Short Communication

Capturing precision: A guide to dental photomicrography

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Abstract

Photography is crucial in modern dentistry, facilitated by digital technology advancements. The two main types of dental photography are macrophotography and photomicrography. Photomicrography, particularly valuable for its high magnification capabilities, offers clear documentation of minute dental details critical for the diagnosis and treatment planning. Mastering the art of photomicrography requires a precise balance between the microscope and camera, offering substantial benefits in patient education, clinician evaluation, and treatment documentation. Despite the learning curve involved, the results of dental photography, both macro and micro, are invaluable in modern dental practice.

Keywords: Dental operating microscope; dental photography; photomicrography

Photography has long been seen an indispensable part of dentistry. With the continuous evolvement of digital technology, imaging has become simpler, faster, and easily accessible along with numerous valuable applications in our field. It addresses patient concerns, showcases completed procedures and documents for insurance purposes, and tracks changes over time. The stored images aid in building patient education resources, facilitating lectures, and illustrating articles.[1]

The two broad terms used in dental photography are macrophotography and photomicrography. In macrophotography, Digital Single-lens Reflex (DSLR) cameras are employed with macro lens attachments, offering limited magnification options, whereas photomicrography involves documentation under a microscope, providing magnification up to ×25. This increased magnification is particularly beneficial in dentistry, as it allows for the clear detection and photography of minute details such as cracks [Figure 1], irregularities, separated instruments, and tooth preparation margins [Figure 2] which are pivotal in dental applications and are often imperceptible in macrophotography. Another advantage with photomicrography is that one can document the live procedures continuously with little interruption to the normal work flow.

For photomicrography, DSLR and mirrorless cameras can be attached to microscopes using dual-port beam splitters through adapters.[2] In photomicrography, high magnification demands a lot of light and uses light source from the microscope. Xenon and Light-emitting Diode (LED) offer better documentation results due to white light or closer to that of white light.[3] Lighting can be improved while capturing the image, by attaching a ring or twin flash to the microscope using mounts, which can be controlled using a commander. When the camera is mounted on a microscope, the operator can only adjust exposure and shutter speed; the aperture size cannot be changed because the lens is not directly connected to the camera.

Achieving a precise balance between the camera and microscope is crucial for successful photomicrography.

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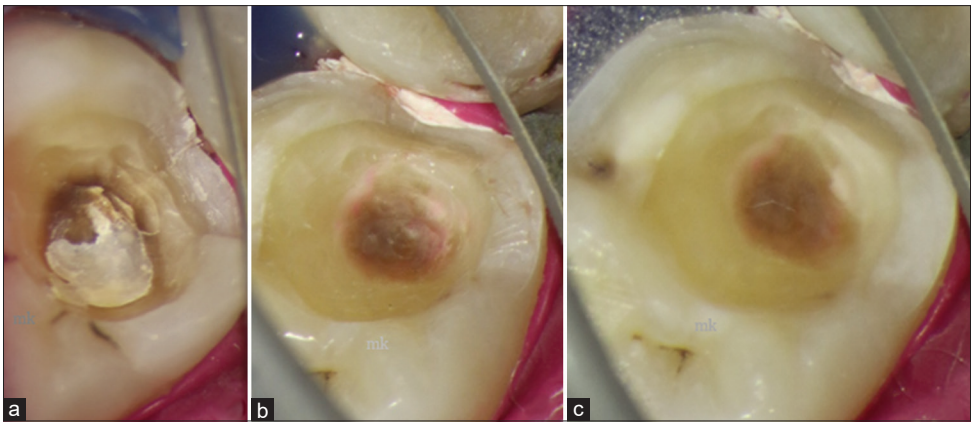

Figure 1: Clinical diagnosis of crack under DOM. (a) Crack seen on mesial marginal ridge of tooth #27. (b) Stained with caries-detecting dye. (c) Final preparation

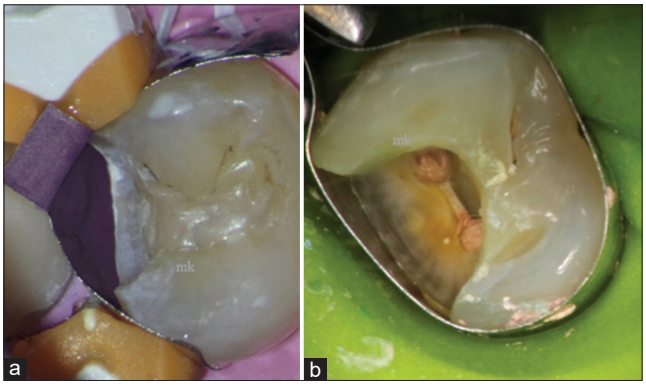

Figure 2: Correct matrix adaptation. (a) Note the demineralized enamel at marginal line

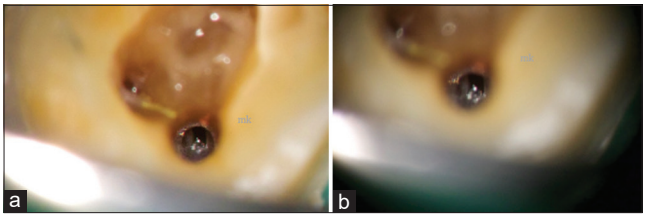

Figure 3: The tip of the fractured instrument seen in Mesio-lingual canal under high magnification with a limited depth of field. (a) Sharp image with a proper line of focus. (b) Blur image that is out of focus

Ensuring an accurate duplication of the subject observed through the microscope's eyepieces without distortion presents unique challenges for clinicians aiming to capture high-quality images.

A common issue faced by an operator is the vibrations of both the microscope and the camera, which can affect the sharpness of pictures and must be eliminated. The perceived motion can result from various factors, including microscope body vibrations, clinician's hand tremors, patient's jaw shaking, and camera mirror movement during shutter release. While scope body vibration is hard to eliminate, surgical armrests mouth props and a remote-control camera with a fast shutter speed can help reduce the nuance.[4]

Every photographer aspires to capture the clear images with accurate reproduction of every peculiar detail in the subject. Understanding depth of field (DOF) is crucial in photomicrography for controlling image sharpness.[5] In this context, the DOF is exceptionally shallow [Figure 3], so even a slight misalignment of the focus point, even just by a millimeter, can result in out-of-focus pictures.[6]

As for camera settings, an increased ISO setting can enhance the sensor's sensitivity, leading to noisy image output. Reducing the shutter speed and the vibration in shutter movement, especially at higher magnification levels, can shift the focus point and result in a blurred image. The aperture can only be controlled by the dual iris in the microscope. The dual iris diaphragm acts as a filter that reduces incoming light and increases the DOF in case of documenting in higher magnification for sharp quality images.

Mastering the art of photomicrography involves navigating obstacles to achieve the perfect balance between the microscope and the camera. Documentation not only maintains records but enhances clinician work through self-evaluation, facilitates patient discussions, and showcases treatment finesse. In the current clinical practice, dental macrophotography and photomicrography are indispensable procedures, demanding a learning curve with DSLRs but yielding extraordinary results.

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Conflicts of interest
There are no conflicts of interest.

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