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FIRST EDITION

Performing Atraumatic Surgical Extractions in General Practice

Educational Objectives

Following this unit of instruction, the practitioner should be able to:

1. Perform exodontia faster, easier, and more predictably.
2. Perform exodontia more atraumatically – with less bone removal and soft tissue manipulation.
3. Know about newer, high tech armamentaria that allow more effective oral surgery.
4. Perform oral surgery therapy in a way that causes less pain, swelling, and bleeding for patients.
5. Avoid common complications that can occur with difficult extractions.

Introduction

Tooth extraction is one of the most common procedures performed in general practice, with general dentists completing the majority of uncomplicated extractions in the United States.¹ Exodontia requires few supplies, has no lab bill, and surgery instruments last a long time. Compensation is good for the clinician – especially if he/she can complete procedures efficiently and predictably.

Patients and a clinician's peers expect oral surgery to be done within an acceptable standard of care. That standard is the same regardless of whether a dentist is a generalist or a specialist. However, over the last decade, the "standard" has been changing to require more conservative surgery. Because of the anatomical requirements of dental implants and the esthetic demands of patients, contemporary dentistry now dictates that surgical extractions be completed atraumatically

– saving as much bone as possible. This is a departure from former methods that utilized 1) large flaps and bone removal to the furcation of molars prior to sectioning, and 2) significant buccal bone removal for difficult single rooted teeth.

Surgical proficiency requires the merger of several factors, including: 1) a knowledge of surgical principles and techniques, 2) effective instrumentation, 3) good patient management skills, and 4) the ability to manage complications. This Quality Resource Guide will focus on some approaches the general dentist may use during extractions to maximize surgical efficiency while producing more atraumatic surgical outcomes.

Preparation for Surgery

Medical Management

Patients undergoing any surgical extraction need to be evaluated regarding their ability to tolerate procedures that are potentially invasive and that could possibly lead to serious complications. Many patients present to the dental office with a number of health conditions that may necessitate treatment modification or medical management, before therapy is scheduled.

A thorough medical history is the most helpful item for deciding whether a patient might have problems with a proposed surgical extraction. Some of the medical issues that are of particular interest to the dentist considering surgical extractions include: cardiovascular and respiratory conditions; renal and hepatic disease; bleeding disorders; sexually transmitted diseases; diabetes; seizure disorders; and implanted prosthetic devices. The clinician needs to know about recent illness and/or surgery, medications being taken (prescription and/or over-the-counter – including herbal), and known allergies or other reactions to medications.

Author Acknowledgements

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Dr. Koerner has no relevant financial relationships to disclose.

The following commentary highlights fundamental and commonly accepted practices on the subject matter. The information is intended as a general overview and is for educational purposes only. This information does not constitute legal advice, which can only be provided by an attorney.

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It is important to be aware of life-style issues the patient has adopted, such as smoking, alcohol intake, and recreational drug use. Smoking compromises the patient's oxygenation of tissues both locally and systemically. It adversely affects soft tissue healing within the oral cavity and has been shown to increase dry socket incidence. Chronic and excessive alcohol consumption can be responsible for hepatic insufficiency and attendant problems such as altered drug metabolism, drug interactions, and diminished blood clotting factors. Recent recreational drug use (within 24 hours prior to surgery) can be responsible for cardio-toxic intrasurgical drug interactions with the vasoconstrictors in local anesthetics.

A head and neck examination with a primary focus on the oral cavity should accompany the medical history. It is also mandatory that vital signs be obtained prior to proceeding with any oral surgery procedure. Temperature elevated to 101 degrees (38.3° C) or higher, or a pulse rate over 100 beats/min., could be an indication of systemic infection needing aggressive treatment, and most likely, referral. Infection does not generally affect blood pressure unless it is accompanied with pain or anxiety (BP goes up), or severe septic shock (BP goes down). The normal respiratory rate is 14-16 breaths/min. Above 18 could be from mild to moderate infection. Under 10 is an indication of respiratory depression. Blood pressure over 121-139/81-89 is considered "pre-hypertension" and requires medical observation. The higher the blood pressure beyond that range, the greater the risk for stroke, and the more bleeding possible during oral surgery.² Use of a pulse oximeter is strongly recommended.

