh amalgam to existing amalgam (Jørgenson & Saito, 1968).

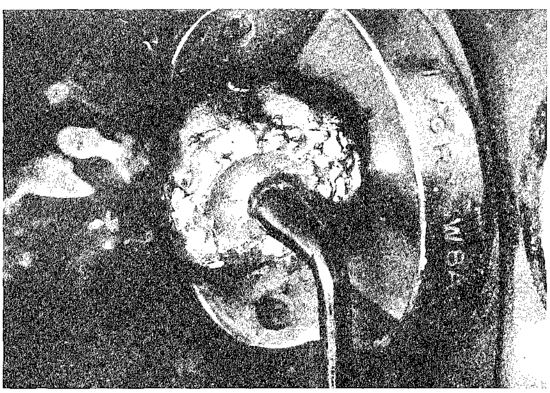

FIG 9. *Occlusal preparation restored with amalgam.*

The amalgam crown may serve as the final restoration (Fig 10) or may be prepared to serve as a core for a cast restoration. A core of amalgam retained by pins is stronger than a dowel and core of cast gold (Lovdahl & Nicholls, 1977).

FIG 10. *Finished amalgam restoration two weeks after periodontal surgery, and three days after completion of endodontic treatment.*

## CONCLUSIONS

The combination of periodontal surgery and restoration of mutilated posterior teeth with amalgam before endodontic therapy offers certain advantages:

- confirms that the tooth is restorable
- restores a crown to a form that is in harmony with the periodontium
- protects against fracture of the tooth, before, during, and after endodontic treatment
- provides landmarks for measuring the working lengths of endodontic instruments
- secures the temporary dressing between appointments
- provides an excellent marginal seal to prevent leakage and contamination of the canal during endodontic procedures

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*(Accepted 8 September 1980)*

REVIEW

# Unfilled, Filled, and Microfilled Composite Resins

A review of their composition, properties, and indications

JOHN W FARAH • EMERY W DOUGHERTY



**Summary**

**Filled composites possess many advantages over unfilled resins among which are: better mechanical properties, lower coefficient of thermal expansion, less shrinkage upon polymerization, and less absorption of water. The main difficulty with filled composites is in obtaining a smooth, well-polished surface. Microfilled composites, with much smaller particles of filler, are capable of giving a smoother, more polishable surface. The compressive and tensile strengths of microfilled composites are in the same range as filled composites, while the modulus of elasticity is much lower. Absorption of water and the coefficient of thermal expansion are about twice those of filled composites, while the shrinkage of polymerization is of the same order. The physical and mechanical properties of the microfilled composites are better than those of unfilled resins and almost as good as those of filled composites. Esthetically, the microfilled composites are superior to the filled composites.**

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## Introduction

Recently a variety of microfilled composites has become available to the dental profession. Questions have arisen about the clinical performance of these new composites. Long-term clinical data are unavailable, so an understanding of the development and physical and mechanical properties of direct restorative resins can assist the clinician in choosing between filled and microfilled composites. The purpose of this article is to help the clinician better understand and select the proper composite resin.

## Unfilled Resins

The forerunners of filled composites are the unfilled resins. Unfilled resins are similar to cold-cure resins currently being used for dentures, with pigments and dyes added to match the color of teeth. The two main components of unfilled resins are the liquid, containing methylmethacrylate monomer and an accelerator to speed setting, and the powder, containing methylmethacrylate polymer and a catalyst such as benzoyl peroxide. The unfilled polymethylmethacrylate products have several drawbacks, among which are high coefficients of thermal expansion, low mechanical properties, high shrinkage during polymerization, and pulpal irritation. The coefficient of thermal expansion of unfilled resins is about 90 x $10^{-6}$ cm · $cm^{-1}$ · $°C^{-1}$ while that of the tooth is only 12 x $10^{-6}$ cm · $cm^{-1}$ · $°C^{-1}$ and 8 x $10^{-6}$ cm · $cm^{-1}$ · $°C^{-1}$ for enamel and dentin, respectively. In other words, the coefficient of thermal expansion of unfilled resins is about nine times greater than that of a tooth. Ideally, the coefficient of thermal expansion of a restorative material should be close to that of the tooth because discrepancies in the coefficients of thermal expansion can result in percolation—the inflow and outflow of oral fluids at the interface of tooth and resin. Percolation can cause staining at the margins, followed by deterioration of the margins of the restoration and, eventually, recurrent caries.

The mechanical properties of unfilled resins are substantially lower than those of filled composite resins, the compressive strength, for example, being one-third to one-fourth; the modulus of elasticity—a measure of rigidity—one-fifth; and the tensile strength one-half to a third that of filled composites. These values are presented along with others in Table 1.

The shrinkage due to polymerization of unfilled resins is about 6% by volume compared with 2% for filled composites. This shrinkage can generate tensile stresses in the order of 30-130 kg · $cm^{-2}$ at the interface of resin and tooth (Bowen, 1967). It has been postulated that these stresses can break the bond between the matrix and the surface of the tooth (Asmussen, 1975).

Filled as well as unfilled resins irritate the pulp and all exposed dentin should be protected with a layer of calcium hydroxide. However, since methylmethacrylate molecules are smaller than difunctional molecules (bis-GMA), which are most often used in filled composite resins, the methylmethacrylate molecules can more easily diffuse through freshly exposed dentinal tubules

*Table 1. Properties of Unfilled, Filled, and Microfilled Composite Resins*

| Properties | Unfilled (Resins) | Filled (Composites) | Microfilled (Composites) |
|---|---|---|---|
| Weight of inorganic filler (%) | 0 | 75-80 | 35-50 |
| Shrinkage of polymerization (% by volume) | 5-6 | 2 | 2-3 |
| Absorption of water (mg · $cm^{-2}$) (14 days in distilled water) | 2 | 0.3-0.7 | 1.0-2.2 |
| Coefficient of thermal expansion ($10^{-6}$ cm · $cm^{-1}$ · $°C^{-1}$) | 90 | 25-35 | 55-70 |
| Compressive strength (MPa) | 70 | 180-250 | 220-280 |
| Tensile strength (MPa) | 15 | 30-45 | 30-55 |
| Modulus of elasticity (MPa) | 2 500 | 13 000-16 000 | 3 500-5 000 |

Modified from Raptis and others (1979) and Craig (1980).

and thus be a greater source of irritation.

