

A Study of a New Material for Retrograde Fillings

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Stailine was found to be an excellent material for retrofilling. In comparing results with this material with results from tests done with silver amalgam, it was seen that Stailine adapts better and does not expand. Collagen fibers appear to grow into cracks in it, which proves it to be biologically acceptable.

For a long time in the practice of surgical endodontics, there was a need for a different material for retrofillings. The difficulties encountered in the use of the traditional silver amalgam made it necessary to look for another possibility.

For some time the medical profession has rejected the internal use of mercury in any form because of the high toxicity of this element. The content of free mercury in the silver alloy raises questions about its use in direct contact with the periapical tissues.

The preparation and design of a retentive cavity and the dry field required for a silver amalgam filling are very difficult to obtain, particularly when dealing with the periapical areas of the teeth in the lower arch. Also, cases that had been successful for a number of years, began to fail¹ for no apparent reason. This caused us to look for a material that could advantageously replace

the one we had become used to for so many years.

Studies of the sealing properties of dental materials² indicated that the combination of zinc oxide and eugenol (ZOE) offered the best chance of a well-sealed filling.³⁻⁷ Nicholls⁸ reported the use of ZOE for retrofills, and we began to use it with some success. However, the material could be resorbable, and there was evidence of this in a few cases.

Consequently, we searched for an addition to the formula that would make it nonresorbable. Stailine Super EBA Cement, manufactured by Staines in England, a combination of ZOE and a silicone dioxide mixed with ethoxybenzoic acid (EBA)⁹⁻¹³ seemed to provide what was needed. Its ease of manipulation and adhesiveness to the dentinal walls,^{14,15} even under imperfectly dry conditions, avoid the need for special retention in the cavity preparation. Because of its plasticity, it can be

placed easily, as long as the mix is as thick as possible. The setting time is long enough to allow an adequate working interval, whereas it sets quickly after it is put in contact with the tissues.¹⁵

Stailine has powder and liquid components. The powder is composed of 60% zinc oxide, 34% silicone dioxide, and 6% natural resin; 62.5% EBA and 37.5% eugenol make up the liquid part.

Stailine has a high compressive strength, a high tensional strength, a neutral pH, and low solubility. It is radiopaque. The clinical success of more than 14 years of use in approximately 200 cases is not enough to prove a point, even though we were able to see some 60 cases in recall. Nonetheless, histological evidence was needed to show its effectiveness (Fig 1).

A block section of the apex of a tooth was removed with the surrounding periapical tissues. The

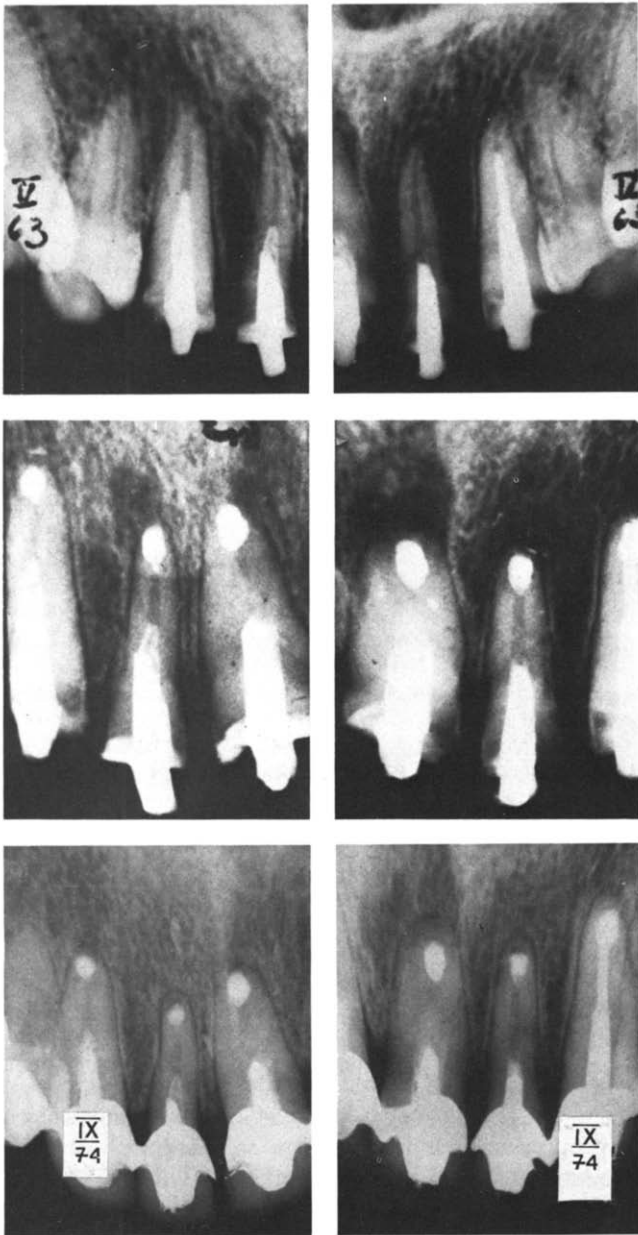


Fig 1—Top: preoperative view of case of six maxillary anterior teeth with dowels and faulty or no endodontic treatment. Middle: postoperative view with retrofills in place. Bottom: 11 years later. Note complete regeneration and no change in retrofills.

