Textbook of Oral and Maxillofacial Surgery

Gustav O Kruger

(The C V Mosby Company, St Louis, Toronto, London, 1979)

Fifth Edition

Chapter 5

Complicated exodontics

Gustav O Kruger

Alveoloplasty

Alveoloplasty or alveolectomy is the surgical removal of a portion of the alveolar process. When multiple extractions are performed, the contours of the alveolar ridge should be considered in the light of future prosthetic needs. The ideal ridge is U shaped. Natural resorption will contour the ridges, occasionally unevenly, but a longer period of time is required, and the patient may experience discomfort until the sharp bony edges underlying the sensitive periosteum round off. Judgment is required to determine whether alveoloplasty is necessary and how extensively it should be done.

Conservation of the maximum amount of bone consistent with a good ridge is the goal. Although the ridge that is extensively contoured by surgery is beautiful, with end-to-end mucosal closure over the sockets, the procedure is worthless if severe resorption of the remaining bone makes denture wearing impossible after a few years. On the other hand, laziness on the operator's part in smoothing obvious sharp edges, protuberances, and excessive undercuts that cause discomfort and an unsatisfactory denture base cannot be equated with conservatism.

Several years ago at a meeting of oral surgeons, discussion revealed that everyone had become more conservative in alveoloplasty procedures. The participants reported seeing greater numbers of elderly edentulous patients whose life-span had increased and in whom no alveolar bone remained. Finally, an elderly oral surgeon in the back of the room said, "I am a diabetic. As you know, diabetics experience rapid and extensive bone resorption. When my son removed all my teeth he said, 'Dad, I am going to remove only the teeth and not one sharp ridge or piece of bone because we have to save every bit of bone we can'. Gentlemen, I suffered the agony of the damned until the sharp edges rounded off. On the basis of my personal experience, I make sure that the bone is smooth, even if I have to remove a little bon in a patient who is expected to undergo extensive resorption".

The most conservative procedure is compression of the alveolar walls by finger and thumb pressure. Extraction usually expands the labial or buccal cortex. Pressure will restore the walls to their former position. Overcompression by heavy pressure can reduce the width of the sockets by one third.

If there is a question in the operator's mind about the amount of natural resorption that will take place, a better judgment is possible 3 weeks after the extractions are accomplished. Most of the initial resorption will be completed in 3 weeks. At that time an extensive

alveoloplasty may still be necessary, but more frequently the operator will find that only a few small areas require contouring.

Simple alveoloplasty. After multiple extractions the buccal alveolar plates and interseptal bone are examined for protuberances and sharp edges. If alveoloplasty is necessary, incisions are made across the interseptal crests. The mucoperiosteum is raised carefully from the bone with a No 4 Molt curet or a periosteal elevator. Difficulty is experienced in starting the flap at the edge of the bone because periosteum is attached at the ends of bones, but caution must be exercised in not raising the flap higher than two thirds of the way up the empty socket. To raise it further would strip the lightly attached mucobuccal fold, with the consequence of serious loss of space for denture flange height.

The flap is retracted gently and an edge of a gauze sponge placed between bone and flap. A universal rongeur is placed sidways halfway up the empty sockets, and the buccal or labial alveolar plate is resected to a uniform height in all sockets. The rongeur now is placed at a 45-degree angle over the interseptal crest, one beak in each socket, and the labial or buccal interseptal tip is removed. This procedure is accomplished on all interseptal crests. Bone bleeders are controlled by rotating a small curet in the bleeding point. A file lightly pulled in one direction over all cuts will smooth the bone. Loose particles are removed, the gauze is removed so that the flap results its place on the bone, and a finger is rubbed over the mucosal surface to examine the smoothness of the alveolus.

The buccal plate should be contoured to approximately the same height as the palatal plate to form a broad, flat ridge. Excessive undercuts in the upper posterior and lower anterior segments should be given particular attention. Excessive soft tissue and chronic granulation tissue are removed from the buccal and palatal flaps, which are then sutured over the interseptal areas but not over the open sockets. Interrupted or continuous sutures are placed without tension.

Radical alveoloplasty. At times radical contouring of the alveolar ridge is indicated because of extremely prominent undercuts or, in some instances, a marked discrepancy in horizontal relation of maxillary and mandibular ridges caused by marked overjet. Such patients may require complete removal of the labial plate to achieve satisfactory prosthetic replacement.

