Mechanics Is Not an Excuse to Disregard Systemic Effects

By Robert Gammal

In arguing the case of whether amalgam is safe or not, the discussion has often been turned to compare the physical properties of various filling materials. The Australian Dental Association still claim that dental mercury amalgam is a far superior filling material and that composite fillings are not only inferior but that they only last a very short time. The types of scare tactics used by such organisations are intended to distract our attention from the fact that amalgam is in fact the greatest source of mercury to the general population and that the stuff simply is not safe. I do not believe that an argument about physical properties of any material can carry more weight than the responsibility of placing health care as our number one priority. It is like suggesting that because Thalidomide stops morning sickness for some women we should still be using it. Mechanics is not an excuse to disregard systemic effects.

To make matters worse, the claim that amalgam is a far superior material to composite as a filling material simply does NOT reflect the scientific research, which is even published in the dental journals. Most of this short paper carries annotated references from some of this literature. As you read them it will become clear that it is in fact the composite materials which are superior to dental amalgam as a tooth restorative material from a purely mechanical perspective. They carry the added advantage that they also look like teeth and are generally almost non-toxic. Ironically, this view is also held by Dr Peter Magnus who in 1992 was president of the Australian Dental Association (NSW branch). In an interview on radio 2UE, 16th February 1992, the reporter asked him if he used amalgam in his practice.

His response was: "I personally don't."

Reporter: "Why is that?"

Dr Magnus: "Because I believe today we have materials which are probably better and not so environmentally unfriendly."

Others, in official positions, have expressed the view that amalgam is in fact a terrible filling material. These views are not new.

Quintessence International is one of the most respected international dental journals. In 1995 the editor-in-chief of Quintessence (Volume 26, Number 3,1995), Dr Richard Simonsen wrote:

> "Amalgam should not be used as a restorative material in pediatric dentistry. Why? Because better materials are available.
>
> Amalgam should not be used as a first time restorative material.
>
> Why? Because better alternatives are available.
>
> Move Over Amalgam At Last."

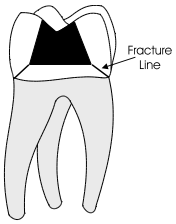
Dr. Harold Loe, the Director of the National Institute of Dental Research (NIDR), stated in the September, 1993 edition of "Dental Products Report":

> "That first filling is a critical step in the life of a tooth. Using amalgam for the first filling requires removing a lot of the tooth substance, not only diseased tooth substance but healthy tooth substance as well. So, in making the undercut you sacrifice a lot, and this results in a weakened tooth. The next thing you know the tooth breaks off, and you

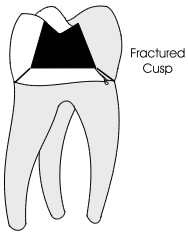
need a crown. Then you need to repair the crown...and so it continues to the stage where there is no more to repair and you pull the tooth. With the first filling you should do something that can either restore the tooth or retain more healthy tooth substance. Use new materials-composites or materials you can bond to the surface without undercuts. You can do this with little removal of the tooth substance so that the core of the tooth is still there."

With these statements, made by such respectable authorities, it is incomprehensible that the dental associations continue to take an opposing position.

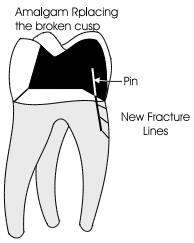
Comparison of Filling Techniques and Their Consequences



Amalgam fillings do not stick to the tooth. To retain the filling in the tooth, the cavity must be prepared with 'undercuts'. These undercuts not only lock in the amalgam filling but also cut off the nutrient supply to the dentine above the cut. Therefore the tooth structure above and to the side of the filling becomes brittle.



All metals in the mouth will undergo some corrosion. Amalgam also corrodes at a reasonably fast rate. When amalgam corrodes it also expands and it does so in all directions. The force created by this expansion will often create minute fractures in the tooth that is already more brittle due to the shape of the cavity preparation. At this stage the patient returns to the dentist to report that all they were eating was some soft bread and the tooth broke!



To repair such a problem, the dentist will usually drill a small hole into the dentine and insert a self-tapping screw - called a pin. The pin is reinforcement for the amalgam filling which will go back in. Even if this pin is made of titanium it will undergo corrosion when in contact with amalgam. Again the corrosion will cause an enlargement of the pin (sometimes up to five times its diameter) which will then crack the tooth further - but this time lower down the root.