tooth had been in the mouth for 12 years after the placement of the retrofilling (Fig 2). This block section was made to perform histological studies of serial sections. The results were that repair had taken place in the tissues around the filling; there were dense bundles of collagen fibers next to the apex and a small granulocytic area consisting of lymphocytes, macrophages, and plasma cells, the latter showing a chronic inflammatory reaction that can be considered normal after the placement of a foreign body in any tissue. Newly formed bone had been deposited in areas of previous resorption (Fig 3).

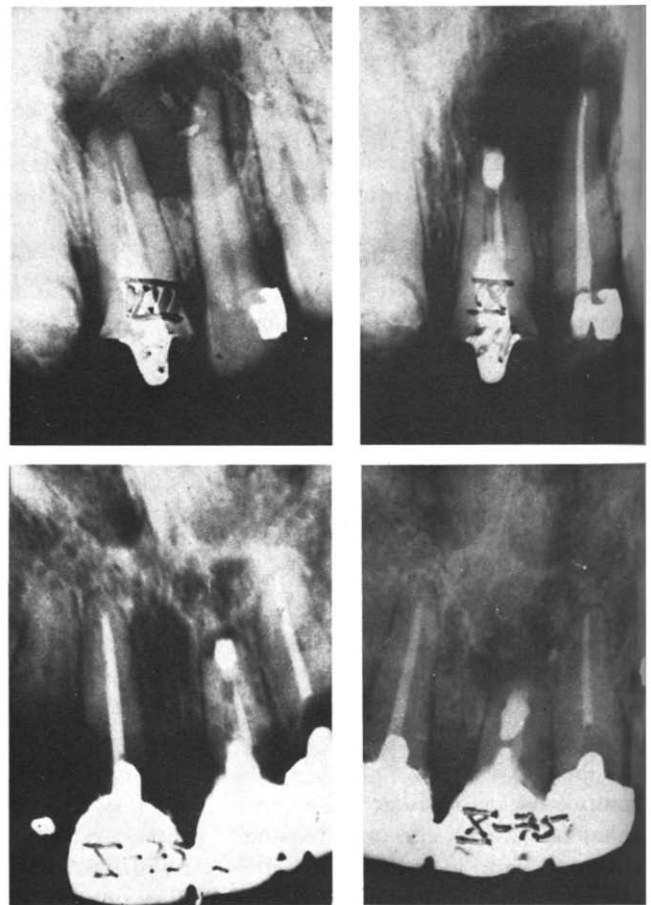


Fig 2—Top left: preoperative view with faulty root canal filling and dowel. Top right: postoperative, pulp of lateral incisor was also affected. Bottom left: 11 years later, periapical lesion healed and retrofill is intact. Bottom right: view after block section was taken for histological study. New retrofill was placed.

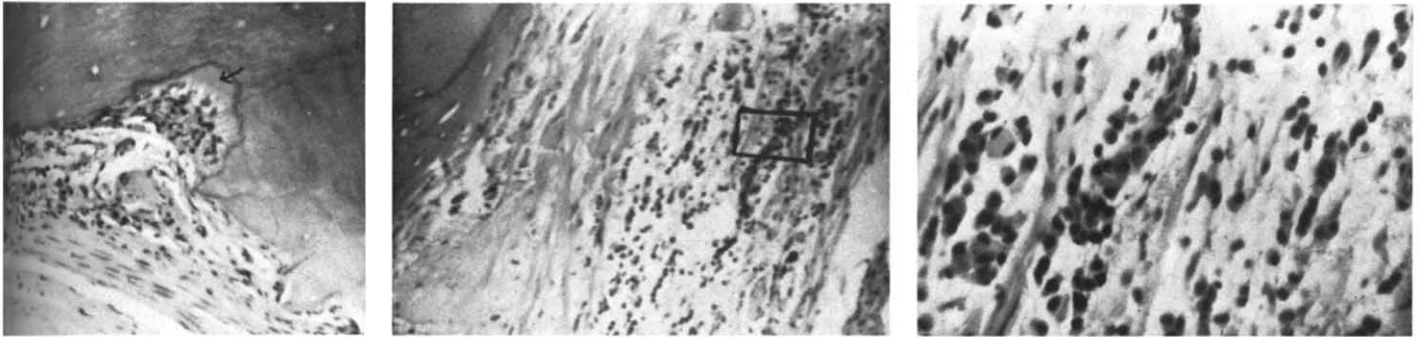


Fig 3—Left: note repair represented by apposition of collagen bundles. New bone has been deposited in areas of previous resorption. Middle: collagen fibers and some chronic inflammatory cells. Right: higher magnification of area enclosed shows presence of some lymphocytes, macrophages, and plasma cells.

