

# Apical microsurgery— Part VI: Sutures, suturing techniques and healing

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**Fig. 1** A well planned design of the incision permits gentle and accurate flap re-approximation.



Dr John Harrison has published some of the most clearly written and comprehensive work on wound-healing associated with peri-apical surgery. There are five publications that are a must read for the endodontic surgeon.<sup>1</sup> After reading these, the microsurgical protocol developed by Dr Gary Carr, Dr Richard Rubinstein and others becomes clearer and is more easily understood. Treating the tissues gently and atraumatically is crucial for achieving predictable wound-healing.

**All steps have been meticulously followed,** the root-end fill has been placed, the crypt has re-filled nicely, the final radiograph has been approved and it is time to suture the flap into position. Sadly, most operators now push the operating microscope (OM) aside and suture without it. Doing so robs the operator of an opportunity to demonstrate to themselves and their patients, the amazing capabilities of the OM. The operator must make a commitment to master the suturing technique using the OM. It will never be accomplished with the OM pushed aside at this critical step in the apical microsurgical procedure. The following is based largely on my own experiences over the 12 years of performing, teaching and writing about apical microsurgery.

Once the surgical site is ready for closure, the flap should be gently massaged to close approximation with the attached tissue. But, keep in mind, the flap has probably lost dimension or shrunk slightly due to the mere act of retraction over a period of time and has endured a slight decrease of blood flow to it. Fortunately, this is usually not a problem. If the initial incision was planned with this final step in mind, the tissues should re-approximate with minimal manipulation. This is when the operator will appreciate nice scalloping and a sharp scalpel when making the incision at the beginning of the surgery (Fig. 1). Remember the adage: hindsight is always 20/20. The smooth side of a small #2 mouth mirror can be used to hold the tissue in position, while the second surgical assistant (on the same side of the chair as the operator) hands the operator the needle

**Fig. 2** Immediate post-op sutures.

**Fig. 3** Twenty-four hours post-op, before sutures are removed.

**Fig. 4** Immediately after suture removal, 24 hours post-op.



holder, with the needle properly positioned in the beaks, so the sutures can be easily and accurately placed.

All suturing is accomplished using 6-0 black monofilament nylon (Supramid, S. Jackson). Some microsurgeons use 8-0 and even 10-0 sutures. In my opinion, the 6-0 is easy to use, does not tear through the tissue as readily and the results are no different to those obtained with thinner sutures, which are technique demanding. Keep in mind that the sutures will be removed in 24 hours, so it really is a moot point as to whether the suture is 6-0, 8-0 or 10-0. The results achieved with 6-0 suture seem to be well suited to apical microsurgery. The black silk suture, traditionally used in surgery, is a detriment to the rapid healing we are trying to achieve. Not only does bacterial plaque accumulate more readily on braided versus monofilament, but the braiding also acts as a wick for the migration of bacteria into the wound. This can result in an increased inflammatory response and compromised healing.

The type of needle used depends on the type of flap to be sutured. For the Ochsenbein-Luebke Flap, a 3/8 circle, taper point needle (TPN; Supramid, S. Jackson) is used. The TPN is far superior to the reverse cutting needle (RCN) because there is no tendency to cut or tear the flap edges. Additionally, it is easier to guide a TPN to the desired point of exit in the attached tissue than it is to guide a RCN. TPNs are easier to use when suturing this type of flap. One of the nicest things about using this flap design is the ability to see the healing taking place easily (Figs. 2–6).

For the sulcular flap, a 3/8 circle RCN is used. This needle is used because the larger size facilitates passing it through the contacts when doing a sling suture. The sling or mattress suture is routinely used to save time on closure, rather than for individual buccal to lingual sutures. On many occasions, the TPN is also used to suture the attached gingival area of the flap at the coronal aspect of the releasing incision.

