Surgery can never replace solid endodontic principles and should always be a last resort. Apical microsurgery consists of nine basic steps that must be completely performed in their proper order, so the desired result can be achieved:

1. Instruments, supplies and equipment (including the operating microscope) ready;
2. Patient, doctor and assistants positioned ergonomically;
3. Anaesthetic and haemostasis staging completed;
4. Incision and atraumatic flap elevation;
5. Atraumatic tissue retraction;
6. Access, root-end level (RER and REB) and crypt management;
7. Root-end procedures: root-end preparation (REP);
8. Root-end fill (REF) techniques and materials; and
9. Sutures, healing and post-operative care.

Predictable microsurgery requires the use of an operating microscope (OM) and a team committed to operating at the highest level. The six-handed team approach optimises the instruments, equipment, techniques and materials that today’s level of technology presents for the benefit of all, especially the patient (Fig. 1).

Dr Berman, an old retired general surgeon, one of my senior-year dental school instructors, would begin each general surgery lecture by tapping the lectern with his pencil, and when he got our attention, he would say: “Treat the tissues with tender loving kindness and they will respond in a like manner.” I have heard those very words many times while performing apical microsurgery; it is truly a gentle technique when
the steps are followed in the proper order.

A thorough past medical history and dental examination, using as many diagnostic aids as possible, is of great importance for a predictable microsurgical event. Thoroughness can help one avoid unfavourable experiences. For example, if the patient, or their physician, states they are sensitive or allergic to epinephrine to any degree apical microsurgery should not be performed. One of my golden rules of thumb is: No Epi, No Surgery … Period! Should the doctor choose to proceed with the microsurgical procedure, it will be exceptionally more difficult for both the doctor, and the patient.

Today’s technology presents us with much more pre-surgical information than was available even a few years ago; thus, recent advances should be inculcated in the diagnostic process whenever possible. A good example of current technology is cone-beam computed tomography (CBCT). The radiological images we used for many years were the best we had but were very limited. Now CBCT enables the microsurgeon a view of all angles of areas of concern in the maxillofacial region and suprastructures of areas of concern in the patient. The doctor and patient can see the entire surgical environment and is the only one on the team that has an overview, to keep track of everyone’s needs. It is important that all possible surgical instruments can be used for ease of access during the operation.

While the anaesthesia is being prepared, the patient’s upper lip, the area that will be placed into the tips of the Stroppo Irrigators for use during the surgery can be modified.

The doctor’s surgical stool must have adjustable arms to allow the elbows to support the back and serve as a reference point, or fulcrum, if the doctor has to reach for an instrument during the procedure. Ideally, neither the doctor nor the ‘scope’ assistant are to remove their eyes from the oculars of the OM during the entire operation. The task of directing the whole operation belongs to the surgical assistant. The surgical assistant is the choreographer for the procedures viewed through the OM. He or she is in a position to observe, coach and/or pass instruments to either the doctor or the ‘scope’ assistant. The surgical assistant can see the entire surgical environment and is the only one on the team that has an overview, to keep track of everyone’s needs. It is important that all possible surgical instruments be organised for ease of access during the operation.

When anaesthesiologists have placed, local anaesthesia is being used, less than one carapule of warmed two per cent lidocaine containing 1,500,000 epinephrine. This small amount is used to anesthetise the injection sites that will be used next. The anaesthesiologist must be regulated. (Note, air pressure to the syringe must be regulated.)

As soon as the patient is in the proper position, the bend can be verified of the tip of the needle that is used to inject the local anaesthesia. The patient with the anaesthetic is warmed and injected into the free gingival tissue (Fig. 4b; and Fig. 5a). While the anaesthesia is being prepared, the patient’s upper lip, the area that will be placed into the tips of the Stroppo Irrigators for use during the surgery can be modified. The notched ends of 25-gauge Monojet Endodontic irrigation needles (Ultradent/Vista) are removed by bending with Howe Pliers and placed into the end of the Stroppo Irrigators. One tip is used with an air/water syringe, and the other tip is used with the dedicated air-only syringe (DCI). The endodontic irrigating needles are then bent in the same configuration as the ultrasonic tips that are used for the root-end preparation. After the needle has been bent, the ergonomics of the bend can be verified quickly and easily because the patient is in the proper position and so is the doctor.

 optimally, three Stroppo Irrigators should be available for any surgical procedure; one three-way syringe fitted with a modified 25-gauge needle, for more precise cleaning and drying (Little John); and one with an air-only syringe also fitted with a modified 25-gauge needle, for more precise and dependable drying of the area without worry of moisture contamination in the area of concern (Fig. 4b). Note, air pressure to the syringe must be regulated.)

