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Microscope Dentistry Active Workflow Factors that Improve the Correct Use of the Microscope in Every Dental Discipline, 100 % of the Working Time

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Abstract

Dental microscopy is a symbol of visual quality and protection of a healthy neutral posture for the operator; it's inappropriate, intermittent, or disuse use is a common trend among colleagues who acquire a microscope. Sustained use throughout the treatment, taking into account specific variables in the working method, can make the operator feel more comfortable with its use, flatten the learning curve, and use the microscope 100 percent of the working time on all the surfaces of the mouth, in a fluid and versatile way, avoiding initial frustration and often the abandonment of a technology of clinical excellence.

Introduction

Common mistakes when purchasing a dental microscope are to use it intermittently for specific procedures in an awkward posture or buy and leave it aside [1]. This unfortunate situation is a constant for dental microscopists, even for endodontic specialists, who often only use it for access, searching for MB2 or root canal filling, where the rest of the working time, they place it aside and execute the procedure in positions that place the risk of injury to the musculoskeletal system.

The discomfort in using the microscope is mainly due to an inability to understand how to accustom the eyes and hands to the focal distances optically established in the microscope to work in focus throughout the entire working time, regardless of the magnification step. This is the first challenge to be overcome by the operator; once adapted to the focal length (microscope objective and object targeted in the patient's mouth), over time with constant use, the operator will be able to automatically place the microscope in a position close to said distance, minimizing the learning curve, and working times, executing the dental treatment in a fluid, comfortable, and efficient way [2].

The idea of working with the dental microscope is to use it 100 percent of the working time, extract the benefits of coaxial shadowless lighting with robust LED systems, and be able to record, document, or show the work in real-time to the patient, generating communication and understanding of the process from the patient [3].

Quality treatment outcomes and operator health are promoted by microscope dentistry, which allows simultaneous magnification to the maximum when minor details are needed in the tooth or oral cavity or work actively at low magnifications to obtain the most significant field of view, but above all maintain a neutral posture throughout the treatment, minimizing discomfort and pain due to musculoskeletal fatigue, especially in the cervical and lumbar areas, therefore maximizing the performance and quality of the final treatment [4].

The active work of the operator requires dedicated concentration, manual dexterity, and the need for details; therefore, when working, for example, with high-speed and low-speed handpieces, scalpels, sutures, and ultrasounds, among others, the operator must have permanent visual-manual control to guarantee quality treatment, controlling motions. On the contrary, if the operator wastes time moving the microscope up or down during active work or simply not using it, the loss of time will result in significant physical and mental wear.

The three most important factors to avoid interruptions in the use of the microscope, use it efficiently, and constantly during active work are:

- Microscope Procedural Depth of field setting
- Indirect vision with the mirror
- Patient positioning and verbal indications for the movement of the patient's head

These factors are optimized by the control of the extraoral environment by the efficient work of the dental assistant [5].

Microscope Depth of Field procedural Setting

The Procedural Depth of Field is one of the most challenging concepts to explain when learning to use the microscope; the optical system of the different magnification steps must be adjusted to offer optical clarity in all of them when working actively on the dental procedure. To understand this term, we must understand that the flattest image, where the focus is most critical, is at the maximum magnification step of the microscope. Obtaining clarity of focus at the maximum magnification will guarantee that the other lower magnification steps are in focus; not doing so will promote unclear focal clarity in the following lower magnification steps, which means interruptions and frustration [6, 7].

Procedural Depth of field setting is recommended and should be carried out from the beginning of the dental treatment. The recommended method is to find a point on the work surface and focus at the maximum magnification step, then all the other magnification steps will be in clear focus once the focus is adjusted with the micro focal, zoom, or multifocal objective lens.

A helpful tip to obtain the focal lengths when using a microscope with a fixed objective, for example, at 250 mm, is to place the thumb on the lower surface of the objective, stretch all the fingers, and with the tip of the little finger touch the surface of the tooth to be worked, in this way, we can find the approximate working distance with the said objective of 250 mm. Figure 1

Figure 1: Approximate location of the working distance with a 250 mm dental microscope fixed focal objective .

With the current multifocal system, the issue of working distances with fixed objectives is less sensitive to manage, allowing focal distances to vary between 200 mm-450 mm, making the issue of focal length and Depth of field setting much simpler and less critical. With said accessory, the operator can maintain a neutral posture and easily manage the working distances to carry out a procedure in a sharp focus. Figure 2

