

Periapical Status of Root-filled Teeth Restored with Composite, Amalgam, or Full Crown Restorations: A Cross-sectional Study of a Swedish Adult Population

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Abstract

Introduction: The aim was to compare the periapical status of root-filled teeth restored with resin composite, laboratory-fabricated crowns, or amalgam in a Swedish adult population. **Methods:** The subjects consisted of 440 individuals from a randomly selected sample of 1000 adult residents of a Swedish county. The type, material, and quality of the restorations were recorded for all root-filled teeth by using clinical examination and intraoral clinical photographs. Periapical status, root-filling quality, and marginal bone loss were evaluated on panoramic radiographs. The association between periapical status and type, material, and quality of the restorations was analyzed by using the χ^2 test and logistic regression. **Results:** No difference in the frequency of apical periodontitis (AP) between teeth restored with resin composite, laboratory-fabricated crowns, or amalgam (29.7%, 26.2%, and 43.1%, respectively) of adequate quality was found. No association between AP and resin composite restorations was disclosed; however, there was an association between AP and inadequate root-filling quality and marginal bone loss $>1/3$ of the root length. **Conclusions:** The results did not indicate any association between AP and resin composite restorations. Neither the type nor the material of the restoration was of significance for periapical status as long as the quality was adequate. (*J Endod* 2016;42:1326–1333)

Key Words

Apical periodontitis, cross-sectional study, crowns, dental amalgam, endodontics, resin composite

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The quality of the coronal restoration of a root-filled tooth has been found to be important for periapical health in various studies. In a longitudinal epidemiologic study, inadequate restorations have been found to be among the most important risk factors for the development of apical periodontitis (AP) in root-filled teeth (1). Similarly, in a prospective follow-up study from a specialist clinic, satisfactory coronal restorations were significantly associated with periapical health (2). In a systematic review and meta-analysis that were based on 9 studies, Gillen et al (3) concluded that the odds for healing of AP increased with both adequate restorative treatment and adequate root canal treatment.

A few studies have focused on the type of restoration in relation to the periapical status; for example, both Safavi et al (4) and Stassen et al (5) have found a lower frequency of AP in root-filled teeth restored with laboratory-fabricated crowns compared with teeth restored with direct restorations. However, other studies found no statistically significant difference in the frequency of AP in teeth restored with laboratory-fabricated crowns compared with teeth restored with direct restorations (6–8). Differences in root-filling quality in teeth restored with crowns or fillings as well as small numbers of teeth in the studied groups may contribute to the variation of the findings. In some studies, the quality of the coronal restorations was not evaluated (4, 6, 8).

Regarding the material for direct restoration of the root-filled teeth and its relation to periapical status, the literature is sparse. In a cross-sectional study of an adult Swedish population, Frisk et al (9) found composite fillings to be predictive of AP in root-filled teeth, and Hommez et al (7) detected more AP in root-filled teeth restored with composite material compared with amalgam. However, Stassen et al (5) did not find any statistically significant difference in the periapical status of root-filled teeth restored with amalgam compared with composite, but a significant difference was found between restorations of adequate and inadequate quality. In Sweden, resin composite has been the predominant restorative material since the 1990s, and since the ban of amalgam in 2009, it has been the only material available for direct restorations. Because 80% (2002) and 85% (2005) of the root-filled teeth in a Swedish adult population were restored with direct composite restorations (10), it seems important to continue the study of possible differences in periapical status between root-filled teeth restored with different materials.

The hypothesis for this study was that the frequency of AP was higher for teeth restored with composite compared with teeth restored with other types of restorations. The aim of the study was to compare periapical status of root-filled teeth restored with resin composite, laboratory-fabricated crowns, or amalgam in a Swedish adult population.

Significance

This study did not indicate any association between apical periodontitis and resin composite restorations in root-filled teeth. If the quality of the coronal restoration is adequate, neither the type nor the material seems to be of significance for periapical status.

Materials and Methods

The random sample of 1000 adults comprised residents of the county of Skåne, Sweden in 2007. The individuals, aged 20–89 years, were invited to take part in a clinical study of oral health. The sample was obtained from SPAR (the government's Person Address Register in Sweden). Of the original sample of 1000 individuals, 34 were excluded for various reasons, leaving 966 available individuals (Fig. 1). In total, 451 individuals underwent clinical examination, and the remaining 515 did not participate because of poor health, old age, not being reachable, or declining to participate. The distribution regarding sex and age did not differ between participants and non-participants. Patients were informed about the study, and they provided written consent. The design of the study was approved by the Regional Ethical Review Board at the University of Lund, Sweden, Dnr 513/2006.

Clinical Examination

The clinical examinations were conducted at the Faculty of Odontology at Malmö University, Sweden or at 3 public dental clinics in the county of Skåne between March 2007 and November 2008. For details about the clinical examination, see Lundegren et al (11). Five intraoral clinical photographs were taken: frontal, right, and left views (all in intercuspal position) and occlusal views of the teeth in the upper and lower jaw. Caries lesions were determined by using standardized clinical criteria aided by mirror, probe (EXD57; Hu Friedy, Chicago, IL), and bitewing radiographs. Cavitated lesions extending into the dentin were defined as manifest caries.

