Principles of Flap Design and Closure

by Jay B. Reznick, DMD, MD

Dr. Jay B. Reznick is a Diplomate of the American Board of Oral and Maxillofacial Surgery. He received his dental degree from Tufts University, and his M.D. from the University of Southern California. He trained in oral and maxillofacial surgery at L.A. County USC Medical Center. His special clinical interests are in the areas of facial trauma, jaw and oral pathology, dental implantology, sleep disorders medicine, laser surgery and jaw deformities. He can be reached at jreznick@sccofs.com.

Introduction

Many oral-surgery procedures require development of a surgical flap to gain access to the surgical site.

Flaps are necessary to facilitate surgical tooth removal, treat pathology and create access for bone- and tissue-augmentation procedures. The type of flap used affects how easily primary closure can be achieved, how quickly the site heals and the risk of complications. Poorly designed surgical flaps can break down, become necrotic and increase the risk of graft failure.

Once the surgical procedure is completed, reapproximation of the soft tissues is indicated. Various suture materials and techniques have been developed for different procedures and purposes.

Knowing which suture to use in which situations, and how to use it properly, is critical for clinicians if they perform surgical procedures.

Surgical considerations

Many surgical extractions can be performed utilizing atraumatic techniques, often

with specialized instruments and devices like proximators, apical retention forceps and the piezotome. These are used to expand alveolar bone, sever the periodontal ligament and luxate roots, respectively.

But when atraumatic techniques are unsuccessful or are not viable treatment options, a surgical flap is indicated to gain access to the site to visualize the field and avoid trauma to the soft tissues.

Done correctly, a surgical flap will make the procedure less traumatic than performing surgery without a well-visualized surgical field. A surgical flap provides clear visualization and access to facilitate sectioning and conservative bone removal (Fig. 1; see p. 78).

This leads to less postoperative pain and swelling, and a lower risk of complications such as infection or delayed healing. The clinician should always be open to creating a surgical flap when clinically indicated.

Despite the benefits of laying a flap, many doctors will try to avoid doing it, either because of inexperience or a lack of training. But the alternative—for example, attempting to remove a broken tooth by persistently digging at it within the socket—can be a nightmare for both doctor and patient.

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Common flaps

The type of flap used in surgery varies based on its purpose, the particular surgery and the anatomical area of the surgical procedure.

In general, the flap should be based on maintaining blood supply and be broader at the base than at the apex (Fig. 2).

The design for the flap should also facilitate wound closure once the surgical task is complete.

Most flaps are created to aid in the removal of teeth, especially erupted teeth, either when simple elevation and luxation fails to mobilize the tooth, or when the crown fractures and there is nothing to which the forceps can be applied.

In this case, the flap is developed to expose the alveolar bone to facilitate creating a bony trough along the root, which provides a purchase point for an elevator.

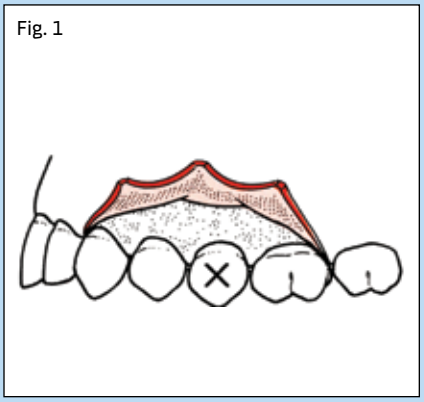
A sulcular incision usually accomplishes this task quite well. A scalpel is used to incise the sulcus and interdental papillae on the facial and possibly lingual aspects of the tooth, and then a full-thickness mucoperiosteal flap is developed.

To avoid tearing the tissues, which may be quite friable as a result of inflammation or infection, it is important to be sure that the incision is made firmly down to bone and that the incision extends to the far interdental area of the teeth on the mesial and distal.

If the incision is deficient in length, it will be difficult to get adequate tissue reflection without stretching or tearing the flap. If it is necessary to extend the flap further apically, then a distal vertical releasing incision is recommended (Fig 3).

