



# Top tips for optimising surgical flap design in primary care

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## Introduction

Surgical flap design and management is something general dental practitioners may have to consider on a regular basis, often at the most inopportune of moments when time pressures are at their greatest. There are few clinicians who have not been faced with the prospect of raising a flap for a surgical extraction when time is short and the need to be as efficient and effective as possible is essential. This article refers to buccal flaps which are more likely to be carried out in primary care.

Improving surgical flap design and management helps to produce predictable results, assists healing, improves patient comfort, and decreases complications. It should be noted however that when carrying out any surgical technique, access and vision should be optimal, and an awareness of vital structures is paramount to limit adverse complications.

In this paper, we discuss techniques and tips to optimise flap design and management which, based on our experience, will improve outcomes for patients and hard-pressed clinicians.

## Flap design

Designing a flap is key to successful dentoalveolar surgery and as such should not be underestimated. A well-designed flap will give good access to allow the surgery to be completed whilst protecting important anatomical structures and facilitating healing of the surgical site. A poorly designed flap risks complications including poor healing and potential long-term harm.

### 1. Preserve important structures

#### a. Avoid incisions over or near to foraminae, blood vessels, or nerve pathways

A sound working knowledge of anatomy is essential to flap design. A misplaced incision could cause avoidable complications such as bleeding or nerve damage. Think of the anatomy beneath the surface when planning your flap. For example, one must not extend a relieving incision down between the lower premolars due to the risk of damage to the mental neurovascular bundle.

#### b. Maintain the integrity of papillae, fraenae and other structures

It is important to preserve the soft tissue anatomy both to aid closure and to ensure that those structures are maintained following healing. Interdental papillae should be included within the flap and must not be bisected or transected. Incisions should not be placed across fraenae.

#### c. Anticipate aesthetic concerns

If a flap is planned in the anterior region be mindful as to how much gingival display the patient exhibits when talking and smiling. In the presence of a 'gummy smile' one might design a flap whereby incisions and hence resultant scars are less immediately apparent.

### 2. Anticipate complications

#### a. Bony defects and cysts

Placing an incision over a lesion will complicate its removal and compromise healing. Plain radiographs are invaluable but can be anatomically misleading. Additionally, a radiograph taken several months previously may not show the current extent of a defect, granuloma, or cyst. It is also vital to plan for any additional defect resulting from necessary bone removal to remove the roots and/or lesion completely. Ensure that ample allowance is made for any bony defect beneath soft tissue such that any incision is placed at a safe distance lateral to the defect margins. The wound margins must rest on sound, uncompromised bone – otherwise there is a significant risk of wound breakdown and poor healing.

#### b. Oro-antral communication (OAC)

If an OAC is a significant risk plan your flap design accordingly such that it could be modified if required to close the OAC. If unsure, or management of this complication would fall beyond your skill set, seek specialist advice and refer.

### 3. Design for good access

#### a. Ensure access to the surgical site is sufficient

Access is essential. Poor access can lead to excessive retractive force and tearing of the soft tissues. Ensure the extent of the flap allows sufficient access with gentle retraction. Whilst it is desirable to raise only as much tissue as required, healing will occur over the same time period regardless of flap size (Fig. 1). ▶▶

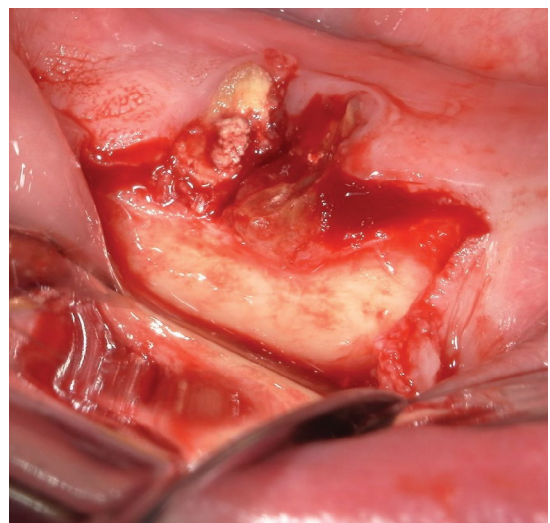


Fig. 1 Envelope flap for 47 roots, with no adjacent teeth, allowing sufficient access for surgical removal

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#### ◀ b. Plan for extension

Design bearing in mind how the flap could be extended to improve access if required. If an envelope alone is insufficient, where would the relieving incision(s) best be placed? A relieving incision can also be extended if safe to do so.

