An Inexpensive Device for Transillumination

Frederick R. Liewehr, DDS, MS, FICD

Patients with cracked-tooth syndrome often present with a chief complaint of vague pains while eating that they cannot localize, making the diagnosis difficult. Frequently practitioners are unable to discover the cause of their symptoms, so treatment is delayed, which can result in apical propagation of the crack, leading to unrestorable vertical root fracture. Transillumination is a valuable aid to diagnosis, but suitable diagnostic lights are difficult to obtain, most being cumbersome and expensive. A portable inspection/bore light that serves as an ideal device for transillumination is available for approximately $10.

Cracked-tooth syndrome presents as a symptom complex characterized by sensitivity to certain biting pressures and often to cold stimuli (1–3). The diagnosis is difficult, because the etiology is an incomplete, often minute, fracture that is often hidden from view by a restoration or by the gingiva (4).

Symptoms of cracked-tooth syndrome are often vague pains that occur irregularly when the patient eats, which the patient cannot localize. Often the patient has visited other dentists previously, who were unable to reproduce the patient’s pain by tapping the tooth, or to visualize the crack on radiographic examination. In some cases the frustrated practitioner may have told the patient, “It’s all in your head,” causing a delay in treatment which can lead to pulpal death and unrestorable vertical root fracture (3).

Vertical root fractures can present a similarly frustrating diagnostic problem. These teeth usually produce symptoms of discomfort upon mastication or percussion, but without the sharp pulpal pain of the cracked-tooth, due to pulpal necrosis resulting from communication of the pulp with the oral environment through the fracture. Radiographic examination will not reveal a mesiodistal fracture, and even a buccolingual fracture may not be visualized unless the plane of the fracture corresponds to that of the central ray (5).

A variety of diagnostic techniques to reveal incomplete and complete fractures have been advocated (1–3, 6, 7). These include tapping cusps in all directions, wedging along a margin with a sharp instrument, biting on a wooden toothpick or burlew wheel, using a sharp explorer interproximally or below the margin of a restoration, staining with iodine, mercurochrome, methylene blue, or other dyes, and transillumination. The partial fractures characteristic of cracked-tooth syndrome are rarely visualized radiographically and do not produce a reaction in the adjacent bone.

In the case of the vertical root fracture, a diffuse radiolucent area of the periodontium, referred to as a “halo,” is often visible. Classically a deep but narrow periodontal defect can be probed. A recurrent periodontal abscess may also be described by the patient. Because the pulps of these teeth are necrotic, pain is usually minimal or absent.

Transillumination is an important aid in locating the crack whether it is incomplete, as in cracked-tooth syndrome, or a complete vertical root fracture. Although visual observation may detect what seems to be a crack or fracture of the tooth structure, it may be difficult or impossible for the clinician to differentiate it from an insignificant craze line (6). Indeed patients may demonstrate many marginal ridges that exhibit what seem to be fractures. Transillumination by placement of a fiberoptic probe at various locations on the crown or root is an important aid in making this determination. Placement of the light at right angles to the fracture plane will result in the beam being interrupted by the fracture, resulting in illumination only of the ipsilateral side of the tooth, with the contralateral side remaining dark. On the other hand, if only enamel craze lines are present, the light beam will not be interrupted and the entire tooth will be illuminated.

Additional uses for a fiberoptic light source are found in the literature. Gerstein (8) recommends its use when attempting to locate the pulp canal orifices of a calcified tooth. The clinician should hold the tip of the light source at a right angle to the cervical area of the tooth, which will cause the pulp chamber to glow with a reddish-orange hue. The canal orifices will appear as dark specks against this illuminated background. Gutmann et al. (9) recommend the use of a fiberoptic system for increased visibility when preparing an access opening through a crown to aid in canal location and to avoid tooth perforation.

PROBLEM

Until relatively recently transillumination devices were available commercially in different sizes. Small units, such as the Novar (Demetron-Kerr, Danbury, CT), are no longer in production. Larger units, such as the Quality-A light source (Quality Aspi-ators, Duncanville, TX), are multiple-use units that provide light to a variety of fiberoptic attachments. These units, however, are much larger, heavier, and cost in excess of $700 when equipped with fiberoptic cable and diagnostic probe. Their size and weight make them inconvenient to transport from operatory to operatory, or
from a storage location, for use, and militate against permanent installation where space is at a premium.

Many clinicians attempt to use the units that supply their fiberoptic-equipped dental handpieces, or even composite curing lights, to accomplish diagnostic transillumination. Dental handpieces are not ideally suited for diagnostic purposes, because it is difficult to adapt the light portals, which are situated a centimeter from the end of the handpiece, to the tooth. If the dental operating unit has an attached light source, a separate fiberoptic cable can be used, but many recent handpieces have the light source in the coupler that attaches to the handpiece, making it nearly impossible to use for diagnostic purposes. Additionally many units are equipped with air switches so that the handpiece must be operating for the light to work. Patients may be somewhat resistant to the use of a rotating handpiece that is producing a jet of air on a possibly cold-sensitive tooth as a diagnostic light.

Curing lights are becoming increasingly powerful to achieve deep curing of composite resins. When used for transillumination, curing lights are too bright for the clinician to observe without eye protection, and the beam is so bright that it is often not interrupted by the crack, thus making these lights unreliable for diagnostic purposes.

**SOLUTION**

A device that works perfectly as an inexpensive and portable diagnostic light is the 10 mm Ballistic Lite (Browning, Morgan, UT) (Fig. 1). This light, designed as a waterproof pocket flashlight, is equipped with a fiberoptic extension to serve as an inspection/bore light. It is equipped with a high-intensity, 4000 candellpower xenon bulb that produces a white light that is four times as bright as a conventional incandescent bulb, yet uses two ordinary AAA alkaline batteries. The unit is available at sporting goods stores for approximately $10.

In clinical use, it produces an ideal amount of light; enough to clearly transilluminate the tooth of concern but not enough to “bleed” across fracture lines (Fig. 2). It is small (6 inches long) and self-contained, so it can be stored anywhere and readily moved to where it is needed. For infection control, the entire unit can be quickly covered with a piece of plastic foil (e.g. Clear Plastic Wrap (Presto Products Co., Appleton, WI). It can be cleaned using any detergent and rinsed, because it is equipped with a rubber “O” ring that seals it internally and makes it submersible to 500 feet.

The low cost and convenient size of the unit make it practical for the clinician to have one in every operating room and should encourage frequent use. As Cameron (2) observed it is up to the dentist to be aware of the cracked-tooth syndrome and to initiate treatment to prevent apical propagation of the crack that could lead to an unrestorable vertical root fracture. This device should assist the clinician in achieving that goal.

The opinions or assertions contained herein are the private ones of the author and are not to be construed as official or as reflecting the views of the United States Army or the Department of Defense.

Dr. Liewehr is the assistant director, Endodontic Residency Program, U.S. Army Dental Activity, Fort Gordon, GA. Address requests for reprints to COL Frederick R. Liewehr, Endodontic Residency Program, USA DENTAC, Fort Gordon, GA 30905-5650.

**References**