Since anticipated oral surgery treatment may cause a high degree of apprehension, anxiolysis with oral or IV sedation is often advantageous. Nitrous oxide is also an option.

Diagnosis and Indications for Exodontia

In addition to the above, a dentist needs to make sure the following questions are adequately answered. Has the reason for

the extraction(s) been thoroughly evaluated? Are there high quality radiographs showing complete root structure and adjacent areas of bone? Is there a written plan in the patient's chart indicating the sequence of treatment? Is there written informed consent from the patient to proceed?

Further, is the anticipated procedure within the capability and comfort zone of the general dentist? Training in exodontia during dental school varies widely, but dentists continue to learn and expand their expertise and comfort level through continuing education courses and clinical experiences. Whether or not to proceed with a case must be evaluated on a case-by-case basis by the clinician. Types of situations that would likely be referred to a specialist would include patients with severe infections (difficulty breathing or swallowing, severe trismus, dehydration, swelling beyond the alveolar process, temperature over 101°, malaise/toxic appearance).³ The following types of cases are also generally referred if the clinician deems them outside their knowledge/experience level: impacted teeth; medically compromised patients; older patients with dense bone; certain pre-prosthetic procedures; teeth in close proximity to vital structures; patients requiring general anesthesia; and extractions that might take the general dentist an inordinate amount of time to accomplish.

Informed Consent

Serious problems related to exodontia are not common if the clinician exercises judicious patient selection. But, they can happen – usually when least expected. It is a standard of care in dentistry to inform the patient (or responsible person in the case of a minor) of reasonable adverse events that could occur and provide the opportunity for them to ask questions. This pertains to all extractions, even those appearing most benign. The best way to document informed consent is to use and discuss a form listing all potential items of concern. When the review is completed,

the patient and the clinician should sign and date the form at the bottom. Obtainment of informed consent must be accomplished prior to the patient taking any sedative medication; otherwise the process is null and void.

A panoramic radiograph and periapical x-rays may provide adequate imaging for most situations, but in other cases, more sophisticated technology is useful. One way to be more aware of potential complications is to utilize a cone beam CT scan. Devices to provide these images are becoming more prevalent and accessible to every dental practitioner.

Considerations During Treatment

Soft and Hard Tissue Management

Exodontia should generally be performed in the least invasive manner possible (minimal flaps and bone removal). However, the clinician should keep in mind that sometimes these methods are unsuccessful and ultimately, an open or "surgical" approach may be the least traumatic because of the time it saves in completing the task. In this event, an envelope or triangular flap may be required to obtain direct vision - without several millimeters of bleeding soft tissue in the way. Releasing incisions, if necessary, should be made one tooth anterior and/or posterior to the area of the surgery, and never over voids in bone or across eminences, such as prominent canine roots.⁴

Soft tissue should always be handled carefully to avoid tears or bruising. If the tissue is diseased (granulomatous, cyanotic) such as that found in the presence of periodontal disease, it should be excised. Although "atraumatic" surgical extractions, aimed at retaining ridge height, are now the standard of care, conservative excision of bone in regions that don't affect postoperative bone levels (such as around a broken root within the socket) is sometimes necessary to create a fulcrum next to a root (or root tip) so it can more easily be delivered from the alveolus.

Luxation

Bone stretches or expands somewhat easily in the young patient. However, even in the young, bone responds best to gradual and delicate forces. One of the biggest mistakes of a new dentist doing surgical extractions is trying to manipulate a tooth with forceps too forcefully or too fast. Until the periodontal ligament (PDL) is stretched and torn by luxation and traction forces, a tooth cannot be removed from the socket. Primary luxation forces with a forceps are facial-lingual, rotational, apical, and coronal (traction). The primary luxation force created by a straight elevator placed into the interdental space perpendicular to the tooth, and turned so the coronal edge of the blade engages the tooth, is in a posterior vector – although the elevator can also be turned in the opposite direction to achieve more vertical tooth displacement.⁵ A straight elevator is never placed into an interdental space to luxate a tooth when the tooth on the other side of the elevator has an artificial crown.