#### 4. Make controlled incisions

##### a. Feel before you cut

Palpate firmly to ensure relieving incisions will be placed over sound bone. Surface anatomy can be visually misleading. What appears to be firm may be soft tissue overlying a tissue space containing key structures. Palpation will confirm the presence of bone and reassure the operator before scalpel placement.

##### b. Handle the scalpel properly

Hold the scalpel as one would a pen and with the forefinger extended along the top of the handle. Use appropriate finger rests, ensuring that you do not slip.

##### c. Intra-crevicular incisions

These may be made using near vertical 'walking' or sawing movements of the scalpel into the gingival crevice around the cervical margins of the teeth. Resist any temptation to turn the blade in the papilla – this will transect the latter. The blade should approach the mesial and distal aspects of each papilla by insertion at their respective sides, ie the scalpel must be removed and repositioned to incise each side of the papilla. Intra-crevicular incisions may need to be recapitulated.

##### d. Plan any relieving incision with care

Place relieving incisions carefully and firmly down to bone in one smooth movement. Avoid recapitulating these whenever possible because it will be very challenging to follow the same line of incision. Keep the incision over the alveolus, within the attached mucosa. Do not extend any relieving incision into the free mucosa nor too deeply into the sulcus.

#### 5. Raise a full-thickness flap

##### a. Loosen any gingivae and papillae

A flat plastic, curved Warwick-James, or similar, may be used to loosen the papillae and gingivae. The tissues can be tenaciously attached and will easily tear if pulled. Press against the bone whilst turning the instrument gently rather than attempting to 'pull'. Similarly, microsurgical instruments and papilla specific elevators, such as the Buser elevator can be very helpful in initial flap management (Fig. 2 and Table 1).

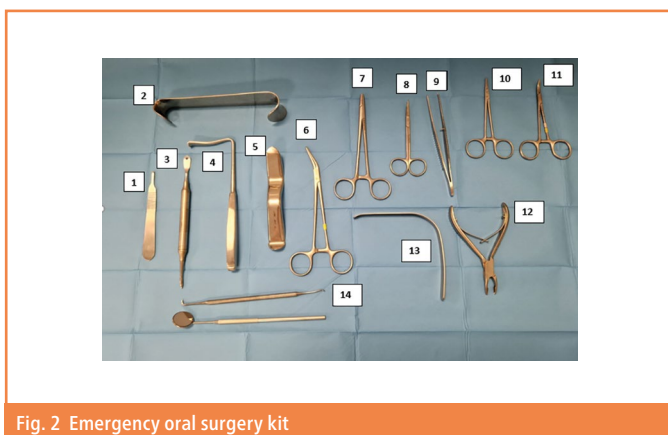


Fig. 2 Emergency oral surgery kit

#### b. Find the plane beneath periosteum

It is important to raise the periosteum fully with the overlying mucosa. This may be easier to find initially via any relieving incision. Push underneath the periosteum with the tip of the periosteal elevator pointing *towards* the bone. Again, do not attempt to pull the flap off the alveolar bone because it will tear, or you may 'button hole' through the flap. Raise the flap from the bone in this manner ensuring that the full thickness of muco-periosteum is released and raised. Poorly raised or macerated periosteum will cause excessive pain and inflammation and slower healing in the post-operative phase.

##### c. If the flap is tethered

If small points are tethered when raising the flap, gentle retraction with a periosteal elevator can aid in identifying any point of gingival attachment which may be released via careful incision.

