Introduction

Marginal integrity is essential to the long-term success of indirect restorations [1]. Loss of good marginal adaptation leads to plaque accumulation and subsequent recurrent caries and periodontal disease [2]. The American Dental Association have stated cement film thickness of zinc phosphate cement to be 40 microns [3]. However, on clinical practice, acceptable marginal gap is highly variable. Mclean and Fraunhofer examined over 1000 crowns and found that 120 microns was the maximum tolerable marginal gap [4] while Blackman et al. [5] stated that an acceptable gap should not be more than 50 microns. Methods to measure marginal gap in vitro are variable like using direct microscopy [6], profilometry [7], and replication of cement space with silicone material and microcomputed tomography [8]. However, in clinic, the evaluation of marginal gap is most commonly done subjectively with the use of DE tip. When the tip of the explorer is able to penetrate the junction between unprepared tooth structure and the crown, the margin is considered not acceptable. One study evaluated the ability of experienced operative dentists to detect marginal gaps of varying degrees using DEs and found that explorer dullness significantly affected their decision regarding marginal fidelity [9]. Up to the author’s knowledge, no previous studies have surveyed the tip diameter of regularly used DEs used in dental schools. The aim of the study is to measure tip diameter of a sample of dental explorers used in the college of dentistry, King Saud University, Riyadh, Saudi Arabia.

Materials and Methods

The study was approved by the college of dentistry research center (#00275). A total of sixty DEs (n=60) were randomly chosen out of sterilized examination kits that is ready to be used in clinical courses in the college in both campuses (test group). Also, additional unused explorers were measured to serve as control group (n=10). Tip diameter was measured in microns (µm). All measurements were done using digital microscope (Hirox KH-7700, Tokyo, Japan) by the same investigator. Intra examiner reliability was measured by repeating measurements of ten explorers on a one week interval (97%). Descriptive statistics as well as independent sample t-test were carried out using Statistical Package for Social Sciences (SPSS) at significance level of 0.05 (p=0.05).

Results

The mean and standard deviations of DEs are presented in table 1. Mean tip diameter of control
group was 30.34 ± 5.62 µm while it was 57.58 ± 20.06 µm for the test group. Comparison of the two groups was done using independent sample t-test and there was a highly significant difference between the two groups (p=0.000).

Discussion

Marginal integrity is one of the most important mechanical factors in success of full coverage crowns. The ability of the dentist to evaluate crown margins in clinic accurately is essential to the success of the cemented crowns. Many factors could obscure that ability; these might include visibility, location of the margin, presence of vertical steps (overcontouring) and use of a dull explorer. A dull explorer that looks sharp to the naked eye can influence the decision of the dentist to accept or discard a restoration or a crown. Explorers measured in this study were randomly selected from daily used examination kits that could be used by students and faculty to evaluate integrity of direct and indirect dental restorations. According to ADA, cement film thickness should be 40 microns and in order for an explorer to effectively detect a gap larger than 40 microns, its tip should be equal or less than that number. In the current study, there was a wide range in tip diameter of the measured explorers with a minimum of 22.78 microns to a maximum of 124.67 microns. Only thirteen explorers examined were below 40 microns (23.33%). The clinical use of the remaining explorers might cause errors by acceptance of faulty restorations that might consequently affect teeth and periodontal health of many patients. Unused sharp explorers showed a mean tip diameter of 30.34 ± 5.62 µm compared to used explorers 57.58 ± 20.06 µm with highly significant difference (p=0.000). Hayashi found that tip diameter of DEs had a significant effect on the detection of horizontal gaps. They suggest that diagnosis of restoration marginal discrepancies in clinical trials is best achieved using techniques other than using DE to probe margins. However, this could be argued that DE is the most affordable and accessible instrument to measure marginal gap of crowns. Instead, we recommend regular sharpening protocol and random microscopic measurement of DEs in clinical practice as a quality control measure in dental settings.

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References