

- Dent Mater J* 1986; **5(2)**: 225–232.
4. Staninec M, Holt M. Bonding of amalgam to tooth structure: tensile adhesion and microleakage tests. *J Prosthet Dent* 1988; **59(4)**: 397–402.
 5. Ben-Amar A, Liberman R, Judes H, Nordenberg D. Long-term use of dentine adhesive as an interfacial sealer under Class II amalgam restorations. *J Oral Rehab* 1990; **17(1)**: 37–42.
 6. Berry FA, Parker SD, Rice D, Munoz CA. Microleakage of amalgam restorations using dentin bonding system primers. *Am J Dent* 1996; **9(4)**: 174–178.
 7. Charlton DG, Moore BK, Swartz ML. *In vitro* evaluation of the use of resin liners to reduce microleakage and improve retention of amalgam restorations. *Oper Dent* 1992; **17(3)**: 112–119.
 8. Staninec M. Retention of amalgam restorations: undercuts versus bonding. *Quintessence Int* 1989; **20(5)**: 347–351.
 9. Torii Y, Staninec M, Kawakami M et al. Inhibition *in vitro* of caries around amalgam restorations by bonding amalgam to tooth structure. *Oper Dent* 1989; **14(3)**: 142–148.
 10. Eakle WS, Staninec M, Lacy AM. Effect of bonded amalgam on the fracture resistance of teeth. *J Prosthet Dent* 1992; **68(2)**: 257–260.
 11. el-Badrawy WA. Cuspal deflection of maxillary premolars restored with bonded amalgam. *Oper Dent* 1999; **24(6)**: 337–343.
 12. Setcos JC, Staninec M, Wilson NH. A two-year randomized, controlled clinical evaluation of bonded amalgam restorations. *J Adhes Dent* 1999; **1(4)**: 323–331.
 13. Browning WD, Johnson WW, Gregory PN. Clinical performance of bonded amalgam restorations at 42 months. *J Am Dent Assoc* 2000; **131(5)**: 607–611.
 14. Mahler DB, Engle JH. Clinical evaluation of amalgam bonding in Class I and II restorations. *J Am Dent Assoc* 2000; **131(1)**: 43–49.
 15. Belcher MA, Stewart GP. Two-year clinical evaluation of an amalgam adhesive. *J Am Dent Assoc* 1997; **128(3)**: 309–314.
 16. Summitt JB, Burgess JO, Berry TG et al. The performance of bonded vs. pin-retained complex amalgam restorations: a five-year clinical evaluation. *J Am Dent Assoc* 2001; **132(7)**: 923–931.
 17. Staninec M, Eakle WS, Silverstein S et al. Bonded amalgam sealants: two-year clinical results. *J Am Dent Assoc* 1998; **129(3)**: 323–329.
 18. Cox CF, Subay RK, Suzuki S et al. Biocompatibility of various dental materials: pulp healing with a surface seal. *Int J Periodont Rest Dent* 1996; **16(3)**: 240–251.
 19. Browning WD, Johnson WW, Gregory PN. Postoperative pain following bonded amalgam restorations. *Oper Dent* 1997; **22(2)**: 66–71.
 20. Staninec M, Marshall GW, Lowe A, Ruzickova T. Clinical research on bonded amalgam restorations. Part I: SEM study of *in vivo* bonded amalgam restorations. *Gen Dent* 1997; **45(4)**: 356–60, 362.
 21. Staninec M, Artiga N, Gansky SA et al. Bonded amalgam sealants: five year clinical results. *J Dent Res* 2000; **79(Spec Iss)**: 417, #2188.

ABSTRACTS

WHERE EXACTLY IS THE APEX?

An *In Vivo* Comparison of Two Frequency-based Electronic Apex Locators. A.R. Welk, J.C. Baumgartner and J.G. Marshall. *Journal of Endodontics* 2003; **29**: 497–501.

Most clinical practitioners prefer the results of research on real patients, rather than laboratory experiments. This study asked seven adults (mean age 53), who were to undergo extraction of teeth for prosthodontic reasons, to allow an experiment to be performed before the teeth were extracted. Thirty-two teeth were used, incisors, canines and premolars. Having checked the apices of the teeth by radiograph, local anaesthesia was administered and the teeth isolated with rubber dam. The crowns were reduced to allow ease of access, and coronal flaring of the root canals carried out.

Each of the two apex locators under test was then used in accordance with the manufacturer's instructions to identify the apical foramen, using alternate machines first. Four different machines of each type were used and it was found that each brand measured consistently with no variation in values. After careful measurement of the files to within 0.1 mm, the second

file used was cemented into the canal with a glass-ionomer cement and the tooth extracted.

The results showed that one machine measured 1.03 mm short of the minor diameter, whilst the other was only 0.19 mm short. If a root canal is prepared long there may be apical perforation and overfilling, whereas a short preparation may lead to inadequate debridement. It is most important therefore that the clinician knows exactly what position is being recorded as the apex by the machine in use.

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HOW LONG DO YOUR RESTORATIONS REALLY LAST?

Long-term Evaluation of Extensive Restorations in Permanent Teeth. J.P. Van Nieuwenhuysen, W. D'Hoore, J. Carvalho, V. Qvist. *Journal of Dentistry* 2003; **31**: 395–405.

This is a report of a prospective study of over 1000 extensive intra-coronal restorations and crowns placed by a single practitioner over a 17-year period. It is a project that any dentist could undertake with a little perseverance, but the results are well worthwhile, especially in today's climate of clinical governance and informed consent issues. The stated

aims of the study were to assess the outcome and survival of extensive amalgam and composite resin restorations; to compare the clinical performance of these materials to that of crowns; and to identify risk factors for failure of the different types of extensive restoration. Strict inclusion criteria were laid down, with protocols for cavity preparation, retention and selection of restorative material.

Twenty-four per cent of restorations were lost to follow-up, but 48% were well functioning at the end of the study. Of the 28% that failed, the most common reasons were fracture of the restoration (8%), secondary caries (6%), and cusp fracture (5%). It was found that restorations in premolars failed more frequently than molars. The median survival times were 12.8 years for amalgam, 7.8 years for composite resin, and 14.6 years for crowns.

The authors conclude that composite resin is not a suitable material for extensive restorations, but amalgam may be an appropriate alternative to crowns with due consideration of the longevity of the restorations. The authors also reported that, in molars, extensive restorations which fail may be better simply being repaired rather than replaced.

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