Although unfilled resins possess these drawbacks in addition to low resistance to abrasion, they can still be successfully used in areas not subjected to stress such as class 3 and class 5 restorations. They are especially useful for class 5 restorations where the restoration might extend subgingivally. Unfilled resins, like microfilled resins, are easily finished and polished and thus can better resist the accumulation of plaque.

### Filled Composite Resins

To overcome some of the problems with unfilled resins, resins were developed having a difunctional monomer formulated from the aromatic dimethacrylate resin, bis-GMA, and filled with particles of glass or ceramic. Bis-GMA has a greater molecular weight and is more viscous than methylmethacrylate. The viscosity is usually reduced by diluting with other monomers of high molecular weight such as triethylene glycol dimethacrylate. Inorganic fillers such as quartz and silica are added to the resin matrix. The particles of inorganic filler are treated with a coupling agent of silane, which chemically bonds the filler to the resin. These compositions (see Table 2), also known simply as 'composites', have mechanical and physical properties superior to unfilled resins as shown in Table 1.

Most commercially available composites contain 75-80% filler by weight and approximately 50% by volume. The size of the particles of filler is in the range of 5-25 $\mu$m. Within a resin, particles of different sizes are used to allow better packing. The addition of inorganic filler markedly decreases the shrinkage of polymerization as well as the absorption of water, as shown in Table 1. Furthermore, the coefficient of thermal expansion is decreased to about $30 \times 10^{-6}$ $cm \cdot cm^{-1} \cdot {}^{\circ}C^{-1}$, which is only three times that of the average tooth, compared with nine times for unfilled resins. A decrease in shrinkage, less absorption of water, and a smaller coefficient of expansion can result in better dimensional stability. This increased stability will result in better long-term adaptation of the restoration to the walls of the prepared cavity.

The addition of particles of filler markedly improves compressive strength, tensile strength, and modulus of elasticity.

*Table 2. Some Commercially Available Resins*

| Type | Brand Name | Manufacturer or Distributor |
|---|---|---|
| Unfilled | Sevriton | Claudius Ash Inc, Toledo, OH 43604, USA |
| Filled | Adaptic | Johnson & Johnson, New Brunswick, NJ 08903 |
| | Concise | 3M Co, St Paul, MN 55101 |
| | Simulate | Sybron/Kerr, Romulus, MI 48174 |
| | Prestige | Lee Pharmaceutical, S El Monte, CA 91733 |
| | Nuvafil | L D Caulk Co, Milford, DE 19963 |
| | Vytol | L D Caulk Co, Milford, DE 19963 |
| | Exact | S S White, Philadelphia, PA 19102 |
| Microfilled | Isopast | PSA Professional Association, San Jose, CA 95129 |
| | Superfil | Harry J Bosworth Co, Skokie, IL 60076 |
| | Silar | 3M Co, St Paul, MN 55101 |
| | Phaseafill | Phasealloy, Inc, El Cajon, CA 92021 |
| Microfilled (Hybrids) | Finesse | L D Caulk Co, Milford, DE 19963 |
| | Miradapt | J & J Dental Products, East Windsor, NJ 08520 |
| | Extra Smooth | Den-Mat Inc, Santa Maria, CA 93454 |

Most physical and mechanical properties are improved by the addition of particles of filler; however, obtaining a smooth surface upon finishing is difficult. Composites consist of two phases, a soft matrix and hard particles of filler, which are embedded in that matrix. The discrepancy in hardness between filler and resin matrix makes finishing difficult. A smoother surface can be obtained after finishing by placing a layer of unfilled resin, in the form of a glaze, on the restoration. In one study glazed composites, after 23 months, were shown to be smoother than similar unglazed composites (Garman & others, 1977). Even if the composite is properly finished, abrasion, which is a continuing process in the oral environment, eventually removes some of the resin surrounding the particles of filler, resulting in their loss and the production of a rough surface, which is more prone to staining and bacterial plaque.

## Microfilled Composite Resins

Recently composite resins filled with particles (see Table 2) of silica 0.04-0.06 μm in diameter and containing 30-50% by weight of inorganic filler were introduced to the dental profession. In contrast, conventional (bis-GMA) composite resins contain particles of glass or quartz 5-25 μm in diameter and about 80% by weight of inorganic filler. These newer microfilled composite resins are designed to give a smoother surface.

The composition of the microfilled composite resins is similar to conventional composites. It is usually a bis-GMA or a modified bis-GMA except in the case of Isopast which is a urethane dimethacrylate. The filler consists of both inorganic and organic components. In the manufacture of microfilled composite resins, particles of colloidal silica 0.05 μm in diameter are embedded in the resin; this mass is then polymerized and pulverized into particles 5-25 μm in size. These particles are used as filler to form a new composite using mono- and difunctional reagents. The matrix of microfilled composites also contains some colloidal silica to control the viscosity of the mix. The resultant material may therefore contain a portion of filler of the same general size as conventional composites and its shrinkage of polymerization may be close to conventional composites since the final volume of unpolymerized resin is similar.

The compressive and tensile strengths of microfilled composites are in the same range as filled composites. Some variations in strength are evident, depending on the brands (Raptis, Fan & Powers, 1979).

The modulus of elasticity is approximately three to four times greater for filled than microfilled composites. Since microfilled composites contain less filler and thus more resin or matrix, the modulus of elasticity should be somewhat lower. However, because some of the resin is prepolymerized, the amount of shrinkage is low. Also, the coefficient of thermal expansion of microfilled composites is about twice that of filled composites.

Although data from laboratory tests are not always directly related to clinical performance, the data are useful in obtaining more insight into the behavior of a material. Data on physical and mechanical properties (Table 1) indicate that the properties of microfilled composites fall between those of unfilled resins and filled composites. Thus in the absence of clinical data, one can deduce that the clinical performance might also be expected to fall between these two extremes. Esthetically, the microfilled materials are superior to the filled composites, in that the surface can be finished to a high gloss, which is less conducive to accumulation of plaque and staining. Unpublished data obtained recently by J F Roulet with a surface analyzer and photographs from a scanning electron microscope (SEM) indicate that the surfaces of microfilled composites finished by various procedures are two to four times smoother than the surfaces of conventional composites finished by the same procedures. These results have been recently substantiated independently by another group of researchers (Dennison & others, 1981). Microfilled composites mix easily, and the resulting mixture is of a soft, creamy consistence that sets slightly faster than filled composites. Microfilled composites can be packed into the cavity with any type of instrument—including metal instruments—without causing discoloration. The best retention of microfilled resins is obtained when they are used in conjunction with a surface etched with acid followed by a good rinse and the application of a bonding agent. Finishing of microfilled composites is more difficult than conventional composites. Good results can be obtained by trimming the excess with 12-fluted burs at high speeds, followed by fine flexible disks or strips and finally fine rubber wheels, all at slow speeds.