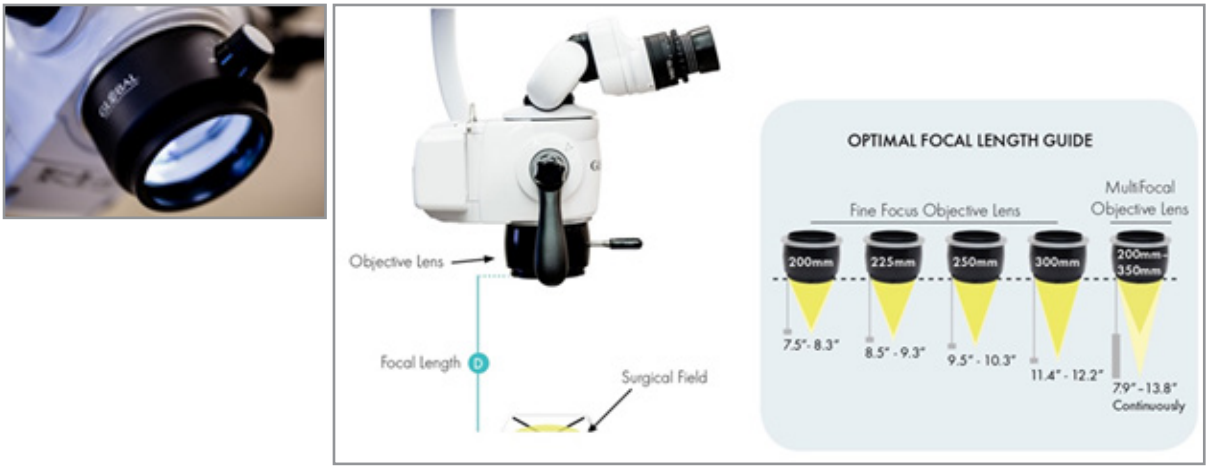

Figure 2: Focal Length guide of the fixed focal objective vs multifocal objective lens

Key point: Adjust the procedural Depth of field setting from the begginig of the procedure, from the highest magnification step.

Indirect Vision-Mirror skills

The skillful use of the dental mirror with the dental microscope is essential to maintaining the working position and neutral working posture [8]. The constant use of the mirror will allow, with gentle rotational and translational movements, to inspect and work in detail all the tooth surfaces in all quadrants of the mouth, working at 12 -11 o'clock behind the patient's head, where postural symmetry is the best [9].

Efficient mirror handling with a simple and stable mirror grip in the middle third of the handle and using the ring finger as a fulcrum or support point on neighboring or antagonist tooth depending on the quadrant and tooth to be worked can help use the mirror well supported, and efficiently in order to gain visual angulation strategically to work in the tooth with uninterrupted workflow with the dental microscope. Figure 3

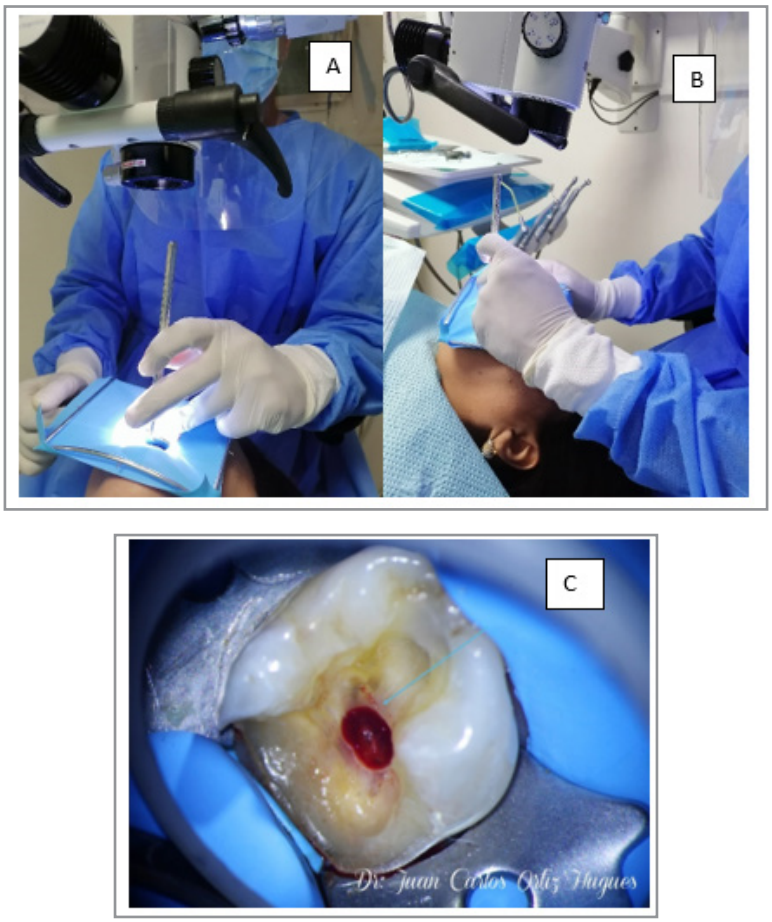

Figure 3: A-B Mirror gripping. C. Mirror Indirect Vision- Depth of field

Key Point: Use the mirror constantly; try using a finger fulcrum support to gain stability during the mirror, and rotate and translate the mirror smoothly.

