

LETTER TO THE EDITOR

Response to the commentary on the article ‘pulpal and periapical disease in crowned vital teeth: A prospective matched cohort study’

Dear Editor,

We thank the commenters for their valuable time and effort in writing the comments on the article, and we appreciate the review given.

The article ‘Pulpal and periapical disease in crowned vital teeth: A prospective matched cohort study’ was published to report the factors contributing to the occurrence of pulpal and periapical disease in crowned vital teeth. As stated in our introduction, there are numerous variables that can affect the outcome of crowned teeth. Ideally, all these variables should be included and analysed. We agree with the commenters that it would be ideal to evaluate the indications for single crowns, mesiodistal dimension of the tooth, pre-operative assessment of the tooth morphology, remaining dentin thickness and pre-operative bone levels as independent variables. In our study, we have included 23 pre-operative factors and 17 intra-operative independent variables. The inclusion of more variables, although ideal, severely limits the power of the study and increases the alpha because of multiple comparisons. If this were a nationwide survey (e.g., National Health and Nutrition Examination Survey) [1], it is logical to include as many variables as possible since the sample size is huge. However, with a split-mouth design and strict inclusion criteria, there is a limit on the number of variables that can be included. We hope that our study explored several variables to inform future studies on the variables that are important.

The indication of crowns in this study was determined at the treatment planning stage. It varies from recurrent restoration dislodgement, suboptimal aesthetic, large restoration, cracked tooth and use as abutments for bridge-work. These factors, except the use as abutments, were not included in the pre-operative factors but might have contributed to the outcome of the study. It is well established that teeth with recurrent restoration dislodgement and large restorations can reduce the pulp survival rate after crown preparation due to its ‘stressed-pulp condition’ from previous repetitive restorative procedures [2]. For cracked tooth, survival studies have shown that cracked tooth that was treated with crowns will require

root canal treatment in 20% of cases within 6 months [3], 9% of cases in 2.6 years [4] and 29% of cases within 3 years [5]. There is a large variation in pulp survival rate between the three studies, which may have been due to the difference in methodology. The findings by Krell and Rivera [3] showed a similar incidence of pulp survival to the study by Saunders and Saunders 1998 [6], where 19% of crowned vital teeth, in general, required root canal treatment. However, the study by Lee et al. [4] and Wu et al. [5] showed that cracked teeth that did not undergo crowning have a reduced rate of pulp survival compared with crowned teeth. Hence, it is difficult to deduce whether the cause of endodontic involvement is due to the crack itself or the crown preparation. In this study, only two cases were involved with cracked tooth, and both had remained asymptomatic after crown cementation.

The pre-operative distance between pulp and dentine was mentioned in the article in table 1 and figure 3. The remaining dentine thickness and convergence angle after crown preparation were not measured in the study, but the inclination of the axial wall was mentioned in table 2 of the article, although the use of convergence angle would have been more accurate.

With regard to the significant effect of pre-operative bone level as a factor for disease, we do agree with the commenter’s inference that the reduced marginal bone level would imply deeper crown margin preparation, which correlates with lesser remaining dentine thickness. This condition can worsen the already jeopardised pulpal condition by the attachment loss leading to the dissemination of insults from marginal gingiva to the exposed radicular dentinal tubules and periapical tissues pre-operatively [7]. This was mentioned in the discussion section of the article.

The commenters did suggest using permanent cement instead of temporary cement during the temporisation of provisional crowns due to the prolonged temporisation. We do agree with the commenters, if prolonged temporisation was to be planned, the use of permanent cement would be more justified. However, the cementation of the definitive crown in this study was not intentionally delayed; hence, permanent cement was not used.


The commenters also noted that 'either the SD of age is wrongly mentioned, or the age groups are incorrectly stated'. We apologise for the error, and the standard deviation for age was wrongly mentioned; it was supposed to be 16.4 instead of 1.9.

Another issue that was raised by the commenters was the sample size calculation. Ideally, the sample size is estimated from values reported in a split-mouth matched control study comparing crowned and sound teeth. However, no such prior study existed to our knowledge. Hence, the sample size was estimated from not just one study, as claimed by the commenters, but two studies. Whitworth et al. [8] reported the incidence of 0.9% incidence of pulpal necrosis in teeth restored with composite/amalgam restorations, while Kontakiotis et al. [9] reported a 9% incidence of pulpal necrosis in crowned teeth. Theoretically, the incidence of pulpal necrosis in intact teeth with no dental procedure is 0, but the calculation of sample size using a 0 value does not make mathematical sense. Since the selection criteria for experimental and control groups can be sound or previously restored, the values in Kontakiotis et al. (2014) and Whitworth et al. (2014) were chosen. The table below illustrates the incidence estimation selected:

Group	Crowned group:	Untreated group:
Pre-operative condition	Sound or restored	Sound or restored
Intervention	Crown	No crown
Incidence	9% (Kontakionis et al. 2014)	0.9% (Whitworth et al. 1995)

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