A second generation of microfilled composites has more recently been made available to the dental profession. These hybrid (see Table 2) microfilled composites combine some of the features of early microfilled composites with those of conventional composites. The hybrids are microfilled composites impregnated with barium glass. Finesse and Extra Smooth contain approximately 18% by weight barium glass while Miradapt contains about 72% barium glass by weight. The barium glass imparts radiopacity to the composite. The size of the particles of barium glass is usually in the range of 4-20 μm. The physical and mechanical properties of Finesse and Extra Smooth are similar to those of the microfilled composites because of the lower content of filler. Miradapt, on the other hand, with a higher content of filler should have lower absorption of water and a lower coefficient of thermal expansion when compared with the early microfilled composites. The method of using these hybrids is similar to that of the other microfilled composites and the incorporation of the barium glass filler should facilitate finishing and polishing and provide radiopacity.

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# SPECIAL ARTICLE

# The Philosophy of the British National Health Service Is Wrong

ROBERT LEFEVER

The philosophical ideas upon which the British National Health Service (NHS) is based are wrong. It is not lack of finance that has destroyed the NHS as an instrument of health care. Nor is it faulty organizational structure. Nor is it overadministration. It is the ideas that are wrong. Over the span of a generation we have seen the provision of health care in the United Kingdom under the NHS degenerate into a free and comprehensive rotten shambles.

Any system of health care—or any enterprise whatever—is only as good as the ideas upon which it is based. However much one tinkers with the organization and however much money one spends, the end result of any venture will be disastrous if the original ideas are unsound. After a generation it surely is due time to sit back from the day-to-day hustle and bustle of the NHS, leave the bickering and bantering, and make a fundamental reassessment of our ideas.

Could it be that the basic concept of a compassionate State can be so wrong as to be laughable? If it is wrong, then it would certainly take only one generation to change a sincere profession into a money-grabbing rabble.

The ideas upon which the NHS is based are:

1. The State should take from the individual the ultimate responsibility for health care.

2. Resources should be distributed according to need.

3. Services should be free at the time of need.

It is these high-sounding ideas that have brought the practice of medicine to its disgraceful state today. Is it disgraceful? Yes, of course it is—considering what it costs. Every year the NHS costs almost £150 ($300) for every man, woman, and child in the country. The service they get is not worth the money. I do not need to document the condition of our hospital build-

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ings, the pitiful lack of general availability of specialized equipment, the painful and dangerous years on waiting lists for admission to hospital, or the disgusting state of general practice in cities where most of the population live. All this has been documented by others and the current evidence and future prospects are almost universally gloomy in the extreme. When one looks at special fields, such as the care of the elderly, the picture is frankly horrific even when we know that particular field will present our greatest challenge in the future. And yet this is the NHS that will cost £12,000 million ($21 billion) this year, a service still held by some to be the envy of the world and whose basic philosophical principles are still thought to be right even by the many millions of people who know in their minds if not in their hearts that the NHS has failed in practice.

The philosophical inertia in any society is substantial. It is part of the strength of a society that ideas bind it together. It is a tragedy, however, when religious fervor infects science. The fundamental idea in scientific discipline is that one's concepts must be malleable according to observations. If we see that something does not happen in the way we thought it should, then we have to change our ideas. Religious belief is by its very nature the opposite concept to scientific discipline. A religion does not assess evidence, nor does it actively and enthusiastically search to disprove its most cherished tenets. But science does—and must, or else it dies. It is religious fervor that is destroying the scientific basis of the NHS. No idea can afford to be inviolate. We must re-examine even our most basic ideas—or perish.

I say again: it is the ideas of the NHS that are wrong. Ultimately even the central philosophical concept of altruism is wrong. We are not our brothers' keepers and we must not be—we diminish them if we try. Moreover, any State system that tries to enforce compassion becomes in time veritable hell on earth. As Ayn Rand says, "The difference between a Welfare State and a Totalitarian State is merely a matter of time."

True compassion can only be individual. If I choose to help you that is my affair. If I leave you to rot that is also my affair—but I shall pay the consequences of that. If I want a compassionate society then I have to earn it through my actions for others. By contrast the State can **never** be compassionate. It takes from those who resent giving and it gives to those who come to believe they have a right to the product of the lives of others. Moreover, when A gives the life of B for the benefit of C this is the essential prerequisite of totalitarianism and this is precisely why Ayn Rand is right.

Who says that I cannot reduce human life to algebra? Indeed I can—and shall. The NHS is an utter shambles; our doctors are becoming lazy, incompetent, and bitter; and the population is increasingly conned into thinking that in general it demands too much. I say the opposite—it demands too little! It is the capitalist in me that demands and expects to give value for money. It is the scientist in me that demands that I challenge ideas and in turn throw my own ideas open to challenge. In the process I may need to use a mathematical model as an example—but I vow never to close my mind to the extent of merely reiterating politico-religious beliefs.

So now let us re-examine the ideas upon which the NHS is based, let us list the inevitable consequences, and let us look around us to see if the theoretical model of the NHS and its end results are true in practice. If they are, then we simply must throw out the ideas.

1. If the State takes over ultimate responsibility of health care from the individual then:

- Individuals come to think that they have rights and hence can demand a service without at the same time having to recognize that inevitably the service is the product of the life and work and integrity of someone else.
- Any thinker who allows himself to be the property of someone else ceases to think. A doctor who allows himself to become merely a unit in the State provision of health care rather than someone responsible for his own philosophical and mental integrity is not worth ask-

ing the time of day let alone his opinion on a clinical or personal problem.

- People assume that the State will care for the less fortunate. When presented with evidence that it does not they complain that it should do so, but do not actually feel obliged to take any positive helpful action themselves. Thus, the State is the cause of the Inverse Care Law which is that those most in need of help are least likely to get it. The State creates a cruel, arid, uncaring society that smothers individual compassion and charity. The State cannot be relied upon to produce responsible clinical care at the time that it is needed. A true sense of commitment can be the product only of an individual mind and personal philosophy. It can never be instilled by rules, regulations, and committees or even by Royal Commissions.