Patient Positioning and Verbal Indications

The patient's position in the dental chair directly affects the position of the microscope and the operator's head, back, and wrists. 10. Placing the patient in a horizontal position with the head and the end of the headrest of the dental chair and his mouth at the height of the operator's elbows, in addition to the instructions given by the operator to the patient according to the tooth to be worked on can improve a fluid use of the microscope while respecting the neutral posture of the operator, for example;

- Request the patient to raise their chin upwards if working on upper or lower molars.
- Request the patient to move the chin toward the chest to work lower incisors or premolars.
- To work on vestibular, palatal, or lingual surfaces, we can always move the patient's head laterally simultaneously with the mirror to gain strategic angulation on surfaces that are difficult to access visually through the microscope. Figure 4

Figure 4: Patient´s head lateral movement for strategic viewing positioning

When working with the handpiece, scalpel, and sutures, many of these movements of both the patient's head and the rotation/translation of the mirror are done simultaneously to respect the neutral posture of the operator and his focus in the binoculars or screen if a 3D microscope is used.

Key point:

- Place the patient horizontally on the dental chair. Figure 5
- The patient's head at the end of the headrest
- Mouth of the patient at the same height or higher than the operator's elbows
- Use verbal indications for patients' head positioning laterally, up and down

Figure 5: Patient Horizontal positioning in the chair / operator at 12 o´clock position

The efficient work of the dental assistant is crucial in dental microscopy; without a well-trained assistant, any effort to use the microscope well will be uphill, much less if we do not work with one. The preorganization of all the items involved in the procedure will allow the operator to focus exclusively on the working visual field through the microscope. Everything that happens outside that visual field will be handled by the assistant, from the transfer of the instruments to their reception, making the procedure more fluid at all times, minimizing interruptions in the use of the microscope, which generates deconcentration, mental and muscular fatigue in the operator, often frustration, and often an inability to use it for fear of slowing down the working time with the patient. Figure 6

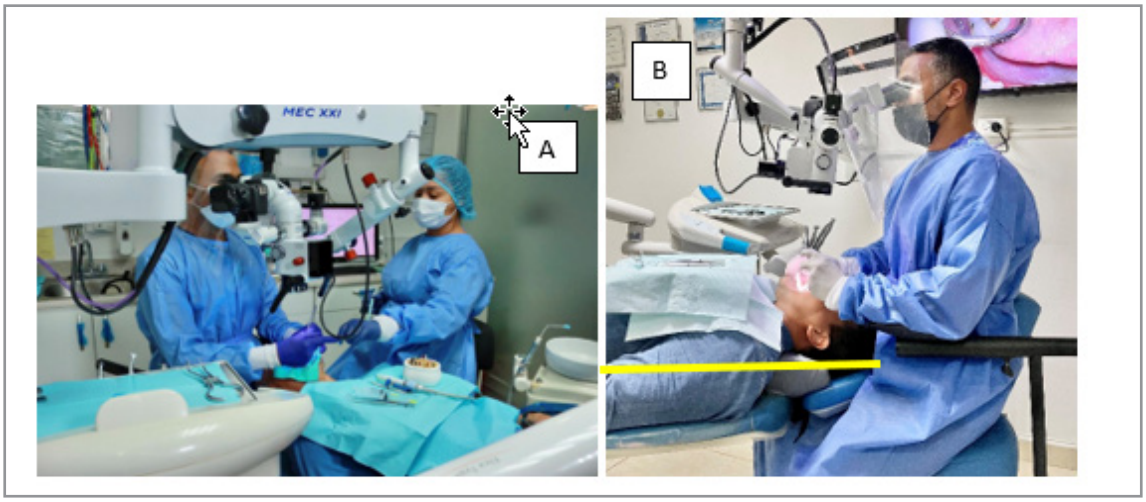

Figure 6: A. Operator-Patient-Assistant positioning in microscope dentistry B. Patient horizontal position in the chair

When working with the high-speed piece and with indirect vision, the assistant's work is essential, blowing closely on the mirror to keep it clean of debris or water, allowing the dentist to work with the bur proficiently.

Other functions of the assistant that make a flowable microscope dentistry practice are keeping all elements of frequent and constant use near horizontal reach, changing the burs of the handpieces, and transferring to the operator's fingers and hands while focused on the binoculars viewing the field of view while not wasting motions to deal with those ítems [11].

Conclusion

Fluid dental microscopy is the expectation of every professional who acquires the microscope; the expectation must be realistic. At first, the development of the activity will be slower. However, with practice and daily use, constant and consistent, adequate information about its use is essential to rapidly adapt to dental microscopy and all the changes that this entails in how we carry out our professional practice.

The tips shown in this article generate a more holistic concept of office management, where the neutral posture protects the operator from the development of musculoskeletal injuries, pain and days away from practice; Aligning the use of the microscope based on the appropriate posture of the operator, from the strategic positioning of the patient, the skilleful use of the mirror and the correct adjustments of the microscope from the beginning of the procedure, added to the efficient work of the dental assistant, will place the dentist on the path of comfortable use of this important tool of clinical excellence. Ultimately, it will be worth it, given that we will work more healthily, without fatigue, no muscle pain, and with the certainty that if we see better, we will do better.

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