While the scope assistant holds the retractor in place, the second assistant uses a small Castroviejo needle holder, ensuring that the beaks of the holder are grasping the needle approximately three-quarters of the distance from the pointed end to where the suture is attached to the needle. The second assistant must pay special attention to keeping the beaks of the holder away from either end of the needle, as these are the areas of its greatest weakness and can be inadvertently bent or broken (Fig. 7). The needle is to be firmly grasped perpendicularly to the beaks of the holder. This allows the operator

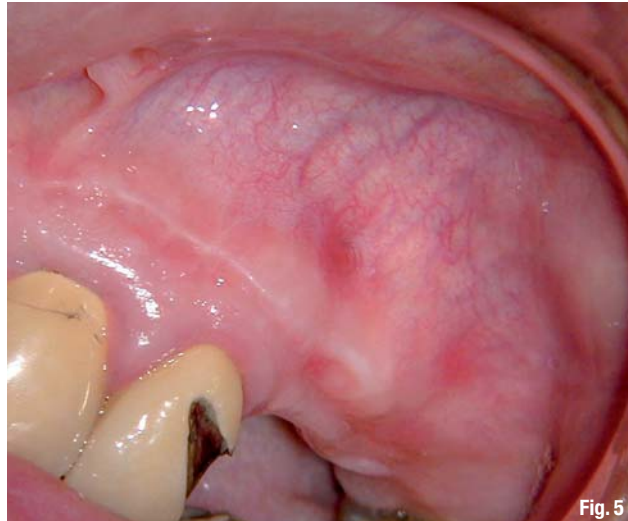


Fig. 5



Fig. 6

more definite control and a better feel of the needle during the suturing process.

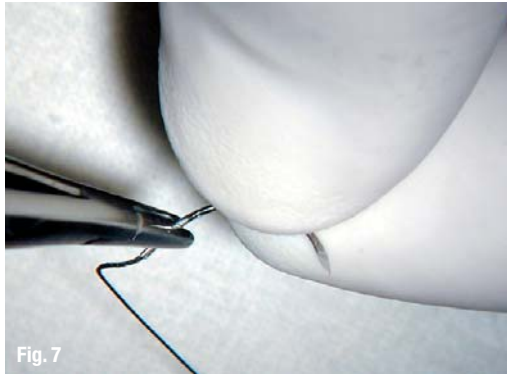
The second assistant passes the needle holder to the operator's working hand (Hand A). The operator begins the suturing process by inserting the needle through both sides of the incision. Once the needle has been inserted completely through both sides of the incision, the needle is grasped between the thumb and index finger of the opposite hand (Hand B). While the operator is doing this, the second assistant holds the end of the suture so it will not inadvertently be pulled through the tissues. The operator proceeds to make the three loose loops around the beaks of the needle holder to start the first knot.

While the operator is making these initial loops, the second surgical assistant places the end of the suture within the operator's visual field. The operator should be able to grasp the end of the suture easily in the beaks of the needle holder. The second assistant ensures that the end of the suture is within the operator's field of vision by looking into a monitor that has been placed within her line of vision (Fig. 8). The loops around the beaks of the needle holder create sufficient friction for a con-

**Fig. 5** Two weeks post-op: note scar from ten-year-old prior apical surgery.

**Fig. 6** Six months post-op: nothing can be seen but the old scar.

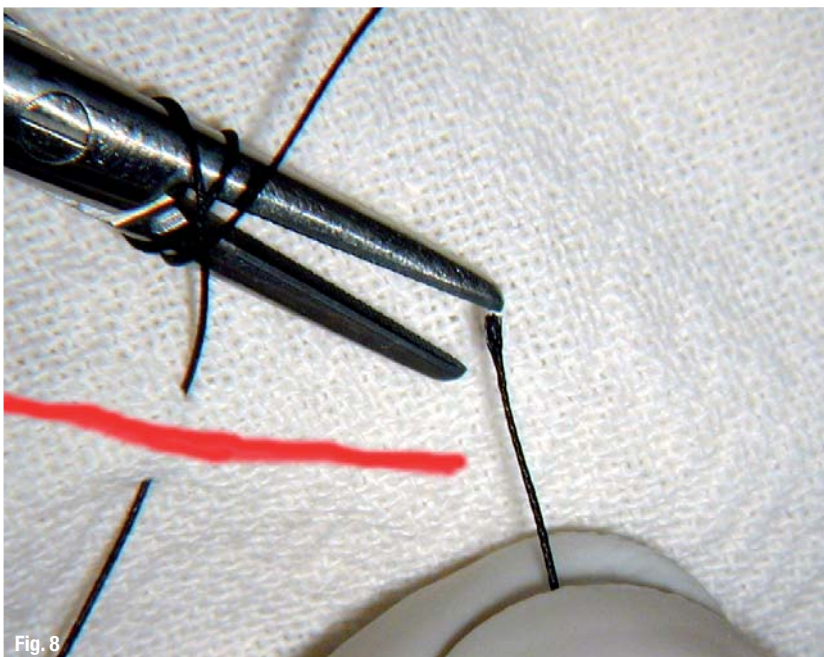
**Fig. 7** Grasp the needle approximately three-quarters of the distance from the pointed end.