As soon as the patient is in the proper position, the bend can be verified of the tip of the needle that is used to inject the local anaesthesia. The patient with the anaesthetic is warmed and injected into the free gingival tissue (Fig. 4b; and Fig. 5a). While the anaesthesia is being prepared, the patient’s upper lip, the area that will be placed into the tips of the Stroppo Irrigators for use during the surgery can be modified. The notched ends of 25-gauge Monojet Endodontic irrigation needles (Ultradent/Vista) are removed by bending with Howe Pliers and placed into the end of the Stroppo Irrigators. One tip is used with an air/water syringe, and the other tip is used with the dedicated air-only syringe (DCI). The endodontic irrigating needles are then bent in the same configuration as the ultrasonic tips that are used for the root-end preparation. After the needle has been bent, the ergonomics of the bend can be verified quickly and easily because the patient is in the proper position and so is the doctor.

Optimally, three Stroppo Irrigators should be available for any surgical procedure: one three-way syringe fitted with a larger tip (Ultradent/Vista), for more general flushing of the surgical area (we call it the Big John); another three-way syringe fitted with a modified 25-gauge needle, for more precise cleaning and drying (Little John); and one with an air-only syringe also fitted with a modified 25-gauge needle, for more precise and dependable drying of the area without worry of moisture contamination in the area of concern (Fig. 4b). Note, air pressure to the syringe must be regulated.)
sue in two or three sites to the buccal of each tooth (MB, B, DB), approximately three mm apical to the mucogingival line. Slow injection of just a few drops of the anaesthetic causes a slight ballooning and blanching of the tissue in the immediate area.

This is an important step as it causes the mucogingival line to become more pronounced, allowing the doctor to have better vision, which results in more accuracy with the following haemostasis injections (Fig. 5a).

As the anatomy of the tissue unfolds during the injections, the doctor should continue visualising and planning the incision (Fig. 5b). The amount and nature of the attached gingiva is an important consideration whether a full sulcular or a mucogingival (Leubke–Oschenbein) flap is used. In general, a full thickness sulcular flap is routinely used unless aesthetics is a concern and there is an adequate zone of attached gingiva present.

In order to ensure haemostasis, the lingual tissues should also be infiltrated to reduce blood flow during the surgical procedure more completely. When performing surgery on the posterior quadrant of the mandible, special attention should be given to the apical region of the mandibular second molar. On occasion, a small foramen, called the foramen colli, may be present. The f. colli contains an ascending branch of the mylohyoid nerve. Lingual haemostasis staging can contribute to more profound anaesthesia, will enhance crypt management and will contribute to a more predictable event with less stress for the entire team as a result.

If the surgery is to be performed on the maxillary, the patient is instructed to close on approximately eight layers of sterile gauze, (four 2 x 2s folded over once) for stability of the jaws and keeping any debris from inadvertently entering the oral cavity. A single piece of a sterile 2 x 2 is also gently placed distal of the tooth/teeth to be operated on. If the surgical procedure is to be performed on the mandible, especially if a full sulcular flap is to be used, the doctor may want to make the incision with the mouth slightly open before placing the gauze.

In either case, with the aid of the OM and using a pre-filled 3ml syringe fitted with a 20-gauge needle the entire surgical site is rinsed with Peridex, to ensure the area is free of debris and plaque before the incision is made (Fig. 6). The surgical site is now ready for the next important step in the procedure: Flap design, the incision and atraumatic flap elevation. Stropko Irrigators are available from SybronEndo or Obtura Spartan in the United States, from Clinicians Choice in Canada, or directly from www.stropko.com.

References

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received his DDS from Indiana University in 1964 and for 24 years practised restorative dentistry. In 1989, he received a certificate for endodontics from Stanford University. He recently retired from the private practice of endodontics in Scottsdale in Arizona. Dr Stropko is an internationally recognised author and editor of micro-endodontics. He has been a visiting clinical instructor at the Pacific Endodontic Research Foundation (PERF), an Adjunct Assistant Professor at Boston University and an Instructor of Endodontics at Loma Linda University. His research on in vivo root canal morphology has been published in the Journal of Endodontics. Dr Stropko has published in several journals and textbooks, and is an internationally known speaker. Dr Stropko has performed numerous live micro-endodontic and micro-surgical demonstrations. He has been a co-founder of Clinical Endodontic Seminars and is currently an instructor of Microsurgery in the Endodontic Faculty at the Scottsdale Center for Dentistry. He can be contacted at topendo@aol.com.