

Christie, W. H. and M. D. Peikoff (1980). "Direct impression technique. Sealing prepared apical foramen." J Can Dent Assoc 46(3): 174-80.

Haas, S. B., A. D. Campbell, et al. (1989). "A comparison of four root canal filling techniques." J Endod 15(12): 596-601.

This study compared the apical seal produced by four obturation techniques. Sixty-four extracted human teeth were prepared and obturated using lateral condensation of gutta-percha that was either unmodified or was **dipped** in chloroform, eucalyptol, or eucapercha paste. After storage in normal saline and 0.02% azide solution at 37 degrees C for 200 days, the teeth were immersed in India ink for 48 h. The most coronal extent of leakage of India ink into the canal was then determined. Significantly more apical leakage occurred in the eucapercha group than in the other three groups. All other comparisons were equivalent. The results suggest that modification of the gutta-percha master cone with solvent does not improve the apical seal in vitro. If modification is desired, then dipping the master cone in either eucalyptol or chloroform produces an apical seal superior to that achieved with eucapercha.

Margelos, J., K. Verdelis, et al. (1996). "Chloroform uptake by gutta-percha and assessment of its concentration in air during the chloroform-dip technique." J Endod 22(10): 547-50.

The use of chloroform as an adjunct to the practice of endodontics has been a matter of debate. In the present study the chloroform uptake of gutta-percha cones was determined by a gravimetric assay for different times of **chloroform dip**. In conjunction with an assessment of the amount of gutta-percha dissolved during dip, this provided an estimate of the amount of chloroform that patients are exposed to in clinical conditions. An assay was also performed of the chloroform concentration in the air in a dental office. Chloroform uptake was shown to increase with an increasing dipping time. There also seems to be a difference in this uptake between pure chloroform and a chloroform preparation with colophonium. The concentration levels of chloroform evaporated during the practice of chloroform dip within a dental office do not exceed the safety limits.

Moyer, P. W., E. M. Osetek, et al. (1995). "Evaluation of a solvent-softened gutta-percha obturation technique in curved canals." J Endod 21(9): 459-63.

The purpose of this study was to compare the efficacy of three obturation techniques in curved canals. Twenty-four sets of three (triplets) morphologically similar molars having root curvatures of 45 to 90+ degrees were assembled. Following canal preparation, one sample from each group was obturated by either a **halothane-dipped, a chloroform-dipped**, or an untreated lateral condensation technique. Twenty triplets were cleared, evaluated, and graded for homogeneity of fill, canal wall adaptation, and replication of internal anatomy. Four triplets had windows prepared to expose the apical 6 mm of filling and were viewed with scanning electron microscopy. Kruskal-Wallis test of cleared teeth indicated a significant difference in favor of the solvent-softened techniques ($p = 0.01$). There was no difference between chloroform- and halothane-dipped groups ($p = 0.03$). Scanning electron microscope evaluations of halothane-dipped samples revealed more homogeneous fills with greater canal replication than untreated gutta-percha. In addition, halothane-treated samples had appreciably less surface porosity than chloroform. Lateral condensation of halothane-treated gutta-percha was judged to be a viable obturation technique.

Smith, J. J. and S. Montgomery (1992). "A comparison of apical seal: chloroform versus halothane-dipped gutta-percha cones." J Endod 18(4): 156-60.

A dye penetration study was done to compare apical leakage among three groups of extracted teeth obturated with a lateral condensation technique. In one group the master gutta-percha cones were customized in the apical portion of the canals after being **dipped in chloroform**. A second group used halothane as the customizing agent. No dip was used in the third group, and all three were then laterally condensed. The teeth were cleared and dye penetration was measured. Statistical analysis using a Kruskal-Wallis one-way analysis of variance of the data showed no significant difference among the groups at the $p < 0.05$ level.

Yancich, P. P., G. R. Hartwell, et al. (1989). "A comparison of apical seal: chloroform versus eucalyptol-dipped gutta-percha obturation." J Endod 15(6): 257-60.

Three groups of extracted teeth were obturated using gutta-percha and lateral condensation. In one group the gutta-percha was **dipped in chloroform** before condensation. In a second a eucalyptol dip was used. No dip was used in the third group. A dye penetration study was done to compare leakage among the three groups. The teeth were cleared for viewing and measurements of dye penetration were made using a stereomicroscope. Statistical analysis using Kruskal-Wallis one-way analysis of variance of the results showed no significant difference among test groups at the 0.05 level.

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Narracott, P. (1989). "An in vitro comparison of the single cone and lateral condensation techniques using 'friction-fitted' and 'solvent dip-fitted' primary gutta-percha cones [see comments]." *Aust Dent J* 34(1): 49-51.

Extracted teeth, root-filled by single cone and lateral condensation techniques, using friction fitted and solvent (chloroform and eucalyptol) dip-fitted primary gutta-percha cones, were compared with respect to apical sealing as measured by length of dye penetration and frequency of no dye penetration. Overall, the single cone techniques were significantly more effective than lateral condensation techniques regarding length of dye penetration. The single cone techniques were not significantly different from the lateral condensation technique which employed chloroform dip-fitted primary gutta-percha cones regarding length of dye penetration. The single cone and lateral condensation techniques which utilized chloroform dip-fitted cones ranked first and second with respect to frequency of no dye penetration.

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