

How the Dental Microscope Offers Powerful Perspectives for Digital Visualization

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Appropriate procedural documentation is an important component of the dental patient's education and treatment record. It allows for an unbiased representation of a patient's presenting condition, the progress of treatment and the eventual outcome. In particular, digital visualization technology in combination with the dental microscope can be used as a powerful documentation tool for patients' records, legal documentation as well as the education of the dental profession.



Fig. 1: Defective crown margin



Fig. 2: Inadequately fixed partial denture

Current digital visualization technology has advanced significantly in recent years. The captured images and videos can be stored in any number of data formats (such as RAW, JPEG, TIFF or DNG for digital images as well as AVI and different MPG formats for digital video recordings) and transferred around the world in a matter of minutes. Despite these advances, in a busy private practice, appropriate photo documentation can still be a time consuming and inconvenient process. It is nearly the same with digital video documentation. Intra-oral video cameras designed specifically for dentistry have made the process somewhat simpler, but it still involves a break in the procedure. Video sequences can suffer from poor resolution, slow frame rates, distorted images and unrealistic color rendition.

However, the introduction of the dental microscope offers an integrated, efficient solution for daily practice and documentation. The benefits the microscope brings to the practice of dentistry extend beyond improved ergonomics and enhanced object visualization. When coupled with the appropriate capture devices, the microscope becomes an instrument for the projection and recording of clinical findings in a streamlined and efficient manner. Moreover, it allows the recording of precisely what the dentist sees. A remote control, foot switch or computer timer can be used to record the images without the need for significant intervention from the dentist or interruption of treatment progress.

In my private prosthodontic practice, I use the OPMI® PROergo dental

microscope from Carl Zeiss together with an attached external 3 CCD video camera and an SLR digital camera. The use of both of the devices together fulfills my needs for image documentation by allowing digital still and video capture. The video camera is set up to record all the time with the output directed to the ZEISS MediLive® MindStream image and video documentation system. MediLive MindStream displays the procedure on its integrated monitor and also records all the procedure steps for later review. The editing capability allows for fast and convenient video manipulation during the patient visit enabling the presentation of pertinent treatment points to the patient. An additional benefit is that the assistant is able to indirectly view the surgical field to keep abreast of the procedure's progress as well as anticipate the next

step. Additionally, the exported video recordings allow producing of a polished presentation for professional display and student education.

A particular instance where a video stream was useful for patient education was a situation where an individual presented with a fixed partial denture (FPD) that had debonded at one abutment. Using a recorded video stream, I was able to show the patient how much the FPD was moving and why it was necessary to remove it and investigate the cause of the movement. As it turned out there

I typically use digital still images to document a patient's condition when a higher resolution image is required. For example, Figure 1 shows clear evidence of a defective crown margin. The patient had initially been skeptical about the diagnosis, but when shown the evidence it was a simple matter to conclude that intervention was necessary.

It is also a simple matter to document pre-existing tooth preparations underneath an inadequate fixed partial denture (Fig. 2) compared with more appropriate tooth preparations (Fig. 3).

of a microscope's halogen light source is adequate for most documentation purposes. However, a xenon light source provides a much brighter light allowing the use of lower ISO settings and higher shutter speeds. A dual iris diaphragm may also be introduced to increase the depth of field in particular instances.

The dental microscope has many benefits, and when integrated with documentation devices it offers an unparalleled opportunity to document patient care in an efficient manner and unique perspective.



Fig. 3: Appropriately fixed partial denture



Fig. 4: Tooth preparation for all-ceramic crowns

was a fracture in the core of the abutment tooth. The tooth had to be restored with a cast post/core and new FPD. Had the situation been left for a period of time, the progress of dentine caries may have rendered the tooth unrestorable and necessitated extraction and a more complicated prosthetic solution.

Figure 4 was captured as part of a series of photographs used in a continuing education course to demonstrate appropriate tooth preparation for all-ceramic crowns.

A key element in digital visualization and documentation is illumination. The use

of a microscope's halogen light source is adequate for most documentation purposes. However, a xenon light source provides a much brighter light allowing the use of lower ISO settings and higher shutter speeds. A dual iris diaphragm may also be introduced to increase the depth of field in particular instances.

Image courtesy: Dr. Philip Tan, Melbourne, VIC, Australia



Dr. Philip L. B. Tan received his MSD degree from the University of Iowa, USA, and his Bachelor degree from the University of Melbourne, Victoria, Australia. Dr. Tan was Visiting Assistant Professor at the Department of Family Dentistry at the University of Iowa. He won first prize in the 2004 Stanley D. Tylman Research Competition. The award honor outstanding research supported by grants from the American Academy of Fixed Prosthodontics. Dr. Tan's project focused on fracture resistance of endodontically treated incisors with varying ferrule heights and configurations. Since 2006, he has worked with a dental microscope in his private prosthodontic practice in Melbourne, Australia. Dr. Tan also gives presentations and lectures on the dental microscope in prosthodontics and restorative dentistry.

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