In such cases a mucoperiosteal flap is raised prior to extraction. Extraction of the teeth can be facilitated by first removing the labial bone overlying the roots of the teeth. This bone removal will also ensure preservation of interradicular bone. After removal of the teeth the remaining bone is trimmed and contoured to the desired labial and occlusal height with the chisel or rongeur and file. Excessive tissue is trimmed from the labial and palatal flaps, which are approximated with interrupted or continuous sutures over the septa.

In closing such a flap it may be necessary to remove a wedge of tissue in the premolar areas to allow for the decreased outer circumference of the labial bone. Care must be taken with this larger flap to preserve as much attachment at the height of the mucobuccal fold as possible, or else an excessively long flap is encountered at closure. If the flap is not supported by an immediate denture and the excess tissue is resected, the height of the mucobuccal fold will be diminished drastically.

Interradicular alveoloplasty. In this procedure interradicular bone is sacrificed rather than labial plate. The teeth are extracted. No attempt is made to raise a mucoperiosteal flap

over the bone to be collapsed. Interradicular bone is removed with a narrow-beaked rongeur (one beak in each socket) to a height halfway up the sockets. A notch is cut by rongeur or chisel in the labial plate in each premolar area to allow for the greater circumference of the labial plate to fit into its new position. The bone is collapsed to the desired contour by thumb pressure.

Less resorption and less postoperative pain are associated with this procedure since periosteum is not stripped from bone and does not rest on roughened bone.

Surgical Flap

A surgical flap is a soft tissue flap that is incised and retracted so that underlying bone can be removed to expose teeth, roots, and pathological tissue. Extractions and root removal procedures accomplished through the intact alveolus are called closed procedures. Operations requiring a surgical flap are called open procedures.

Basically, the indication for the surgical flap is inability to remove the structure or tissue without traumatizing the surrounding tissues. If a closed procedure fails, adequate visualization and access are obtained by means of an open procedure. A root remnant that cannot be recovered by ordinary means is removed by making a surgical flap. A large tooth that is encased in dense bone and will not move with forceps pressure is dissected out under a surgical flap, making forceps delivery possible. However, there are indications for making a surgical flap without first attempting a closed procedure. For example, if there is a reasonable possibility that the crown of a tooth will fracture because it is weakened by extensive caries or large restorations or if the crown is not present, a surgical flap should be considered. Some operators routinely prepare all devitalized teeth because the crown and root are friable after endodontic procedures. If the roots of a tooth are widely divergent, curved, or enlarged by hypercementosis, a flap may be prepared. If the overlying bone structure is enlarged or especially dense, or if the periodontal membrane is atrophic or absent (ankylosis), surgery is indicated. A large area of pathological tissue that cannot be removed through the narrow socket may be removed by way of a surgical flap.

Principles. Healing should take place without complication if basic surgical principles are followed. The incision should be designed so that the blood supply of the flap is adequate. If the free end of the flap is wide and the base containing the blood supply is narrow, nutition to the flap may be inadequate. The flap should contain all the structures overlying bone, including mucosa, submucosa, and periosteum, with special care given to include the periosteum in the flap. The flap should be sufficiently large that adequate vision and space for removal of bone are present without damaging the soft tissue edges. The incision should always be made over bone that will not be removed, so that the sutured incisions are supported by bone. Incisions made in tissues that harbor uncontrolled infection may cause rapid spread of the infection.

Types. The two basic types of intraoral surgical flaps are the envelope flap and the flap that has a vertical component on the buccal or labial surface. The envelope flap is made by incising the tissues around the necks of several teeth anterior and posterior to the area and spreading the resultant labial or buccal flap away from the bone. This flap is used in removing impacted teeth more than in other extractions. The vertical flap employs a vertical incision extending from the mucobuccal fold to a horizontal gingival incision around the necks of the teeth. Less tissue is raised, and the free gingival fibers of adjacent teeth are not incised. Some operators prefer one type, some the other.

Surgical procedure. Incision with a No 15 blade is made around the buccal or labial gingival cuff surrounding the tooth posterior to the one to be operated on, around the tooth itself, and then angled upward toward the mucobuccal fold away from the tooth to be removed.

Elevation of the mucoperiosteal flap is started in the vertical component where the periosteal attachment is not tight, and the periosteal elevator is worked toward the gingival cuff incisions as well as backward. The thin periosteum overlying the bone must be included in the flap. The flap is raised. The edge of the elevator is inserted 2 mm under the attached anterior tissue midway between cuff and fold for later entrance of the suture needle.

