

TIPS FROM OUR READERS

## Quality assurance of ceramic dental restorations by photographic transillumination



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Quality assurance of indirect restorations should be performed by the dental laboratory before delivering the prosthetic parts to the clinician. Ultimately, it is the clinician's responsibility to inspect and ensure, within the limits of clinically available technical and technological means, the quality of the prosthesis prior to insertion. Transillumination techniques in dentistry have been described as an aid in diagnosis as well as during the execution of various clinical procedures, including those for interproximal caries detection,<sup>1</sup> endodontic visualization of dentinal defects,<sup>2</sup> surgical localization of retained roots,<sup>3</sup> location of the maxillary sinus floor and septa during sinus augmentation procedures,<sup>4</sup> diagnosis of occult submucous cleft palate,<sup>5</sup> and as a facilitator during arthroscopic puncture.<sup>6</sup>

In the specialty of prosthodontics, transillumination has been described thus far in the detection of microcracks in ceramic materials, based on the principle that subsurface cracks and flaws redirect light, resulting in darker shadows.<sup>7</sup> Beck et al<sup>7</sup> compared the sensitivity of transillumination with the fluorescent penetrant method (FPM). This technique consists of ceramic evaluation under fluorescent light after specimen immersion into a fluorescent liquid able to penetrate microscopic cracks. The technique can be used to detect microcracks in zirconia and feldspathic ceramic materials. The transillumination technique allowed a minimum crack length detection of 33  $\mu\text{m}$  for feldspathic ceramic and 55  $\mu\text{m}$  for zirconia ceramic. The FPM minimum crack detection was 17  $\mu\text{m}$  for feldspathic and 18  $\mu\text{m}$  for zirconia ceramics.<sup>7</sup> Despite the increased sensitivity, the authors

stated that the FPM requires advanced microscopy equipment and additional training<sup>7</sup> and that it was better suited to a laboratory environment<sup>7</sup> than the clinical setting.

The present article describes a clinical application of transillumination in prosthodontics and the accidental finding of a ceramic crack/flaw on a metal-ceramic fixed dental prosthesis during photographic documentation under different light conditions.

### PROCEDURE

1. Position the restoration on the definitive cast (or holder) for photographic documentation.



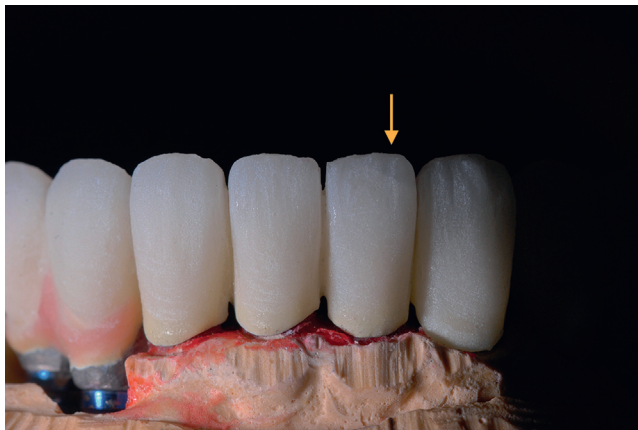
**Figure 1.** Metal-ceramic restoration, right side lighting. No detectable flaws.

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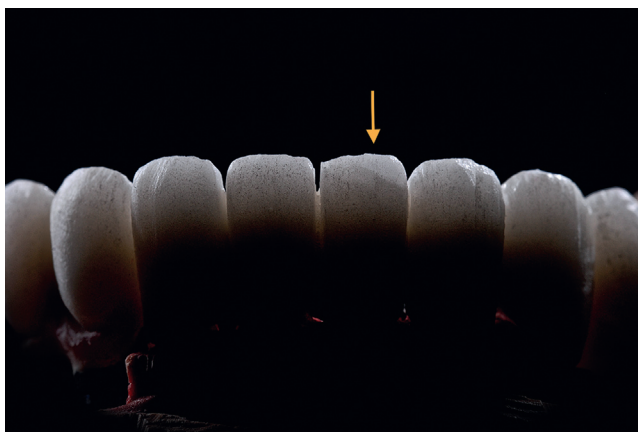
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**Figure 2.** Metal-ceramic restoration, left side lighting. Slight discoloration is observed on incisal edge's distal portion of mandibular left central incisor (second from left).



**Figure 3.** Metal-ceramic restoration, posterior (transillumination) lighting combined with digitally increased image contrast, saturation, and definition. Confirmation of flaw is observed on incisal edge's distal portion of mandibular left central incisor (fourth from left).

2. Make a series of photographs (Nikon D80; Nikon Corp), varying the location of a wireless flash light source (Nikon R1; Nikon Corp) (Figs. 1-3).

3. Upload the images into a computer (MacBook Air; Apple Inc) with image-processing software and inspect the ceramic surfaces while varying the "contrast," "saturation," and "definition" parameters (iPhoto; Apple Inc).
4. Repeat the previously described steps for restorations to be evaluated.
5. Save the obtained images as part of the treatment clinical record.
6. Share the produced record with the dental laboratory to improve communication of the corrections to be made.

The described technique combined with photographic documentation is a straightforward and inexpensive step for evaluating ceramic restorations. Detection of any flaw before definitive insertion will allow for laboratory correction and may decrease postinsertion complications, increasing reliability.<sup>8</sup>

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