Erupted teeth in an adult have a PDL width in the range of 1-3 tenths of a millimeter.⁶ Older patients may have an atrophied PDL, or it may be non-existent with the tooth attached directly to bone (ankylosis). Ankylosis usually requires that roots needing removal be drilled out (removal by attrition) with a round bur.

Handpiece Selection

Choosing the right handpiece is important when preparing for surgical extractions. Options for handpieces include either a straight handpiece (air turbine or electric) or a “surgical” high-speed handpiece. Both types of handpieces (Figure 1) are designed so they do not blow air into the surgical field. When air is forced into soft tissue during surgery, it creates the possibility of air emphysema into fascial spaces. This complication is not limited to oral surgery procedures as the dental literature also includes many case reports occurring during restorative procedures – usually when the soft tissue attachment around a tooth is violated.⁷⁻¹⁰

Air emphysema is manifest by sudden swelling of soft tissue in the vicinity of the drilling. It can affect tissue overlying the mandible or maxilla - extending into the infraorbital area, the neck, and even the mediastinum. Oral organisms accompanying the air can potentially cause life-threatening infections. Should emphysema occur, a consultation with a specialist is recommended. Treatment, depending on severity, generally consists of cone-beam CT imaging, clinical evaluation, and appropriate follow-up care including antibiotic therapy and possibly hospitalization.

All drilling of teeth and bone with a handpiece should be accompanied by irrigation to prevent overheating and flush away debris. As mentioned above, the irrigation medium should not be mixed with air (air-water spray). Sterile saline is recommended - non-disinfected water coming through biofilm-laden dental unit tubing is not. Water is typically delivered through the handpiece when using a high-speed handpiece. In other situations, it may come from a bulb syringe, a 12cc Monoject syringe, or a 20-30cc syringe with a blunt 18-gauge irrigation needle attached.

Complications leading to an untoward experience during tooth extraction should be infrequent. If “exceptions” happen routinely, there is the probability that the dentist is operating outside his/her range of ability, and thus, outside the standard of care. One good subjective criterion to use as a guide during

case selection is the dentists’ “comfort zone”. If the dentist does not feel right about starting a case, it should be referred. On the other hand, clinicians should keep learning and broadening their expertise throughout their professional career so that over time, their comfort level expands.

Care Near Vital Structures

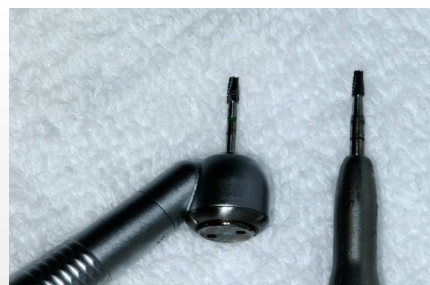
Good visibility and careful technique are especially necessary when a surgical procedure takes place in close proximity to vital structures, such as the mandibular canal (inferior alveolar nerve), mental foramen, lingual nerve, floor of the mouth (including the lingual artery), infratemporal space, the maxillary sinus, facial artery/anterior facial vein, and the greater palatine artery. Whenever a surgery procedure approximates these areas or structures, significant care must be exercised. If one tries to curette out an abscess apical to a lower premolar, the mental nerve could be injured. Excessively long buccal releasing incisions between the mandibular first and second molars could approximate the region of the facial artery and/or anterior facial vein. Manipulation of palatal tissue lingual to the maxillary second molar could endanger the greater palatine artery. Inadvertently letting a straight elevator slip into the floor of the mouth could puncture the lingual artery.