2. If resources are distributed according to need then:

- People compete to establish their need rather than their capacity to do well on their own account. The individual demands his so-called rights without any thought that it is at another's expense. The corporate body, answerable for its expenditure of public funds, spends its budget up to the hilt—or even overspends regardless of the needs of others—so that it can **demand** the same again or more the following year.
- Little attention is paid to the capacity of the recipient to benefit from the resource. An absolute need may be totally unchanged even after all the resource has been devoured. Meanwhile someone else with a lesser total objective need is left with no possibility of the benefit that could have been his because the resource has in effect been squandered.
- Scientific assessment of benefit takes second place to the hollerings of political pressure groups.

3. If services are free at the time of need:

- Perceived needs become relative rather than absolute.
- Instead of the individual patient not being able to afford treatment, the State runs out of money so that either the individual can't get the treatment anyway or, alternatively, the treatment that he can get isn't worth having.
- The proponents of the system point to a few people who have been dramatically helped "at no cost" and
  (i) Play on the fear or pity of their listeners and in so doing make them into suppliant pap.
  (ii) Disregard what is happening in general and focus on the particular.
- The State comes in time to be thought indispensable. With that goes every last individual freedom.

And what has all this to do with you in general practice? Everything—or have even **your** ideas, the ideas of a reader, a thinker, been so conditioned by the abysmal standards of the NHS that you have forgotten that the prime requirement of scientific thought—and there is no more concentrated thought required than in the initial assessment of a problem—is philosophy.

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POINT OF VIEW

# Semantics—the Name of the Game

JAMES V GOURLEY

To function in today's society, we must act and speak in thirds. With third world nations, third parties, and now third person writing, we must all learn to speak and write again to remain competitive and not offend certain elements of our society. Gender has been removed from our language: 'man' or 'woman' is now 'person'. Recently even 'person' is questioned: if we have one 'per son', then we must have one 'per daughter'; therefore 'individual' should be used rather than 'person'.

We dentists resist changes in our techniques and, perhaps more importantly, in our language. But our choice of words is very important for conveying concepts, connotations, and images to our patients. When we are dealing with the third parties underwriting the fees for many patients our choice of words becomes more critical than ever.

For example, a word important to our profession has created confusion and misunderstanding between dentists and patients. The word is 'permanent'. It is used to describe a type of restoration—permanent vs temporary.

Webster defines 'permanent' as: "continuing or enduring without fundamental or marked change; not subject to fluctuation or alteration; lasting or intended to last indefinitely." Patients expect permanent restorations to last indefinitely as indicated by the usual meaning of the word. However, we dentists use 'permanent' to describe any restoration of a durable or lasting nature.

The best word to describe such a restoration would be 'definitive', defined by Webster as: "serving to supply the final answer . . . with the implication of final and perfected completeness or precision." Isn't this what we are attempting to accomplish when we treat diseased teeth? The biological environment in which our treatments reside places a heavy responsibility for the longevity of a properly completed restoration on the patient, who must practice proper home care.

Another example is the phrase 'dental work'. Wouldn't 'dental treatment' be more appropriate? Are we treating diseases of the teeth and supporting structures or are we merely working on them?

"See your dentist twice a year and he will take care of your teeth" implies that no effort or care is required on the part of the patient. What could be further from the truth! The use of this phrase is not as prevalent as it was once. We may be making some progress! But we must continue to try to name our game—dentistry—with the same precision and accuracy with which we practice it.

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The opinions or assertions contained herein are those of the author and are not to be construed as official or reflecting the views of the Dental Corps or the Department of the Navy.

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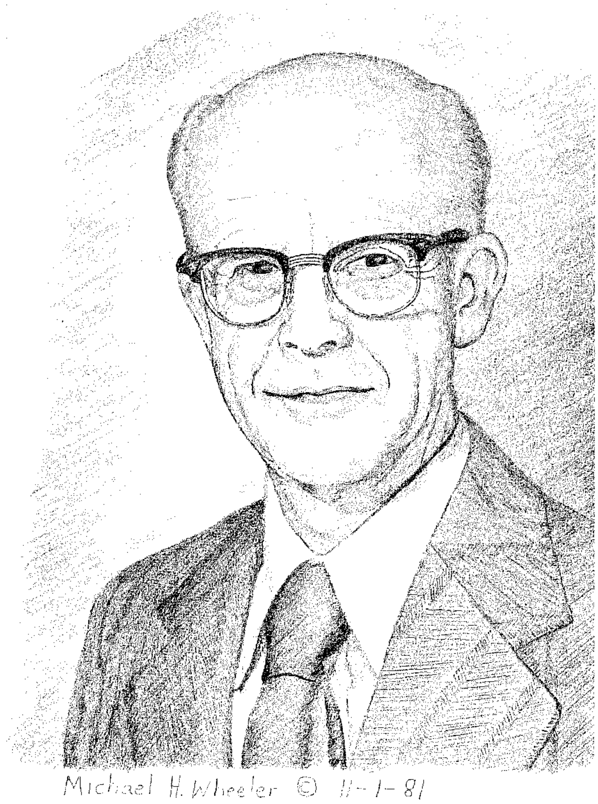
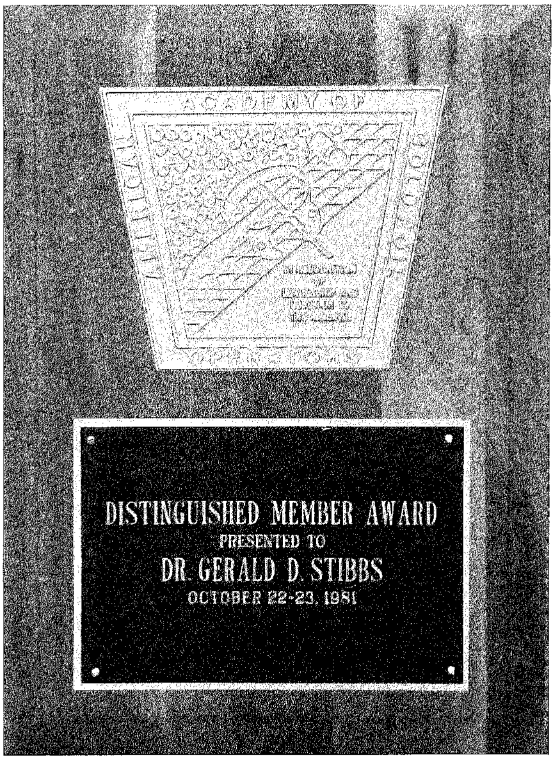
# Distinguished Member Award

The award of Distinguished Member of the American Academy of Gold Foil Operators was conferred this year on Gerald D Stibbs. This honor is given annually to a member of the academy for major contributions to dentistry. Qualifications must include diversity of interests, endeavors that warrant recognition, and unselfish giving to colleague and student alike. The recipient this year is abundantly qualified for such distinction.