The flap is held up from the incisal plane with the periosteal elevator, or a piece of gauze is placed under the flap to retract it away from the field of operation with a finger. Retraction should be gentle to prevent damage and edema. The flap should remain retracted without relaxation of the retracting force until the operation is completed.

Bone removal may be accomplished by chisel, bur, or rongeur, the last being used to start ossisection if an empty socket is present. In dissection of a tooth, cuts parallel to the long axis of the tooth are made in the labial or buccal plate on the mesial and distal sides of the root. After removal of the buccal plate, further bone cuts are made on the two sides of the wound until the greatest width of the root is exposed. Care must be taken to avoid roots of the adjacent teeth.

The tooth is removed with forceps or elevators. Pathological tissue at the apex is removed with curets. Edges of the bony incision are smoothed with a file or small curet. All debris and small spicules are removed. The flap is returned to position. A suture is placed through the edge of the free flap about halfway between cuff and fold and sutured to an opposite point in the fixed tissue anterior to the incision. It is tied without tension. A suture to the lingual tissues is not necessary. A folded, moist gauze sponge is placed over the socket to prevent bleeding.

Variations in basic flap design are necessary in special areas. In the mandibular premolar area a distal vertical incision is added so that the mental foramen structures can be protected. The mandibular molar area benefits from a similar flap for better dissection of the distal root. The double flap is more difficult to suture.

Root Removal

The removal of a freshly fractured root is attempted by the closed method (that is, without a surgical flap) if there is likelihood of success. Many skilled operators boast that they can remove all such roots through the intact socket. However, it is best to prepare a surgical flap if the technique is not successful within 4 or 5 minutes. Otherwise, a half hour can be wasted, the soft and bony tissues can be traumatized, and the flap has to be made anyway.

Closed procedures. A tooth fractured at its anatomical neck often can be grasped by an anatomical or a root forceps and delivered. An alveolar purchase may be obtained by loosening the buccal or labial gingival cuff with a small, sharp curet. The buccal beak of the forceps is then placed under the tissues on the buccal plate. Pressure on a sharp forceps will bite down on the root, and the root, with the cut alveolar plate attached, is delivered. Occasionally pressure will fracture the plate enough to loosen the tooth, and the forceps is

returned to its normal position at the anatomical neck for a normal extraction, without removing the alveolar plate. Alveolar purchase will not be successful if the buccal plate is excessively heavy or the palatal edge of the root cannot be grasped.

A straight-shank elevator is used to remove roots fractured just below the alveolar margin, especially in the maxilla. The instrument is held in a plane parallel to the long axis of the tooth and worked up along the palatal aspect of the root, with purchase placed on the palatal rim if necessary. Another method of using the straight-shank elevator is to place it in the interdental area at a right angle to the long axis of the tooth, using a buccal approach. The root is elevated by using the interdental septum as a fulcrum.

If the root is fractured more than half-way up the socket, root exolevers are used. These are delicate instruments that can break easily. Pressure on the root tip itself may force the fragment into the antrumm, the mandibular canal, or the soft tissues. A careful technique is necessary, the most important aspect of which is adequate vision. If bleeding obscures the field, pressure for several minutes on a piece of gauze held by an instrument in the socket, with or without 1:1.000 epinephrine, will allow the fragment to be seen. The light, positions of the patient and operator, retraction of tongue and cheek, and dryness must all be coordinated. Once the fragment is seen it often takes only a moment to remove it.

The object of the procedure is to place the instrument between the socket wall and the highest side of the fragment (that is, closest to the rim of the socket) and tip the fragment in the opposite direction. It can then be teased out. A clue to the inclination of the surface of the root can be obtained by observing the fracture in the tooth that has been removed. It is better to excavate slightly into the socket wall to obtain a good purchase than to risk placing apical pressure on the fragment.

Maxillary molar fragments, particularly those in the third molar area, are best visualized and approached indirectly using a mirror. The operator stands behind the patient. Buccal roots may be curved, necessitating considerable teasing. Palatal roots of molars are large and are surrounded by unyielding socket walls. Because of their proximity to the antrum, no direct pressure is placed on the root. Space is gained between the socket wall and the root at the expense of the socket wall, and several sides are attacked before a curved root can be delivered.

Maxillary first premolar roots are small and thin. The buccal root can easily be pushed through the thin buccal wall so that it lies between periosteum and alveolar plate. A finger is placed over the buccal plate to prevent this occurrence or to feel the root if it does penetrate the plate. The palatal root is removed at the expense of the intervening septum between the roots.

