

RESEARCH SUMMARY

A 3 year longitudinal, controlled, clinical study of a gallium-based restorative material

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Aim

The aim of this three-year longitudinal controlled study was to compare the clinical performance of Galloy¹ versus a high copper, mercury based Dispersalloy² filling material.

Methods

Moderate to large class I and class II cavities or replacement restorations were selected and 25 Galloy[®] restorations and 25 Dispersalloy controls were placed in 14 adult patients by a single operator. Restorations were photographed and a silicone impression recorded at baseline, 6 months, 1 year, 2 years and 3 years.

Results

At 3 years all 22 Dispersalloy restorations but only 4 Galloy restorations were still *in situ*. Three Dispersalloy restorations were lost to follow-up. Tooth fracture was observed in 15 (60%) of the Galloy restorations by the end of the 3 years, compared to one (4%) Dispersalloy restoration, which failed due to tooth fracture. A further six Galloy restorations had to be removed due to complaints of persistent pain. Four teeth restored with Galloy required endodontic treatment but none of the Dispersalloy restored teeth required endodontics. Of the four Galloy restorations remaining *in situ*, three were relatively small restorations and the fourth a moderate sized restoration required a marginal repair.

Conclusion

The clinical performance of Galloy restorations was so grossly inferior to the Dispersalloy controls that Galloy cannot be recommended for clinical use in moderate to large or multi-surface cavities.

IN BRIEF

- Galloy restorations in moderate to large class I and class II cavities displayed early catastrophic failure that resulted in fractured tooth structure in 60% of cases.
- Galloy restorations demonstrate dimensional instability and marked corrosion in the presence of oral fluids even when placed using procedures designed to reduce moisture contamination.
- Due to its inferior clinical performance, Galloy is unsuitable as a restorative material for use in moderate to large class I and class II restorations.

COMMENT

There was a time when it was thought that gallium would be a suitable metal to replace mercury in metal-based pastes that set at mouth temperature, just like mercury based amalgams do. Early clinical studies on small restorations appeared to produce no serious problems once the clinician had learned how to handle the paste, which tended to stick to the packing instruments.

However, when the present authors extended these studies to more realistic clinical applications in Class I and II cavities, alarming problems arose. They placed Galloy restorations in such cavities alongside others in Dispersalloy.

In Galloy, a packable paste is formed when powdered Ag-28Sn-12Cu-0.05Bi alloy is triturated with the liquid with a melting point of 10°C that forms when gallium is mixed with indium, tin and bismuth to form a eutectic mixture. In Dispersalloy the paste forms when powdered Ag₃Sn alloy containing spheres of Ag-Cu eutectic is triturated with mercury.

Once the packed Galloy came into contact with water internal corrosion went wild and the set restoration expanded and was extruded from the cavities. For the patient, it was a return to the days of the Crawcour brothers. It will be recalled that shortly after their arrival in America in 1833, these itinerant 'dentists' went around stuffing ill-prepared cavities in rich and gullible patients with a mixture of silver and copper shaved from French silver coins and mercury. These restorations expanded dramatically and caused both pain and fracture of the tooth. Such was the manifestation that the present authors found with these large Galloy restorations.

If ever there was a case that demonstrated that the only real place to test a new material is in the mouth rather than rely merely on laboratory studies, this was it. The authors final statement says it all: "The manufacturer's decision to withdraw Galloy from the UK market based on the results from this study prevented potential damage to many thousands of patient's teeth in the UK. Galloy is still employed in some parts of the world and we feel that the major problems identified in this clinical study should be widely disseminated."

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