Gerald Stibbs graduated from the North Pacific College of Oregon in 1931 with the degrees of BS and DMD. Immediately after graduation he began to practice in Nakusp, British Columbia, moving to Vancouver, BC in 1936, where he became a charter member of the Vancouver Ferrier Study Club. In 1948, after 17 years of full-time practice, he was appointed professor and chairman of the Department of Operative Dentistry at the newly established School of Dentistry at the University of Washington in Seattle. In 1950, he was also appointed chairman of the Department of Fixed Partial Dentures, a position he held until 1957. He resigned from the chairmanship of the Department of Operative Dentistry in 1970 and retired from the university in 1976 with the title of professor emeritus. He still teaches part-time in a course on gold foil as well as practicing two days a week. The exceptionally high standard of competence manifested by dental graduates




*Drawing by Michael Wheeler*




*Plaque presented to Dr Gerald Stibbs*

of the University of Washington derives mainly from the talent of Gerry Stibbs—a remarkable teacher, a stickler for detail, and a hard but fair taskmaster. His influence has spread nationally and internationally and has been amplified by many of his former students having been appointed to commanding positions in dental education. He never imposes himself on a student, graduate or undergraduate, but helps the student to his highest possible level of achievement. He has a way of helping a person do it himself and take pride in his own efforts.

When reading the information about James Frasier, the sculptor of the "End of the Trail," in the Cowboy Hall of Fame I was reminded of Dr Stibbs by the statement: "He never made anyone work along any particular line just because he himself liked or preferred it—but encouraged each one to be individual."

Dr Stibbs has worked untiringly in support of dental organizations. He is a charter member and past president of this Academy of Gold Foil Operators, was its first secretary-treasurer, and drafted its first constitution and bylaws. His memberships include the Academy of Operative Dentistry (charter member), Associated Ferrier Study Clubs (past president), American Academy of Restorative Dentistry, CAIC Seminar, American College of Dentists, International Association for Dental Research, Sigma Xi, Omicron Kappa Upsilon, and honorary membership in the Canadian Academy of Restorative Dentistry. He has also contributed substantially to the literature of restorative dentistry, dental education, dental materials, radiodontics, and is an associate editor of *Operative Dentistry.*

In collaboration with the well-known photographer Clifford H Freehe, he produced a motion picture film on the class 5 foil, which in 1961 won, among other prizes, the grand prize at the Second International Film Festival (Dental) in Paris.

Dr Stibbs has resolutely advocated the use of gold foil in dental therapy and has contributed immeasurably to its teaching and dissemination. He is the esteemed mentor of three gold foil study clubs whose members he continues to inspire. Thank you, Gerry, for all you have done for us and for dentistry.

From the address by Perry W Dungey, 22 October 1981.

*Perry Dungey presents the award to Dr Stibbs. Photo courtesy of Bob Allen.*

# DEPARTMENTS

## Book Reviews

### SIMPLIFIED PAINLESS ENDODONTICS FOR THE GENERAL DENTIST: THE ALTERNATIVE TO N2

By David A Pyner

Published by Quintessence Publishing Co, Chicago, 1980. 175 pages, technical atlas. Indexed. $48.00

The author's purpose is ". . . to describe to you a straightforward reproducible technique that will give you predictable success every time you use it." This technique is offered "as an alternative to N2, but it is meant as an alternative to most endodontic techniques being used today as well." The author's introduction offers one comparison with Sargenti's N2 technique. Whereas Sargenti claims 100% success, Pyner claims only 99.5% (100% minus a small x-factor). The claims of both are empirical, since neither, in his respective text, presents data to substantiate his claims.

The book is strictly a technical atlas, illustrating and describing Dr Pyner's concepts and experience in the field. There are 383 illustrations but no literature is cited and no references are included.

The author has divided his text into two main sections: Section I - Simplified Painless Endodontics, and Section II - Simplified Painless Endodontic Surgery for the General Dentist.

Section I includes chapters on the comparison of modern techniques of endodontics, diagnosis, control of pain, rubber dam, emergency treatment, access cavities, cleaning and filling the root canal, the difference in treatment of vital and necrotic teeth, and special cases.

The chapter on diagnosis is somewhat superficial. The text, however, presents to the general practitioner many suggestions of value on the topics of profound anesthesia, isolation with rubber dam, and quick development of radiographs. The author divides his diagnostic categories for emergency treatment into "two classes of endodontic disease": a vital pulp, which means that there is vital tissue at least in the apical 3 - 4 mm of the root, and a necrotic tooth, which means that there is no vital tissue in the canal. Most practitioners would not agree with his proposition that all necrotic or pulpless teeth should be left open for drainage at the end of the emergency appointment. His criteria for the use of antibiotics are not well defined and his concepts of the concentration of antibiotics in the blood compared with their concentration in bone seem fuzzy. The access preparations as described appear to be rather large. As an example, including the transverse ridge in the distal extension of the cavity in a maxillary molar is seldom necessary for adequate access into either the distofacial or palatal canal.

The author suggests that success of therapy depends on adequate cleaning of the canal. He advocates using an identical sequence of instruments for all teeth. He does not give any criteria for the completion of instrumentation other than completing this predetermined sequence. The author leaves all necrotic teeth open to drain after completion of instrumentation, a procedure not commonly advocated. The obturation technique can be characterized as a technique of using a master cone with heat and vertical condensation in the coronal half of the canal. As illustrated in many of the cases in the text, it is unlikely that the heat is carried far enough apically to aid in conforming the apical segment of the gutta percha to the contour of the canal. Radiographically, however, most fills appear to be well done. As previously stated, neither research nor rates of success are cited.