Inferior alveolar nerve injury can occur during surgery of lower posterior teeth. Injury of both the inferior alveolar nerve and lingual nerve can also happen with mandibular block injections. If there are concerns about sensory deficit after two months, an oral and maxillofacial surgeon should be consulted.

Bleeding Problems

Bleeding is expected with oral surgery, but occasionally it can become serious and even life threatening. As mentioned previously, the clinician should avoid actions that could compromise the lingual artery or facial artery/anterior facial vein. Incisions near the greater palatine arteries can lead to difficult-to-control

FIGURE 1



Examples of surgical high-speed handpiece (left) and surgical electric straight handpiece (right) - both are engaging a 702 surgical bur - Both types of handpieces are acceptable for exodontia.

spurting of blood from the palate. Drilling bone will sometimes expose a nutrient canal (blood vessel), also causing spurting. This can usually be managed by burnishing adjacent bone into the bleeding orifice, pressing a small amount of bone wax into that spot, then using local measures such as Gelfoam, hemostatic gauze, Surgicel or, rarely, even an iodoform gauze temporary tamponade (leaving it in place for several days) along with gauze under pressure. If a dentist does extractions he/she should have several hemostatic local measure items on hand.

Other bleeding issues exist with patients taking Plavix, Coumadin, and even aspirin. Discussion of the protocols for management of these patients is beyond the scope of this Guide.

Losing Teeth Into Adjacent Areas

Erupted teeth or roots may rarely be displaced into adjacent locations, such as fascial spaces, the maxillary sinus, the submandibular space, the mandibular canal, or trabecular spaces in bone. For example, it is possible for lower molar root tips more apical than the floor of the mouth to be pushed lingually through the thin lingual plate into the submandibular space.

If an entire root is displaced into the maxillary sinus, it should be retrieved. Decisions on root tips in the sinus are not as black and white – depending on factors such as size, presence of infection, etc. If a root tip enters the sinus during an extraction, it is usually advisable to call an oral and maxillofacial surgeon for a consult and/or treatment.

The wise clinician develops the habit of using a throat pack during exodontia to prevent tooth loss into the stomach or lungs. During extractions, artificial crowns or other restorations, can pop off, weak tooth structure can shatter, or the entire tooth can pop out of the socket as the ligament snaps. Since a patient is usually supine, these objects can easily be swallowed or aspirated. A throat pack is merely an unfolded 2X2 or 3X3 gauze

sponge placed in the back of the throat as a safety net. A piece of dental floss can be tied to it for additional security. An aspirated object could require the Heimlich maneuver and/or EMS assistance. The standard of care for a swallowed object is a chest x-ray (an object thought to be swallowed could actually be an asymptomatic aspirated object).

Suturing

Placing an adequate number of sutures is necessary to close the wound and facilitate hemostasis. After extractions, sutures are placed in reflected papillae (across from each other) and along incision lines. Even with the extraction of only one tooth, two sutures are usually needed (on the mesial and distal) to approximate and stabilize the papillae for better healing. When suturing a releasing incision, the suture needle is inserted through the more mobile tissue first and then the more attached tissue. Needle insertion should be at least three millimeters from the tissue margins. Preferred suture needles for exodontia are reverse-cutting $\frac{3}{8}$ or $\frac{1}{2}$ circle needles approximately 19mm long (medium size). Common suture materials are 3.0 or 4.0 chromic gut or silk, although some clinicians prefer other materials.

More Modern Instrument Options

Dentists are aided by many new innovations that are changing the way exodontia is performed. Nearly all these devices focus on allowing surgical extractions to be completed with less bone removal. Unfortunately, most surgery textbooks still teach old techniques geared toward speed of an extraction at the expense of bone. Many of the newer devices use principles that have the advantage of bone maintenance while still allowing the clinician to perform the procedures in an expeditious manner. It is incumbent on dentists to keep up with these changes in order to provide the best care for their patients. Some of the most common devices are discussed below.

