ZOOM IN: AMED INSIGHTS

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Indirect Vision and Microsuturing: Ergonomic Tips & Tricks for Oral Surgery Under the Microscope

Working under a dental operating microscope offers unmatched precision and magnification, but it also demands a progressive acquisition of skills to fully exploit its potential in oral surgery. The transition from conventional loupes to an operative microscope requires not only technical adaptation but also a rethinking of ergonomics, visual strategies, and teamwork [1–5].

Figure 1 – *Ergonomic 12 o'clock operator position with fixed microscope and assistant in a defined zone.*

1. Operator and Microscope Position: The Non-Negotiables

A core principle in microscope-assisted dentistry is that the operator maintains a fixed position at 12 o'clock in relation to the patient, with the microscope also fixed in space [1]. The patient's head and chair position become the main variables for optimizing access and visibility.

This approach has several ergonomic and clinical advantages:

- Stability of posture: Avoiding repeated operator movement reduces fatigue, especially in long or complex procedures.
- Consistency of visual axis: Preserving the same optical pathway improves hand–eye coordination.
- Predictable assistant positioning: The assistant works in a stable and familiar zone, improving efficiency.

Whenever possible, the patient is repositioned so that the surgical site aligns with the optical axis. This may involve tilting the chair, rotating the head, or adjusting neck extension. If repositioning is not feasible—due to medical conditions, anatomy, or surgical access—indirect vision techniques become essential.

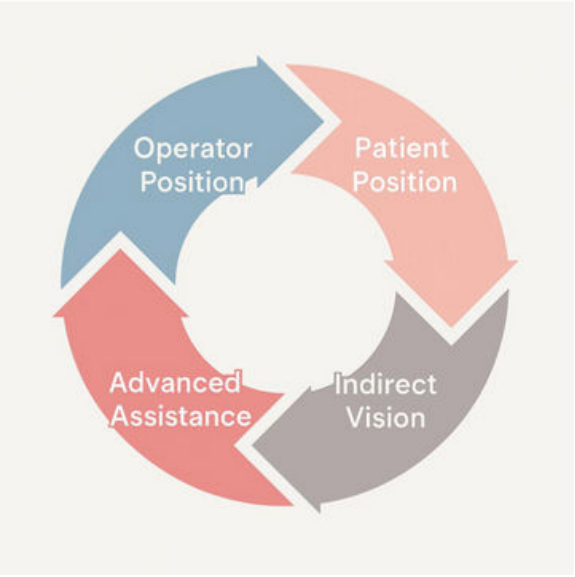

Figure 2 – *Concept diagram of skill progression: operator position → patient position → indirect vision → advanced assistance.*

2. The Progression of Skills

Mastering microscope-based surgery is not a binary skill; it develops progressively [2,4].

Step 1: Direct Vision Mastery
The first stage focuses on achieving the best possible view through direct line-of-sight under the microscope. The operator manipulates only one instrument, using the other hand for minor adjustments of retractors or mirrors. This stage builds the foundations: posture, minimal hand movement, and stable fulcrums.

Step 2: Indirect Vision with One Free Hand
Once direct vision is comfortable, the next step is working via a mirror held in the non-dominant hand. This allows access to areas otherwise impossible to see directly—such as posterior lingual surfaces—without changing operator position. The challenge is maintaining spatial orientation and depth perception with a reversed image. I tipically work with Acteon Satelec mirrors, size 3 or 4, as they offer optimal maneuverability and image clarity under the microscope. When a wider reflective surface is required, I prefer to use large dental photography mirrors.

Figure 3 – *Indirect vision with mirror in the operator's non-dominant hand.*

Step 3: Advanced Four-Handed Assistance

In daily practice, I work almost exclusively at four hands. This means the assistant controls the mirror while I operate with both hands, which is critical for micro-suturing, flap manipulation, and precise incisions. The assistant must anticipate movements, keep the mirror steady, and ensure the optical axis remains optimal. When the mirror is held by the assistant, I prefer to use large dental photography mirrors. Their broader field makes it easier to maintain a stable and complete view of the surgical area, especially during delicate flap manipulation or microsuturing. In four-handed dentistry, the assistant's role goes beyond simply holding the mirror. They are responsible for maintaining mirror stability, retracting cheeks or tongue, controlling surgical suction, passing and receiving instruments efficiently, and keeping a consistent instrument layout on the working tray (e.g., forceps and scalpel to the left, suture materials to the right). This predictability allows the operator to maintain full focus within the microscope's field of view.

In rare, highly complex procedures, a second assistant may be involved, creating a six-handed setup. This configuration streamlines irrigation, suction, and instrument exchange without interrupting the optical axis, particularly in surgeries involving multiple surgical sites or simultaneous graft and implant work.