Section II provides an adequate description of periapical surgery. The author advocates that a "retrograde amalgam should be placed during all apical surgery." A step-by-step illustration of the basic surgical procedure is well done. However, the descriptions of some of the technical details, such as the preparation for a retrofill, are not adequate to instruct the neophyte. Many examples of technically difficult surgery of posterior teeth are demonstrated and appear to be beyond the scope of dentists who do not have extensive surgical experience.

Whereas the author's cavalier approach to perforation of the maxillary sinus during the course of maxillary surgical procedures may not meet with unanimous approval, the surgical results demonstrate the fine technical ability of the operator. Dr Pyner's overview of his surgical approach to the various anatomical areas that may be involved in periapical surgery provides a reasonable contribution to the literature and would be of interest to both general practitioners and specialists.

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## SEDATION

by H L Hamburg

Published by Quintessence Publishing Co, Chicago, 1980. 198 pages. Illustrated and indexed. $16.00

This paperback offers the dentist interested in sedation an easily readable "how to" book. Dr Hamburg has been trained in general anesthia, has a master's degree from Yeshiva University, and for over twenty years has limited his practice to general dentistry performed under general anesthesia. He has also taught general anesthesia in three hospitals.

Dr Hamburg states, "This book is going to teach you effective pain control," but the student must be "debriefed while he learns." He further states that: "Effective sedation requires that dentists be knowledgeable of all techniques, all modes of administration, so that they can adapt the proper technique and the proper drug combinations to the patient's physical and emotional needs." Thus, Dr Hamburg expects the dentist to be well qualified in the pharmacology, physiology, and anatomy of sedation.

In the first chapter (with illustrations) the author dwells on the routes of administration of drugs and the effectiveness and safety of each, dispelling objections to the intravenous route. The second chapter concentrates on inhalation therapy (nitrous oxide and oxygen). The various techniques and equipment are well covered and well illustrated, but his casual insistence that penthrane added to nitrous oxide is an ideal combination concerns me.

The third chapter is essentially about intravenous anesthesia. He feels that all dentists can easily accomplish an adequate venipuncture since addicts learn it so easily. Several illustrations are devoted to the technique of venipuncture, and the author briefly describes several common techniques in use today — the Jorgensen (Loma Linda), Monheim, and Shane — for administering drugs intravenously. Chapter four is about cosedation by either intramuscular or rectal technique and a few illustrations of these routes are shown. Hamburg advocates ketamine for very young children.

The author's technique, which is basically intravenous, is made up of selections from the other techniques and it is both like and unlike them. His technique includes various medications, premedications, nitrous oxide with penthrane, and intramuscular ketamine (for very young children). Dr Hamburg maintains that: "Sedation can be universally successful only if the dentist does not use a universal technique, a universal pathway of administration, nor a universal drug." Therefore, his technique requires a knowledge of many of the sedative drugs and all of the techniques of sedation, with a good bit of experience.

Most dentists would like to develop a simple technique that can be used in the office with fairly high efficiency, whereas the author's technique may be difficult for the reader to incorporate and master since it requires a multiplicity of drugs and techniques. The use of several agents in combination can present problems for an individual not trained in general anesthesia. Dr Hamburg's statement "if a patient inadvertently is pushed into unconsciousness and the dentist is unprepared for general anesthesia, he must wait until the patient's reflexes return (which can only be a matter of seconds at those doses)" is disquieting.

The author includes a short chapter on premedication followed by a review of medical problems and the selection of drugs and a technique for sedating the patient. Chapter seven discusses monitoring the patient. Dr Hamburg feels that monitoring, other than careful observation and verbal contact, is unnecessary, since the patient is always conscious. Chapter eight is devoted to the sedative drugs and contains information along with the experiences of the author.

On the whole, Hamburg's book is written for the general practitioner so that he can review techniques of sedation and add some pearls of wisdom in reference to equipment and technique. I recommend this paperback to anyone interested in sedation because it can be easily read and studied before sedation is instituted. This book is not a substitute for the university education in sedation, which the ADA council recommends; however, it is a good text to read before or after taking a course in sedation.

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## FUNDAMENTALS OF FIXED PROSTHODONTICS
**Second Edition**

by Herbert T Shillingburg, Sumiya Hobo, and Lowell D Whitsett

Published by Quintessence Publishing Co, Chicago, 1981. 454 pages, 778 illustrations. $38.50

Successful management of patients requiring fixed prostheses demands thorough understanding and prudent application of fundamental concepts common to the many disciplines of modern dentistry. The scope of problems dentists must confront is broad. Many therapeutic modes are so wrought with dogma, based primarily on individual conjecture, that it is refreshing to read a book based on a rationale, materials, and techniques from an updated bibliography.

In the five years that have passed since the introduction of the first edition, the authors have identified its strengths and weaknesses. Constant changes and improvements in materials and techniques have dictated that all of the chapters be revised. Most chapters have been enlarged and two new chapters have been incorporated.

Major revisions have been made in the text on dental casting alloys, impression materials, and dental cements. One new chapter addresses the problems of control of fluid and management of soft tissue, including electrosurgery. The second new chapter presents the principles and application of the techniques of the functionally generated path.

The authors' inimitable style and prolific use of impeccable line drawings make the text both easily read and understood. Some insight into the authors' wry sense of humor is afforded us when they comment that: "Only an adult male gorilla could remove a full arch polysulfide impression with a snap." There is ample evidence of the authors' philosophy of practice in this edition. It is evident in the continued emphasis placed on the role of occlusion, in the cognizance given to multiple techniques to solve a problem, and in a firm adherence to fundamentals.

Occlusion continues to receive heavy emphasis because it is the authors' belief that even the simplest cast restoration has a potential impact on occlusal relationships. Recognizing that there is usually more than one way to accomplish a particular operation, the authors present alternative techniques if they are widely used in the profession. They caution, however, that a thorough background in fundamental principles and an intimate knowledge of the techniques required are necessary to select the most appropriate technique for a given clinical situation. A firm undertone of adherence to fundamentals prevails and a specific admonition to avoid "herodontics" is noteworthy.

This book is intended as a basic text for undergraduate students. However, because of the scope, the incorporation of basic principles, the background information on recent materials, and the detailed descriptions of procedures, it is an excellent review for the practicing clinician. Adherence to fundamentals and the incorporation of new knowledge set this text apart from others in the field.

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# Dear Woody

### Fractured Porcelain (Vol 6, No 1)

There have been several reports published about materials and techniques for repairing fractured porcelain on porcelain to metal crowns. Is there a truly effective repair material and technique?