More evidence was needed, so another specimen was obtained to be examined with the scanning electron microscope (SEM). A tooth was chosen where a retrofilling had been placed three years before with good clinical and radiographic results (Fig 4). The apex of the root was cut and another retrofilling was made. The SEM picture clearly showed good adaptation even at high magnification. A comparison of the results with this material, with the results obtained by Moodnik¹⁶ in his study of silver amalgam, showed that the Stailine has a better adaptation, no expansion, and, what could be more important, shows growth of collagen fibers over the material and into the cracks present (Fig 5). This image confirmed the clinical impression we received at the time of the removal of the apex. Even though it was already completely separated from the rest of the tooth, it was with great difficulty that we were able to extract it, as if it was still attached to the surrounding tissues. This was confirmed by the SEM pictures that showed there were collagen fibers deposited not only on top of the filling material, but apparently growing into it.



Fig 4—Top left: preoperative view of central and lateral incisors. Note complete calcification of root canal on lateral incisor and apical resorption in both. Top right: immediate postoperative view. Note retrofills on both teeth. Bottom left: three years later, tissues have regenerated and retrofills look unchanged. Bottom right: after removal of apex of central incisor for SEM. New retrofill was placed.

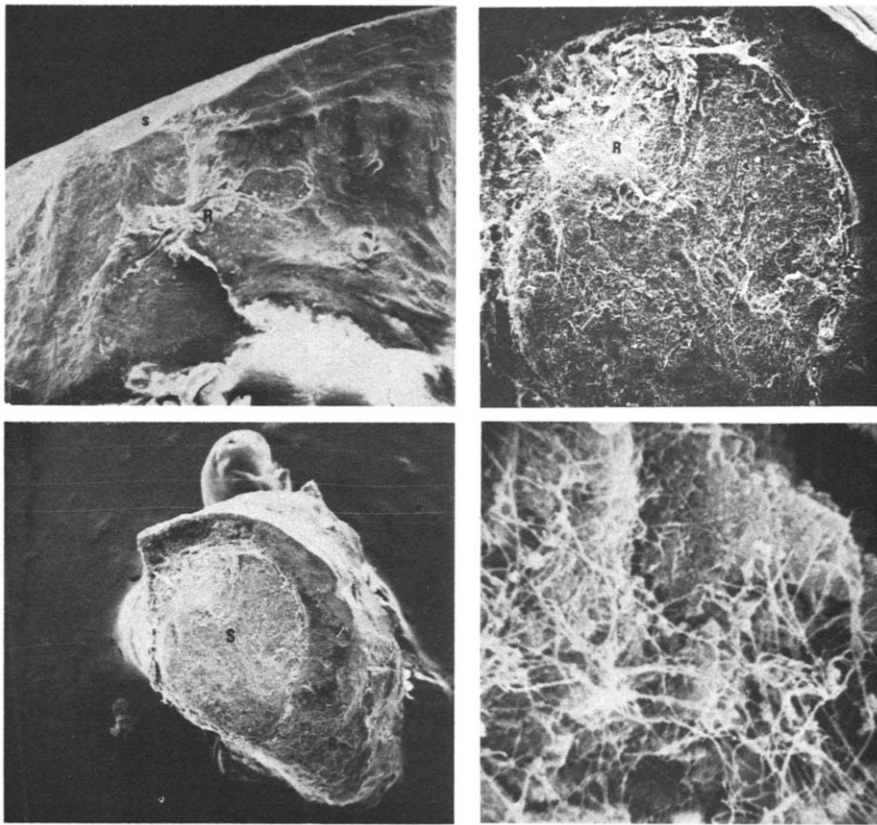


Fig 5—Top left: side view of root apex (R) and retrofilling (S). No expansion or protrusion of material is present (orig mag $\times 50$). Top right: view of periphery of material at apex. Notice close adaptation of material (orig mag $\times 21$). Bottom left: higher magnification of retrofilling. Collagen fibers are beginning to show (orig mag $\times 500$). Bottom right: collagen fibers look as if they were going into cracks present in material (orig mag $\times 5,000$).

DISCUSSION

The objective of a retrofilling is to seal the apex of a tooth that otherwise cannot be filled. There are many materials that have been used in the past for this purpose with different degrees of success.

Because of the special conditions encountered in the periapical region, it is necessary to have a material that will not only give a good seal, but will be the most biologically acceptable. According to the results of this study, Stailine comes close to achieving these objectives. The results should encourage further and more extensive studies to corroborate these findings.

SUMMARY

A study was made to prove the clinical, radiographic, and microscopic efficiency of a new material for retrofills. This material, consisting mainly of ZOE, resin, EBA, and

silicon, was tested using the microscope to show its biocompatibility. A block section was taken from the apex of a tooth where a retrofill had been placed 12 years before. These results, as well as those from SEM sections of an apex with a three-year-old retrofill, showed that it has better sealing properties than the conventionally used sliver amalgam.

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