This tooth is now a candidate for a crown because the filling, which has to go back into the tooth, is now so large that it cannot sustain the forces of chewing for very long.

Composite fillings do stick to the tooth. They are bonded chemically and mechanically to the tooth. They do not require a cavity, which is undercut and therefore do not require such a large or damaging cavity. In fact a composite filling can be used to rebuild a broken cusp without the use of pins or other mechanical support. I personally have not used a pin for years and have had great success with such restorations.

Studies comparing the fracture resistance of the tooth when filled with amalgam or composite indicate that amalgam will weaken the tooth structure whereas bonded composite fillings will strengthen the tooth. There is absolutely NO reason to continue the use of mercury amalgam!

Secondary Decay Under Fillings

Another bit of misinformation, which is often touted about by the dental associations, is that secondary decay is much greater with composite fillings than amalgam. This is completely false. When amalgam corrodes it not only does so on the chewing or exposed surfaces, but also corrodes on the side, which is in contact with the tooth - the deep part of the cavity. The corrosion

products react with the calcium and phosphorous in the tooth, forming hydrochloric acid. This acid then dissolves the tooth structure which is called secondary decay. The newer term for this is Crevice Corrosion. This does not happen with composites.

Toxicity

Mercury is one of the most toxic substances known to man. Amalgam is made of 50% mercury which leaches from the set amalgam all of the time. Recent research is indicating that the breakdown products of composites and glass ionomer cements are between 300 and 1.6 million times below the Tolerable Daily Intake levels. By comparison the mercury from amalgam is about 4 times greater than the Tolerable Daily Intake levels.

Although different people may show sensitivity to different composites, they are not subjected to the high level of poisoning as with dental mercury amalgam.

As a cautionary note, there has been one study published, which shows that some composites (those based on BIS-GMA) may break down to two materials (Bisphenol-A and Bisphenol-A dimethacrylate) which have been shown to be estrogenic. It is therefore advisable, for patients who have a hormone-related cancer, to avoid such materials if possible. With this warning in mind it is still preferable to replace all amalgam fillings. Mercury from amalgam will reduce the body's level of selenium. Several studies have shown that cancer rates increase as the body's selenium levels drop.

Replacement of missing cusps: an in vitro study. LC; Smith-BG J-Dent. 1994 Apr; 22(2): 118-20

A composite restoration with dentine bonding agent and additional pin retention was second best and significantly better than the pinned amalgam restoration. A cermet restoration with additional pin retention required slightly less force to fracture than pin-retained amalgam restorations, but not significantly so.

Clinical evaluation of a highly wear resistant composite. Dickinson-GL; Gerbo-LR; Leinfelder-KF Am-J-Dent. 1993 Apr; 6(2): 85-7

The colour matching ability of the material never fell below 96%. The percent of restorations exhibiting a surface texture similar to enamel never fell below 90% Alfa. At the end of 3 years, the total average loss of material was only 28 microns. No clinical evidence of bulk fracture was detected .... 79% of the restorations were Class II complex restorations with the replacement of at least one cusp!

Directed Shrinkage Technique in Class V Composite Restorations: in Vivo Microscopic Evaluation and Clinical Procedure, Ferrari, M., Practical Periodontics and Aesthetic Dentistry, Vol. 5, No. 7, September 1993, pp. 29-36.

The results showed no enamel margins leaked, with only one cervical margin showing minimal leakage.

Evaluation of occlusal marginal adaptation of Class II resin composite inlays. Kreulen-CM; van-Amerongen-WE; Borgmeijer-PJ; Gruythuysen-RJ ASDC-J-Dent-Child. 1994 Jan-Feb; 61(1): 29-34

The dentist was the variable that most influenced the marginal adaptation. Variability in the period elapsing between applying the restoration and conducting the assessments is discussed as a factor that may impair a fair comparison with initial results for direct composites.

Three-year follow-up of five posterior composites: in vivo wear. Willems-G; Lambrechts-P; Braem-M; Vanherle-G J-Dent. 1993 Apr; 21(2): 74-8

It can be concluded that the investigated ultrafine compact-filled composites can be considered as amalgam alternatives as far as their wear resistance is concerned.

Posterior adhesive composite resin: a historic review. Fusayama-T J-Prosthet-Dent. 1990 Nov; 64(5): 534-8

This landmark study by one of our great pioneers, graphs resin vs. amalgam failures and shows resin (Clearfill Posterior - a self-cured resin) far superior in the long term