Radiographic Examination

Radiographic examination comprised panoramic radiographs and bitewings (in general 4 bitewings), which showed the distal surface of the canine to the mesial surface of the last molar.

The radiographic images were available in the digital record system (Romexis 2.8.1.R; Planmeca, Helsinki, Finland) and interpreted

separately on a 19-inch liquid crystal display monitor (Olorin; Kungsbacka, Sweden, VCD 190D; resolution: 1280 × 1024 32-bit color; graphic card: HD Graphic; Intel, Santa Clara, CA) in a room with adjusted ambient light.

Interpretable radiographs were not available for 11 individuals (3 were edentulous, 7 without panoramic radiographs, and 1 with panoramic radiograph of inadequate quality). Thus, the final sample for this study comprised 440 subjects (46%) (Fig. 1).

A calibration process for the criteria of periapical status, root-filling quality, and marginal bone loss was carried out by 4 observers through discussion and interpretation of panoramic radiographs from 20 randomly selected subjects. The panoramic images of another 20 patients were then randomly chosen and independently evaluated by 3 observers to assess the interobserver agreement for periapical status, root-filling quality, and marginal bone loss by computing Cohen's kappa. After a second calibration, the remaining subjects were randomly assigned to 1 of 3 groups, and each observer was allotted the radiographs of 1 group for interpretation. Image processing by changing contrast, brightness, and magnification of the image was done when needed.

Evaluation of Caries and Restorations

Clinical examination protocol, intraoral clinical photographs, and radiographic images were used for the following registrations: type (filling and/or crown), material and quality of restoration, and manifest caries. Two observers simultaneously recorded the data for all endodontically treated teeth including third molars (Table 1).

Evaluation of Periapical Status, Root-filling Quality, Marginal Bone Loss, and Type of Post

In the panoramic radiographs, periapical status, root-filling quality, marginal bone loss, and type of post were evaluated. The criteria for classification are presented in Table 1. In cases of doubt about the presence of AP, the status was classified as normal. At the registrations of all teeth in the 440 patients, the 3 observers agreed on 96% of the periapical status registrations with a Cohen's kappa value of 0.6. Regarding the root-filling quality (adequate and inadequate), all 3 observers agreed on 98% of the registrations with a Cohen's kappa value of 0.5, and regarding the marginal bone loss, the observers agreed on 95% of the registrations with a Cohen's kappa value of 0.5. During the statistical calculations, the variable marginal bone loss was dichotomized as follows: (1) no marginal bone loss or $\leq 1/3$ of the root length or (2) marginal bone loss $> 1/3$ of the root length.

Statistical Methods

Statistical calculations were performed with the Statistical Package for the Social Sciences (SPSS 22 for Windows; SPSS Inc, Chicago, IL). Chi-square tests were applied to detect any significant differences in periapical status associated with type (filling and/or crown), material, and quality of the coronal restorations and manifest caries and root-filling quality. Logistic regression was used to describe AP by the following explanatory variables: type (filling or crown) and material of the coronal restoration, manifest caries, root-filling quality, marginal bone loss, and type of post. Differences were considered as significant at a 5% level.

Results

Individual Level

Four hundred forty individuals, 215 men (49%) and 225 women (51%), were examined, with a mean number of 27 teeth and 2.9

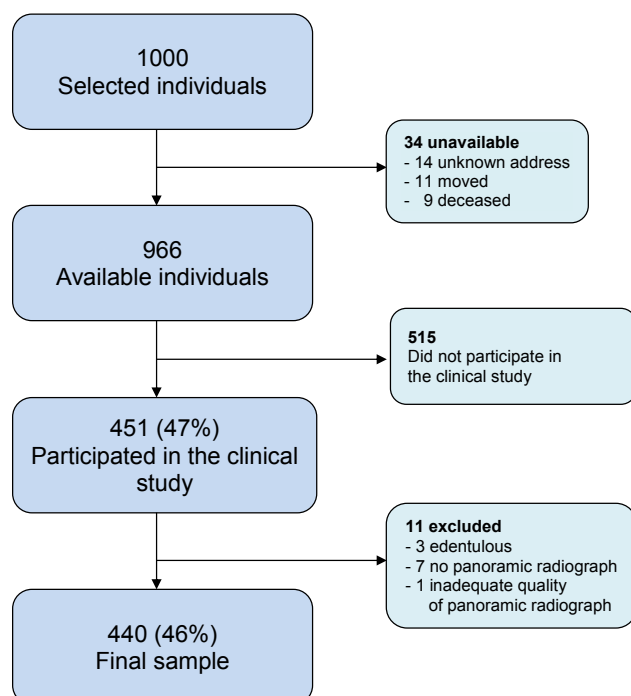


Figure 1. Flow chart of original sample to final sample.

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