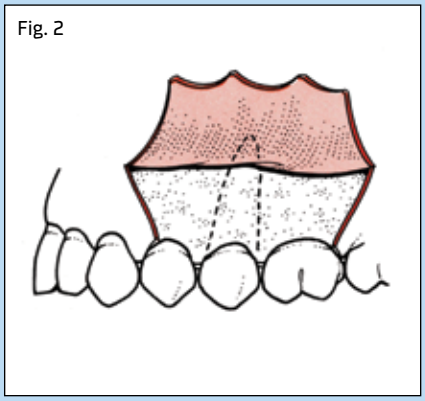
The keratinized tissue just distal to the releasing incision should also be elevated to facilitate suturing in this area. The releasing incision should first be reapproximated to ensure a smooth transition of the marginal gingival after healing. The

Fig. 1



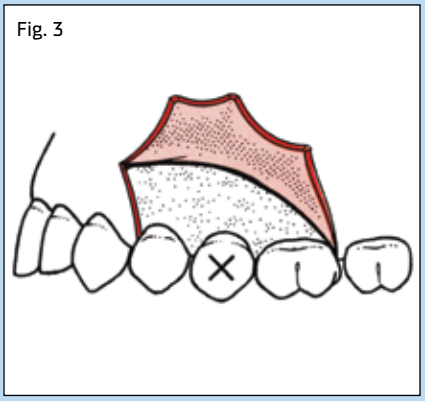
The basic incision for exodontia is a sulcular incision that is sufficiently extended to allow access to the surgical site, while avoiding excess tension that can tear the flap.

Fig. 2



A properly designed surgical flap is wider at its base to ensure adequate blood supply to the margins of the incisions.

Fig. 3



When access to the more apical region of the alveolus is needed, a vertical releasing incision can be made. The direction of the vertical release is made in consideration of ensuring adequate blood supply.

remainder of the release is then sutured. The buccal aspect of the flap is reapproximated with sutures in the interdental papilla.

Preserving the ridge

If ridge preservation is planned for the extraction socket, many choices are available for the bone graft and barrier membrane that will be used. In my more than 20 years in clinical practice, I've had the opportunity to try many materials. I prefer a calcified, freeze-dried corticocancellous allograft covered with a barrier membrane made of polytetrafluoroethylene and polytetrafluoroethylene (PTFE) sutures.

In the following example, I began with a sulcular incision on the buccal and lingual side of the tooth into the mesial and distal interdental papillae. The marginal gingival is reflected to expose the alveolar bone margins, and then, using a curved spoon curette, a pocket is developed between the periosteum and the alveolar ridge.

Once the allograft bone is in place, the PTFE membrane is contoured to stay about 1mm from the adjacent teeth, and the long ends are tucked into the buccal and lingual pockets that were developed. A figure-eight suture is placed over the socket, and single interrupted sutures are placed to reapproximate the interdental

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papillae over the membrane (Fig. 4).

The sutures are removed after two weeks, and the membrane is removed after six weeks. A layer of healthy granulation tissue will be found under the barrier membrane. This will epithelialize in about four weeks. The bone will be sufficiently healed to allow for implant placement four months after extraction and grafting.

Third molars

The incision for removal of impacted third molars has been taught a number of ways, because no particular incision design has been shown to be superior. This is true for both mandibular and maxillary teeth.

Most designs have one thing in common: a buccal sulcular incision that begins along the second molar and extends over the area of the impacted tooth. As a general rule, the deeper the impaction, the more extended the incision should be to adequately expose the surgical site without tearing or traumatizing the tissue.

The distal aspect of the incision should be carried toward the buccal in the retromolar region (Fig. 5).

Avoid any extension of the incision lingual to the central groove of the second molar, because the position of the lingual branch of the trigeminal nerve can be quite variable.

An alternative to a sulcular incision is to make an incision across the retromolar pad, with a releasing incision in a vertical direction just distal to the second molar. This avoids disruption of the interdental papilla between the first and second molars, and the risk of facial gingival recession.

If a sulcular incision was made and the interdental papilla was reflected, a simple interrupted suture will be necessary in this area (Fig. 6).

The flap should be replaced over the third-molar extraction

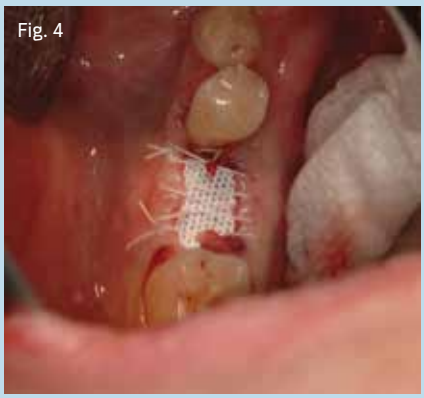

Fig. 4

An example of the ridge-preservation technique that secures a PTFE barrier membrane in place over the particulate bone graft, utilizing figure-eight sutures made of PTFE.