#### 6. Reposition the flap with care

##### a. Use landmarks

Suture anatomical landmarks, such as papillae, first. This will aid correct repositioning of the flap for closure. For more extensive flaps it may be helpful to start with the landmarks towards the middle of the flap to ensure correct alignment.

##### b. Take an appropriate 'bite' of tissue

For intra-oral relieving incisions the bite is usually 3–5 mm. It is important to ensure the suture doesn't pull through the delicate tissue whilst still apposing the tissue accurately. The needle should be rotated through the tissue, following its curve, to ensure it does not cut through. The wound margins should be slightly everted.

##### c. Avoid excessive tension

Sutures should hold the tissue gently back in place. Too much tension may cause the suture to pull through the tissue. Excessively tight sutures will result in pain and potential tissue necrosis due to swelling during the post-operative phase. ▶▶

Table 1 Instruments in the emergency oral surgery kit (depicted in Figure 2) and their uses

Number	Instrument name	Instrument role
1	Number 3 Scalpel Handle	Handle to a Number 15 scalpel blade
2	Kilner Cheek Retractor	Used to retract the cheek during suturing
3	Periosteal Molt Elevator	Aid to raising a mucoperiosteal flap
4	Bowdler Henry Rake Retractor	Mucoperiosteal flap retractor
5	Minnesota Retractor	Mucoperiosteal flap retractor
6	Toothed Fickling Forceps	Used to pick up tooth/bone fragments
7	Needle Holder	Used to hold the suture needle
8	Suture Scissors	Used to cut sutures
9	Gillies Toothed Tissue Forceps	Used during suturing to hold the mucoperiosteal flap
10	Straight Mosquito Clip	Used to remove soft tissue fragments
11	Curved Mosquito Clip	Used to remove soft tissue fragments
12	Rongeur Bone Nibbler	Used to remove sharp alveolar bone
13	Lack Tongue Depressor	Used to keep the tongue away from the operative field for protection
14	Mitchell Trimmer	Aid to raising a mucoperiosteal flap, used to curettage and debride tissue

« d. **Tighten and knot carefully**

An appropriate surgeon's knot should be used, with 3–5 mm of tail end remaining after the knot to avoid unravelling. The knot should be tightened without over-tightening the suture itself. If a suture is too loose and the knot locked tight, it may be appropriate to cut the suture out and replace it. Similarly if the suture appears to be too tight, or incorrectly positioned, it is perfectly reasonable to remove and reposition it. Bear in mind that multiple re-attempts at suturing may be challenging because the intra-oral soft tissues are delicate.

7. **It is better to stop if you are getting into trouble**

No matter your level of experience there are always occasions when the unexpected can happen. If things are not going to plan, stop and reassess. If the situation is moving beyond your skill set, listen to your gut feelings. Close with sutures, explain the situation to your patient, review and refer as needed. It is far better to abandon a procedure than to cause serious complication or irreparable harm.

**Conclusions**

The need to carry out a surgical extraction in primary care often arises at the most inopportune of moments, when the adrenaline levels of patient, clinician, and nurse often rise accordingly. The practical tips in this short paper if followed will offer you the chance of success. Raising the flap sufficiently to allow appropriate vision and access is key. Having a surgical kit on standby will prevent much anxiety, and as always further ongoing training and mentoring will help to optimise outcomes for patients and clinicians alike. ■ ✦

CLINICAL PUZZLE

# Fractured retainer

A 28-year-old patient presented for an orthodontic consultation. They had a history of previous fixed appliance-based treatment in adolescence. However, their upper fixed retainer had fractured 12 months previously and the patient had noted that their upper teeth were becoming crooked with an asymmetric open bite also developing. What is the likely cause of these changes?



Send your answers to [k.quinlan@nature.com](mailto:k.quinlan@nature.com) by 23 February 2023. The answer will be revealed in an upcoming issue.

If you would like to send a clinical puzzle, view the details here: <https://www.nature.com/articles/s41415-022-5392-2>.

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