Mandibular roots fractured at high level require separation of the roots if the crown is fractured below the alveolar rim and the two roots are still joined. Separation can be accomplished by chisel, bur, or elevator. The first root is removed with a short Winter elevator (No 11); purchase is obtained between the two separated roots with the fulcrum on the second root. An alternative method obtains purchase in the interdental area. After the first removal the second root is removed with the same elevator by means of a high purchase in the interdental area, or, better, the long Winter elevator (No 14) is placed in the depth of the empty socket. With care that the heel of the elevator does not damage the adjacent tooth, the point of the elevator engages the septum and removes it with a turn. The elevator again is

placed in the socket, engages the root, and delivers it. The latter method is used to remove all roots in the mandibular molar area.

Mandibular roots in the anterior and premolar areas are removed with root exolevers.

Open procedures. When unyielding socket walls, curved root tips, inaccessibility, or inadequate visibility preclude removal of roots by closed procedures, a surgical flap should be made before much time is wasted. The standard flap procedure is employed for buccal roots. Labial or buccal bone can be removed with a rongeur, although a chisel or bur is equally rapid. The root tip will come into view soon after the alveolar plate is removed.

An apicoectomy-type semilunar incision is advocated by some people for small buccal or labial root tips. This procedure conserves considerable alveolar plate, but orientation is more difficult, and two areas - the wound and the socket - have to be watched for delivery of the root.

Palatal roots in the maxillary premolar and molar area are approached through the septum. The standard surgical flap is made, enough buccal bone is removed for access, and the septum is removed with cutting instruments. Since the antrum often extends low in the septal area of molars, deep cutting is hazardous. Palatal roots are not located close to palatal roots of adjacent teeth; therefore, bone can be removed mesial or distal to the root.

If a palatal root of a molar tooth suddenly disappears upward, the patient is directed to blow forcibly with the nostrils pinched together. If the root does not come down immediately, it is in the antrumm. A Caldwell-Luc procedure is indicated (see Chapter 15). Occasionally a small root tip becomes wedged between the antrum mebrane and the bone so that it will not be found lying within the antrum mebrane.

The maxillary molar occasionally is fractured horizontally through the pulp chamber high enough so that forceps purchase is impossible, and still the roots are not separated. In this situation a surgical flap is raised, bone over the buccal surface is removed, and the buccal roots are separated with a bur, chisel, or elevator. The buccal root that has split free is removed with an elevator. If the other buccal root is still attached to the palatal root, an attempt is made to remove the combined structure. If this is not possible, the two roots are separated and removed individually.

Incidentally, if an intact maxillary molar tooth cannot be removed by a closed procedure because of an excessively rhomboidal shaped crown or other reasons related to the roots and surrounding structures, it must be removed surgically. After a surgical flap is rased, the two buccal roots are cut off from the crown above the bifurcation with a bur or chisel. The crown and its palatal root are removed with a forceps, followed by individual elevation of the buccal roots.

Surgical flap procedures can be complicated by bleeding in the mandibular incisor areas. In the premolar and molar areas the procedure becomes more formidable because of the presence of the mental foramen and heavy buccal bone strengthened by the external oblique ridge.

Residual roots. Residual roots that have been present in the jaws for some time are considered to be infected. Occasionally they appear on the radiograph circumscribed by a cemental line and a periodontal line. This signifies that healing has taken place, and a

judgment must be made whether or not to remove them. Most dentists do not construct dentures over a residual root, and many physicians require that all residual roots be removed in the presence of systemic diseases. Each situation requires individual evaluation.

Of equal concern is the differentiation on the radiograph between osteosclerosis and root remnant. The oral surgery staff of a dental school made individual judgments for each such diagnostic problems during a school year, followed by surgical removal and histological diagnosis. The staff was wrong in one third of the cases. Osteosclerosis does not have to be removed if proper diagnosis can be made. If it forms in a socket or between two nutrient canals, it is difficult to differentiate from a root.

Exact localization of the root is necessary, particularly in a completely edentulous area. If there are no anatomical landmarks, a suture needle is placed in the anesthetized tissues in the region of the root, and a radiograph is made to compare the location of the root to the needle. An occlusal view is helpful to ascertain the buccolingual position. The root may not lie within the bone at all, although it is superimposed over bone on the radiograph. The occlusal view will demonstrate the true position, and surgical search can be made between the bone and the periosteum on the buccal or lingual side, whichever is indicated.