### Answer

The request for a "truly effective repair material and technique" for porcelain fractures hints that the techniques published are not effective in the hands of the correspondent.

Two papers for which I am responsible (*Operative Dentistry,* Summer 1977 and Spring 1979) reported positive evidence that silane coupling agents are effective bonding agents between porcelain and composite restorative materials.

And, after one year, both of the tested agents produced an improved bonding. These tests were conducted as meticulously as we knew how and were clinically oriented so that the results were correlative with actual use in the environment of the mouth.

It is urged that these chemicals be kept refrigerated and that the date of manufacture be noted, because they do have a limited shelf life if stored too long.

Many dentists with whom I have visited have confirmed our reports — and no one, to my knowledge, has done a study to disprove our results.

The bonding occurs only at the roughened porcelain interface and not on metals. In the latter case, obviously an additional attempt should be made to slightly undercut metallic areas when possible.

Cyanoacrylates should not be used in the mouth. They are not only unsuitable for use in the human mouth, but they will fail.

WILMER B EAMES, DDS
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### New Question

Many reports have been published recently concerning die spacers and die hardener solutions. I practice in a small community, prepare my own dies and casts, and articulate them before sending them to a laboratory. How can I decide which material and method are the best to use for preparing my dies?

*Editor's note:* Any reader with an answer to this question—or with another question—is asked to communicate as soon as possible with Dr Nelson W Rupp, National Bureau of Standards, Dental Research Section, Washington, DC 20234.

# Wit and Wisdom

### GET IT RIGHT THE FIRST TIME

Those persons who look at things as they are and ask, "Why?" probably have asked more than once why Jews and Christians are burdened with the Ten Commandments when so many other cults and religions have no such strictures. Some time ago we presented the results of our research and subsequent introspection into why things are as they are and explained why the earth is as it is. At long last we are ready to publish the results of another phase of this continuing labor.

Our studies have shown that the first set of stone tablets which God gave Moses to bring down from the mountain was slightly, but significantly, different from the second set. In the original version, for example, "Thou shalt not steal ..." actually read, "Thou shall steal whenever the current owner doesn't need an item as much as you do." This had been proved practical in a number of tribes where it simplified exchange and reduced the burden on limited manufacturing facilities.

The same was true of "Thou shalt not covet ..." The person who doesn't covet is not highly motivated. Originally the orders read, "Thou shall covet because it keeps the economy perking ..." Coveting, admittedly, can include coveting a man's wife or car or maidservant, but in the better form is expressed in the desire for one *just like* his (or hers).

And many of you will be surprised to know that the first set of tablets read "Five days shall thou labor and do all of thy work and on the sixth and seventh go shopping and mow lawns." This was changed to read, "Six days shalt thou labor and do all thy work, but on the seventh day ... thou shalt not do any work." That difference has caused many Jews and Christians to have guilty consciences and spend much of their time and money with psychiatrists.

(To head off the otherwise inevitable flood of calls and letters, we must advise that despite popular interest in the subject, we have been unable to determine whether the first tablets differed from the second set on the subject of adultery.)

As to the reason for the differences, you'll remember that Moses dragged the stone tablets with the Ten Commandments chiseled into them down from the mountain, and the people didn't like them. Moses got huffy, threw them down and broke them. When it dawned on him what he had done he went back for another set. Well, naturally, God was angered and he thought, "I'll fix their wagons!" So he sat down and chiseled out a new set, but in the version that we know today, and that has made our lives so much tougher than they otherwise would have been.

Which only goes to show that if you're called into the boss's office for instructions, you'd better get them right the first time. The next version might be tougher.

From an editorial by Robert R Jones in *Industrial Research/Development* (1979) **21**, 11.



## HAS THIS BEEN YOUR DAY?

Did your best friend's eight-year-old throw a
tantrum?
Did you push a root into an antrum?

Today, did that simple extraction turn out to
be major surgery,
And you wished you had become a steam-
boat pilot or had gone into the clergery?

Did your every anesthetic procedure refuse
to get numb,
... Chum?

Was your waiting room full, and some nut
complained for all to hear that the filling
you placed (but didn't) came out and it
took all the control you could muster,
... Buster?

Did you ask this guy to close against his
new filling gently but with aplomb,
And he snapped together as surely as
though he were testing his mother-in-
law's thomb?

Or, does the fellow whom you ask to bite on
his back teeth retort that he won't be a
back-biter, that's the kind of guy he's.
Or, when you ask him if his filling is too
high, he responds that any filling you place
is too high and he would appreciate an
adjustment of your fees?

Did the denture you made day before
yesterday snap,
While your patient was only eating mashed
potatoes or just taking a nap?

Do the mouths you see seem purely
alimentary, rather than something fine and
beautiful that you have tried to restore?
Did you just hear about your most particular
patient who, while speaking at her

twentieth class reunion, slid her lower denture clear across the floor?

Do you feel today like the man in charge, or just the apprentist?
Then this is the day you will go to a party and the one with his foot in his mouth will come up to you and say, "Are you a doctor, or just a dentist?"

WILMER B EAMES, DDS
Glenwood Springs, Colorado

(Reprinted with permission from the *Journal of the Colorado Dental Association,* March 1960, p 25.)

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**MILLER'S FILLER**

Pedodontists make good deans because they are used to dealing with children.

—CLIFFORD H MILLER

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# Press Digest

**Professionally (operator) applied topical fluoride therapy: a critique. Ripa, L W (1981) *International Dental Journal,* 31, 105-120.**

Neutral sodium fluoride, acidulated phosphate fluoride, and stannous fluoride are about equally effective in preventing dental caries when applied to the permanent teeth of children living in communities deficient in fluorine. Amine fluorides are also effective but it is not known if they are better than inorganic fluorides.

The most consistent results have been obtained when the fluoride is used in an aqueous solution. Prophylaxis pastes containing fluoride should not be the sole method of application.

The recommended technique of applying the fluoride consists of two steps—first, a prophylaxis of the teeth and then the application of the fluoride. A viscous gel in a tray provides a convenient means of applying the fluoride.