trollable tension between the operator's Hand B and the beaks of the needle holder in Hand A. Care must always be taken that the tension is only between Hand B and the needle holder in Hand A, so no undesirable tension is exerted on the tissue during the suturing process. The purpose of maintaining some tension is to give the operator a positive tactile sense while taking up the excess suture material in Hand B.

As the suture is drawn through the tissue by Hand B, Hand A is lowered to prevent exerting too much tension on the tissue. The tension on the suture is regulated by the looseness, or tightness, of the loops, which controls the amount of friction for the suture to overcome as it is gathered. Hand B continues gathering as Hand A yields the suture with a descending motion, while still maintaining the desired tension and the beaks of the holder firmly securing the end of the suture. Once the end of the suture is at the desired length relative to the incision, the loops are allowed to slip off the beaks for the initial knot. Then, using the same basic

**Fig. 8** The assistant hands the free end to the operator.



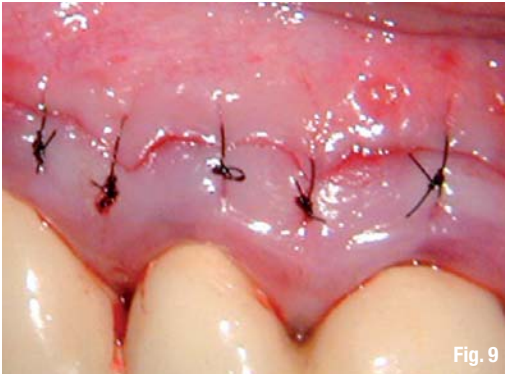
rhythm of movements, the securing and locking knots are placed. It is an alternating rhythm of movement that is difficult to describe in writing, but is actually very easy for the beginner microsurgeon to learn.

The operator now allows the second surgical assistant to take the needle holder from Hand A and simultaneously be handed the micro-scissors so that the suture can be cut close to the knot. After the second assistant has taken the scissors and the suture, the operator is handed a micro-forceps to move the knot between the point of insertion and the incision gently, helping to prevent plaque build-up over the incision itself (Fig. 9). Note: When moving the knot with the micro-forceps, it is important that the knot be **pushed** to place, not **pulled** to place. This ensures the knot's original integrity is maintained.

One of the most common mistakes made in suturing is making the suture too tight. It is better to make the suture a little too loose because if the suture is too tight it causes ischaemia and thus compromises rapid healing. In making a sling suture in a sulcular flap, it is easy to be too aggressive when tying the knot, causing the rest of the suture to become too tight. The operator should always re-check the tension over the entire length of the suture before completing the securing knots.

The suture tension for the **releasing incision** needs to be considered differently compared to that used for the rest of the incision. Normally, the releasing incision is not sutured, but if it is, the suture should be looser than the other sutures. It has been shown that epithelial creep, or streaming, occurs rapidly or at a rate of about 1 mm per side per 24 hours. In other words, a wound whose edges were separated by 2mm would be expected to come together within a 24-hour period. In hundreds of surgeries over the past 12 years, there have only been a few cases in which the releasing incision did not completely close. Of those few that did not close within 24 hours, they did so within 48 hours. Thus, if the operator prefers to suture the releasing incision, it must be sutured loosely (Fig. 10). Another consideration is to suture like tissues to like tissues. Never suture attached gingival tissue to unattached gingival tissue. Should one side of the suture tear out, it will be the attached gingival side.