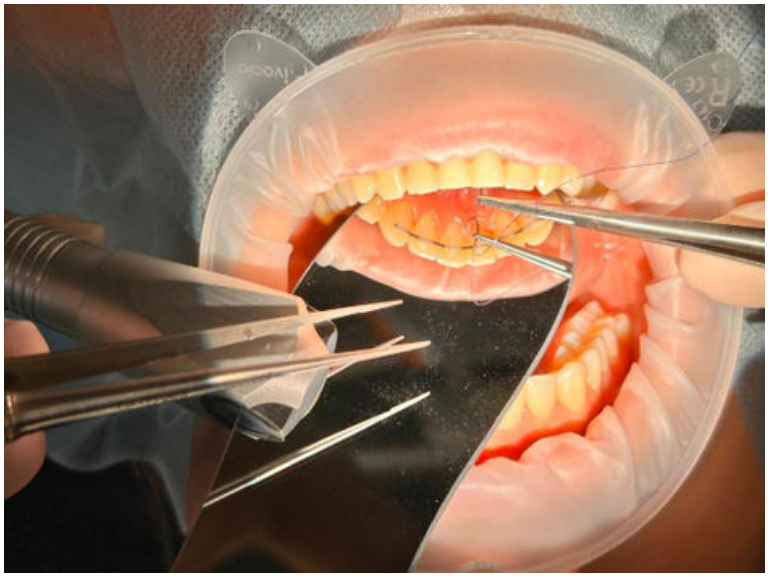

Figure 4 – *Indirect vision with mirror held by assistant.*

3. Ergonomics as a Performance Multiplier

Ergonomics is not just about comfort—it directly impacts outcomes [4]. Key points:

- Neutral spine and shoulder alignment prevent long-term musculoskeletal strain.
- Elbows close to the body maintain fine motor control.
- Micro-movements are preferred, relying on patient repositioning rather than operator reach.
- Consistent instrument zones minimize visual interruptions.

Following these principles allows longer working times without fatigue, improving procedural consistency over years of practice.

For most flap design and manipulation steps, I work at 4–5× magnification, which provides a comfortable balance between precision and a broad working field. During microsuturing, I typically increase to 6–8× to enhance detail without losing orientation. Higher magnifications, such as 12– 16×, are reserved only for occasional final checks or critical inspections, as they reduce the field of view and are less practical for continuous surgical work.

4. Application in Periodontal and Implant Microsurgery

These principles are particularly valuable in periodontal and implant microsurgery [3]:

- Flap management: Delicate tissues benefit from stable ergonomics.
- Micro-suturing: Indirect vision with four-handed assistance is especially beneficial for 6–0 to 9–0 sutures in esthetic zones. Periodontal microsurgery, as originally conceptualized by Shanelec and Tibbetts [5] exemplifies how magnification and refined ergonomics enhance both surgical precision and patient-centered outcomes.
- Precision osteotomy and implant placement: Magnification improves control over angulation and osteotomy precision, ensuring optimal implant positioning.

5. Implementation Tips

To apply these concepts effectively:

1. **Fix your position first**: Commit to the 12 o'clock stance and adjust the patient before moving yourself.
2. **Train mirror skills early**: Practice on models to master reversed imaging.
3. **Invest in assistant training**: Four-handed indirect vision depends entirely on the assistant's skills.
4. **Audit your ergonomics**: Use photos or videos to check posture and movement economy.
5. **Scale complexity gradually**: Only progress when the previous stage is second nature.

CONCLUSION

Mastering oral surgery under the microscope is a gradual process. The integration of fixed operator positioning [1], progressive indirect vision skills [2], and advanced ergonomics [4] transforms both the quality of care [5] and the operator's long-term health. The microscope is not merely a magnifying device—it is a discipline, a workflow, and a partnership between surgeon, assistant, and patient.

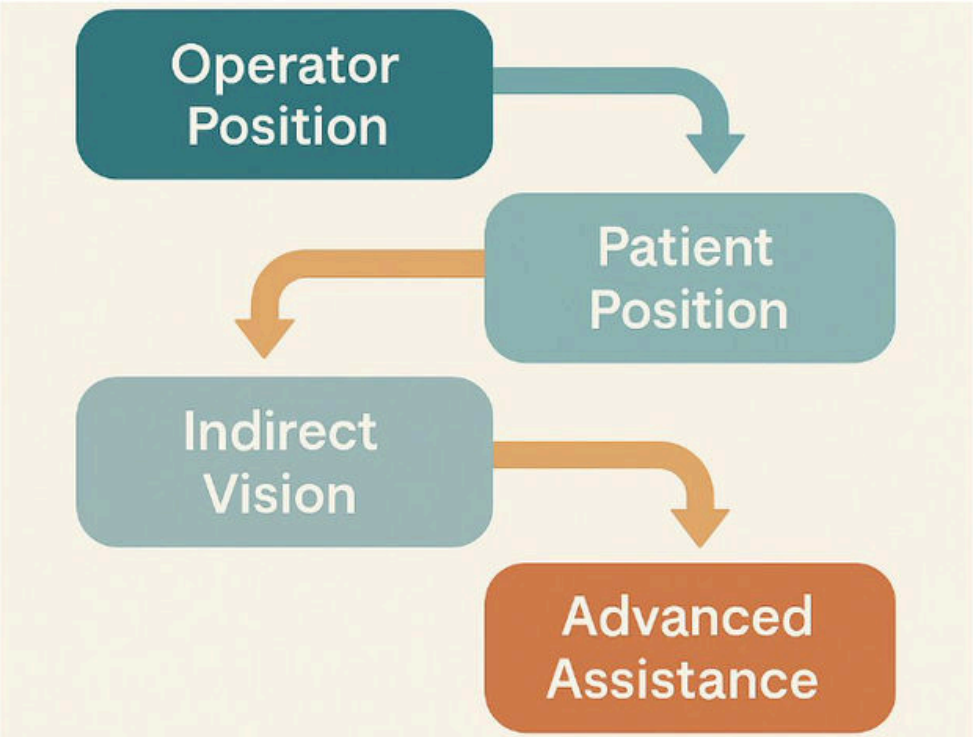

Figure 5 – *Flowchart of skill development in microscope-assisted oral surgery.*

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