When the location of the residual root has been determined in the bone, a buccal mucoperiosteal flap is raised, usually by an incision over the crests of the ridge with a small anterior vertical incision. A window in the buccal cortex is made (1 chisel-width square), or a series of bur holes is made. After this portion of the plate is removed, exploration of the spongiosa is made with a sharp curet. If the root cannot be found or cannot be delivered through the small window, the window is enlarged in the proper directions. The wound is closed with sutures.

Elevator Principles

Two main forces are emplyed to raise an object from base level with the help of a fulcrum. Depending on the location of the fulcrum in relation to the object to be raised, a push or a pull force will dislodge the object upward. In placement of a thin, flat elevator between the second molar and the third molar (in situations wherein the third molar cannot be grasped by forceps), the fulcrum can be established at the bottom edge of the elevator where it contacts septal bone so that the top edge of the elevator does the lifting or it can be established near the top edge of the elevator so that the bottom edge of the elevator does the lifting.

Consider the second situation first. When the bottom edge of an elevator is used to contact the object to be removed (the third molar), the top edge and back of the elevator form a fulcrum at the place of contact on the second molar. The third molar is scooped out when sufficient space has been obtained by distal movement of the third molar. However, great force is placed on the second molar.

The first situation establishes the fulcrum in the proper place. When the top edge of the elevator is used to contact the third molar, the fulcrum is placed on the bottom edge of the elevator, which rests on the septum. The top edge is leaned backward to obtain purchase on the anatomical neck of the third molar. The elevator does not exert force on the second molar at all. By means of an up-and-down "can opener" motion on the handle of the spearpoint elevator, the third molar is dislodged nearly straight upward so that the anterior

ramus of the mandible does not interfere with the pathway of exit of the tooth. This is the recommended technique.

As the tooth rides upward it also rides backward to some extent so that continued contact of the elevator with the anatomical neck may be lost. If the tooth cannot be removed entirely with this technique, the fulcrum is shifted when the tooth is halfway out of the socket, and the bottom edge of the elevator scoops underneath the crown to complete the elevation. This is the proper application of the second example. By this time there will be sufficient space between the teeth so that the top edge of the elevator can make contact with the septum as it is rotated and not with the second molar.

The straight-shank elevator (No 34) is used in two ways. It is placed parallel to the long axis of roots between the socket wall and the root and worked toward the apex. When purchase is obtained, the strongest portion of the alveolar socket may be used for a fulcrum if additional leverage is necessary. The older method is to place the elevator between the root and the adjacent tooth at right angles to the long axis of the root and to rotate it slightly. This motion should severe the pericemental attachments and deliver the root. The latter method is used sometimes to loosen teeth before forceps delivery is attempted, but because of discomfort associated with periodontal membrane pressure, it is used more commonly under general anesthesia.

The long Winter elevators (Nos 14R and 14L) were designed for the removal of mandibular molar roots. They are never used elsewhere, with the possible exception of a special technique for elevating mandibular and maxillary third molar impactions. A crossbar elevator can develop tremendous pressure, and mandibles have been fractured with it.

The elevator is placed in the empty socket of the tooth being extracted, with the tip facing the root to be removed in the adjacent socket. The shank and handle are located on the buccal side. The interradicular septum is engaged near the apex of the socket, care being taken that the point does not invade the mandibular canal. The back of the instrument should ride buccal to the next tooth because contact with this tooth may damage it. A rotatory motion will cut through and deliver the septum. The elevator is placed in similar position, this time engaging the fractured root, and a rotatory motion will deliver the root.

The No 14 elevator is used to deliver a partially mobilized mandibular third molar impaction by engaging it in the area of bifurcation on the buccal side and elevating it upward, using the buccal plate as a fulcrum.

The short Winter elevators (Nos 11R and 11L) are used for many purposes. Because the root surface must be engaged in each instance, these elevators (in common with all elevators) must be reshaprened frequently. The No 11 elevator is used to elevate molar roots that have been fractured near the alveolar rim. Many situations that prevent forceps application on whole teeth are amendable to the use of this elevator. For example, a mandibular fist premolar is crowded lingually so that the buccal beak of the forceps cannot gain access between the canine and the second premolar. In the example given, the anatomical neck of the tooth is engaged on the mesial side and loosened or delivered by use of the lingual alveolar rim as a fulcrum.