When using the OM to suture, the incision can be closed accurately with extremely good approximation. It is because of well-planned and nicely scalloped incisions, atraumatic flap elevation procedures and the very close repositioning of the flap with thin, hair-like sutures (6-0) that we can plan on routinely removing sutures in 24 hours (Figs. 3 & 4).



**Fig. 9** The suture knot is pushed away from the incision.

The sutures have completed their task after 24 hours and, in fact, then become foreign bodies that can cause irritation and excessive inflammation, be a source of infection and ultimately result in a retardation of the healing process.<sup>2</sup> For those that doubt the **24-hour suture removal theory**, try the following easy exercise:

1. At the next surgery, place at least five sutures.
2. After 24 hours, have the patient in and remove the suture that looks the worst, the one you think is not healing as well as the others.
3. The next day, remove the next suture that looks the worst.
4. The next day, do the same, and so on. At the end of the fifth day, the area that looks the most inflamed will be around the remaining suture(s). If that does not convince you, nothing will.

Post-operatively, the usual result is little, or no, pain or swelling. The post-operative instructions are ice packs—15 minutes on and then 15 minutes off—for the first six hours only, gentle rinsing with Peridex for the next 24 hours and suture removal the following day. Experience has demonstrated that prescribing 600 mg of Ibuprofen every six hours, along with one to two tablets of over-the-counter Tylenol (taken between the doses of Ibuprofen), has a very effective anti-inflammatory effect. It is the exception, rather than the rule, that a patient requires a stronger medication for post-operative pain. Antibiotics are not usually prescribed.

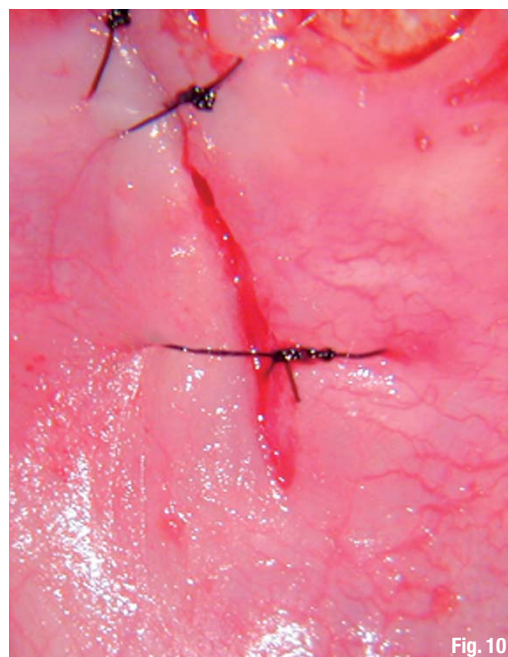
If everything is within normal limits, the patient is instructed to begin gentle cleaning of the area—

using a facecloth over their index finger—on the third day and gentle brushing with a soft brush on the fifth day. The patient is scheduled for a follow-up visit two weeks after surgery. At the two-week visit, the incision is generally barely visible and, on most occasions, can hardly be detected (Fig. 5). A word of caution: not all patients respond to treatment as well as others. Do not be in a hurry to treat a problem that may not exist. On a few occasions, patients may be slower than normal in response to treatment, sometimes taking several weeks to heal. If there is any doubt, place the patient on an antibiotic and an anti-inflammatory for a week as a precaution, but what is really desired is more time for delayed healing to occur.

The apical microsurgical technique described in the previous six parts of this series has become the new standard of care in endodontic treatment and raises endodontic apical surgery to a new and exciting level. For the first time, apical surgery can be performed with predictable results. These results, however, can only be achieved if the proper protocol is followed meticulously. Each step must be followed without compromise.

Much more could have been written, but hopefully enough of an overview has been given to encourage even one more operator to begin using the OM. It is the finest tool our profession has ever been given. Apical microsurgery can be an enjoyable part of the daily regimen, for both the operator and the newly involved dental team!\_

*Editorial note: A list of references and copies of all previous parts of this series are available from the publisher.*



**Fig. 10** The vertical releasing incision should be sutured loosely.

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