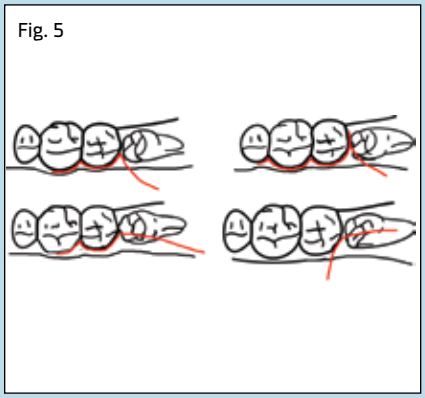

Fig. 5

There are multiple incision methods for third-molar surgery.

Fig. 6

A simple interrupted suture is placed interdentally between the first and second molars to secure the flap. This is used to expose an impacted third molar.

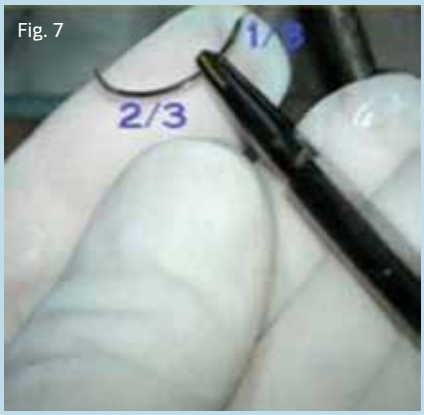

Fig. 7

The proper way to hold a suture needle is about two-thirds from the tip, using the end of the needle holder.

Fig. 8

A surgeon's knot is used to tie the suture securely.

Fig. 9

Examples of some of the suture types and sizes commonly used in office oral surgery.

site, and the cheek should be gently reflected. If there is minimal displacement of the tissue with this maneuver, often a suture will not be necessary.

However, if there is mobility of the flap, a simple interrupted suture can be placed just distal to the second molar or more distally over the incision. Care must be taken to keep the suture needle from penetrating tissue below the level of the lingual alveolar bone. Penetrating the tissue below this level increases the risk of injury to the lingual nerve.

Suturing

Suturing the wound is usually required once the surgical procedure is completed. The purpose of suturing is to approximate surgical flaps to their original position and to hold them in place long enough for healing to occur.

A suture alone will not stabilize a blood clot in an extraction site. When indicated, a surgical packing is placed, and the suture is used to contain this pack within the extraction socket. The selection of suture material depends on the purpose and duration needing tissue support, as well as the location and accessibility of the surgical site.

For most oral-surgery cases, either silk or gut suture works efficiently. Suture size ranges from very thin to very thick. But for most procedures, either 4-0 (thinner) or 3-0 (heavier) suture will suffice. These two suture sizes are generally attached to needles that are easy to handle with a standard needle holder, and are easy to see and tie.

For most extraction procedures, 3-0 sutures give the appropriate strength and minimize scarring. However, in thinner tissue or for non-keratinized tissue, 4-0 sutures may be preferred.

To suture properly, it's important to place the needle in the needle holder correctly. The needle should be at the tip of the needle holder, approximately two-thirds of the way from the tip of the needle (Fig. 7). If the needle is held too close to the tip, the surgeon will not be able to pass the suture as far through the tissues. If it is held too close to the back end, the needle will tend to bend.

The tying technique used in surgery is the surgeon's knot. This is a double throw, followed by a locking stitch in the opposite direction, and then a second locking stitch in the opposite direction of the first (Fig. 8).

Silk sutures, which are not resorbable, are used when a suture is required to stay in place for about a week. For most extraction and impaction surgeries, resorbable sutures made of gut (sheep intestine) are used. These sutures generally last about three to five days, then break down and fall out. If a longer duration is needed, gut suture treated with chromic acid (chromic gut) is used. These last up to 10 days.

Silk sutures should not be left in place for more than seven days, because the risk of infection sharply increases. For this reason, many surgeons prefer chromic gut suture, in case the patient does not return for timely suture removal.

Synthetic sutures made of polyglycolic acid and polylactic acid may sometimes be used in oral surgery. These materials are resorbed much more slowly—lasting three to four weeks—and are generally reserved for procedures in which multilayer closure is necessary (Fig. 9).

Another popular suture, especially for bone-grafting procedures, is PTFE, which is sold under a couple of brands. This is a very strong, soft, non-wicking material that is very well tolerated by tissues. It can be left in place for two to four weeks. The material unties easily, so an extra fourth throw is necessary to secure the stitch, compared with the three throws of the surgeon's knot. More advanced suturing techniques are used for more advanced procedures.

Conclusion

Mastery of surgical flaps and a working knowledge of suturing will get the clinician through most oral-surgery procedures. The practicing dentist can consult the many available courses, textbooks and online videos to learn and master these techniques. ■