**Effect on gingival health of removing overhanging margins of interproximal subgingival amalgam restorations. Rodriguez-Ferrer, H J, Strahan, J D & Newman, H N (1980) *Journal of Clinical Periodontology,* 7, 457-462.**

Inflammation, a constant finding in gingivae associated with overhanging margins of class 2 restorations of amalgam, results from the accumulation of plaque, which, in the circumstances, is difficult for the patient to remove. Although scaling and polishing and instruction in oral hygiene reduce the inflammation, the greatest benefit is obtained when the overhang is removed.

**The effect of dental amalgams on mercury levels in expired air. Svare, C W, Peterson, L C, Reinhardt, J W, Boyer, D B, Frank, C W, Gay, D D & Cox, R D (1981) *Journal of Dental Research,* 60, 1668-1671.**

The expired air of subjects with dental restorations of silver amalgam was found to contain 0.10–2.61 micrograms of mercury per cubic meter before chewing and 0.08–87.5 $\mu g \cdot m^{-3}$ after chewing, an average increase of 15.6 times. Subjects with no restorations of amalgam had no mercury in their expired air either before or after chewing.

**Interface leakage in microfilled composites, amalgam, conventional composites and gold foil: a comparative *in vitro* study. Martin, D W (1981) *Journal of the California Dental Association,* 9 (8), 33-39.**

Class 5 cavities were prepared in extracted teeth with the cavities having the occlusal margin in enamel and the cervical margin in cementum. The cavities were then filled with composites—both conventional (Exact) and microfilled (Isopast), amalgam (Aristalloy), and gold foil. The enamel of some of the cavities for composites was etched, the enamel of others was not. The axial walls of all cavities for composite were lined with Dycal. The teeth were subjected to simulated wear by toothbrushing for a period of time equivalent to two years. The teeth were then cycled, for a period of time equivalent to two years, between two separate baths containing a 0.2% aqueous solution of basic fuchsin dye, one at 10 °C, the other at 55 °C.

All the restorations of composite resin showed penetration of the dye at the cervical margins. All composites with unetched enamel and about half of those with etched showed leakage. About a quarter of the restorations of amalgam showed leakage at the cervical margin, but only one showed leakage at an enamel margin. None of the restorations of gold foil showed leakage at any of the margins.

# Announcements

## NOTICE OF MEETINGS

### Academy of Operative Dentistry

Annual Meeting: 18 and 19 February 1982
Continental Plaza Hotel
Chicago, Illinois

### American Academy of Gold Foil Operators

Annual Meeting: 4 and 5 November 1982
University of Southern California
Los Angeles, California

*Gold foil placed in the distal of a canine by Richard D Tucker at the annual meeting. (Photograph courtesy of Dean St Arnault)*

## NEWS OF THE ACADEMIES

### American Academy of Gold Foil Operators

The 31st annual meeting was held 22–23 October at the University of Oklahoma College of Dentistry and the Hilton Inn NW. Clinical operations of direct gold restorations were demonstrated during the morning of 22 October. In the afternoon the members and their guests visited the Cowboy Hall of Fame. The day concluded with the president's reception and banquet, the highlight of the banquet being the presentation to Gerald D Stibbs of the Distinguished Member Award. The next morning was given to essays emphasizing the use and importance of direct gold in restoring teeth.

The officers of the academy for the forthcoming year are:

President: Harold E Schnepper

President-elect: Norman C Ferguson

Vice-president: William J Roberts

Secretary-treasurer: Ralph A Boelsche

Councillors: Ronald K Harris, Nelson W Rupp, and Julian J Thomas, Jr.

*Paul Dawson, winner of the Distinguished Service Award of the American Dental Association, and Gerry Stibbs, winner of the Distinguished Member Award of the American Academy of Gold Foil Operators together at the annual meeting in Oklahoma City. (Photograph courtesy of Dean St Arnault)*

# INSTRUCTIONS TO CONTRIBUTORS

## Correspondence

Send manuscripts and correspondence about manuscripts to the Editor, Professor A Ian Hamilton, at the editorial office: OPERATIVE DENTISTRY, University of Washington, School of Dentistry SM-57, Seattle, WA 98195, USA.

## Exclusive Publication

It is assumed that all material submitted for publication is submitted exclusively to *Operative Dentistry.*

## Manuscripts

Submit the original manuscript and one copy; authors should keep another copy for reference. Type double spaced, including references, and leave margins of at least 3 cm (one inch). Supply a short title for running headlines. Spelling should conform to *Webster's Third New International Dictionary,* unabridged edition, 1971. Nomenclature used in descriptive human anatomy should conform to *Nomina Anatomica,* 4th ed, 1977; the terms 'canine', 'premolar', and 'facial' are preferred but 'cuspid', 'bicuspid', and 'labial' and 'buccal' are acceptable. SI (Système International) units are preferred for scientific measurement but traditional units are acceptable. Proprietary names of equipment, instruments, and materials should be followed in parentheses by the name and address of the source or manufacturer. The editor reserves the right to make literary corrections.

## Tables

Submit two copies of tables typed on sheets separate from the text. Number the tables with arabic numerals.

## Illustrations

Submit two copies of each illustration. Line drawings should be in india ink or its equivalent on heavy white paper, card, or tracing vellum; any labeling should be on an extra copy or on an overleaf of tracing paper securely attached to the illustration, not on the illustration itself. Type legends on separate sheets. Photographs should be on glossy paper and should be cropped to remove redundant areas. For best reproduction a print should be one-third larger than its reproduced size. Maximum size of figure is 15x20 cm (6 x 8 inches). The cost of color plates must be met in full by the author. On the back of each illustration, near the edge, indicate lightly in pencil the top, the author's name, and the number of the figure. Type legends on a separate sheet. Where relevant, state staining techniques and the magnification of prints. Obtain written consent from holders of copyright to republish any illustrations published elsewhere.

## References

Arrange references in alphabetical order of the authors' names at the end of the article, the date being placed in parentheses immediately after the author's name. Do not abbreviate titles of journals; write them out in full. Give full subject titles and first and last pages. In the text cite references by giving the author, and, in parentheses, the date, thus: Smith (1975) found . . .; or, by placing both name and date in parentheses, thus: It was found . . . (Smith & Brown, 1975; Jones, 1974). When an article cited has three authors, include the names of all of the authors the first time the article is cited; subsequently use the form (Brown & others, 1975). Four or more authors should always be cited thus: (Jones & others, 1975). If reference is made to more than one article by the same author and published in the same year, the articles should be identified by a letter (a, b) following the date, both in the text and in the list of references. Titles of books should be followed by the name of the place of publication and the name of the publisher.

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