Luxators

The luxator (Figure 2) is an indispensable instrument for modern surgery and has become part of the “standard of care” for surgical extractions.¹² “Luxator” is actually the brand name of the first instruments of this type brought on the market over a decade ago by J.S. Dental Company. The term “luxator” is now used generically.

At first glance, a luxator looks like an elevator, but it is much different. Unlike an elevator, a luxator is razor-thin at the tip, and is designed to be placed parallel to the long axis of a root. It is pushed and wiggled into the ligament space for 3-4 mm, then turned to displace and avulse the root. Since it is oriented parallel to the root, there is the potential for slipping and puncturing the cheek or floor of the mouth. For this reason, it should 1) be held in a palm grasp with the index finger near the tip of the instrument and touching an adjacent tooth or the ridge to serve as a finger rest (or stop),

FIGURE 2



Zoll luxators – 3 mm and 5 mm - The luxators shown have a gold-colored titanium nitride coating that reduces friction and enhances their effectiveness.

FIGURE 3



Result of incorrect use of a luxator – fracture at the tip. Instrument was placed horizontally instead of vertically to the long axis of the tooth.

and 2) be used with limited and “controlled” force, relying on the instrument’s design to let it function effectively. It is usually only used interproximally where bone is thicker, stronger, and supported by an adjacent tooth. In the author’s experience, it is about 90%

effective and can often be used in lieu of flaps and buccal bone removal. However, if used incorrectly (entering the interproximal space from the buccal, perpendicular to the teeth, as one would use an elevator) the instrument’s thin tip may fracture (Figure 3).

NOTE: Some brands may claim to be luxators but, upon close examination, do not have the ideal thin dimension at the tip.

Proximators / Periotomes

Proximators, including spear-point instruments, serve much the same purpose as luxators and are also applied interproximally (Figures 4a and 4b). Their handles are not as large or comfortable to hold as luxators, and they are designed to be malleted, if desired, by the clinician. Oral and maxillofacial surgeons sometimes also mallet a chisel or even a scalpel along side a root to cut the PDL and facilitate removal.

Periotomes are of two types. One variety is double ended with thin flat blades angled from the shank (Figure 5). These blades are thinner, flatter, and weaker than those of luxators. Periotomes can serve a similar function as luxators (severing the periodontal ligament fibers), but the process is slower and less effective. On the other hand, they cut gingival attachments from the root very well, preventing the soft tissue bruising that would normally occur when using a periosteal elevator (which is thicker and more blunt) to reflect marginal soft tissue.

The second type of periotome is one with a straight handle that can be malleted (Figure 6).

FIGURE 4a

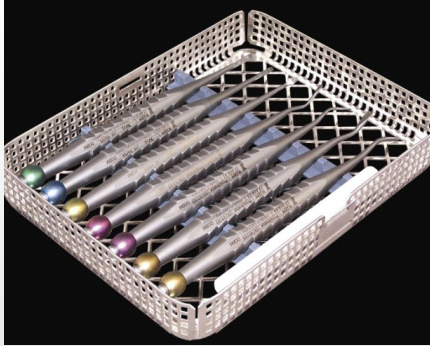
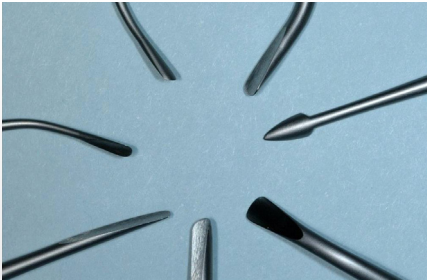


FIGURE 4b



Figures 4a and 4b: Proximators from Karl Schumacher Dental Instrument Company.

FIGURE 7



Apical retention forceps to maximize a more apical grip on a tooth.

FIGURE 8



Demonstration of how to hold a Physics Forcep.

FIGURE 5



Conventional Periotomes from Hu-Friedy.

FIGURE 6



Straight-handled periotomes suitable for malleting from Hartzell.

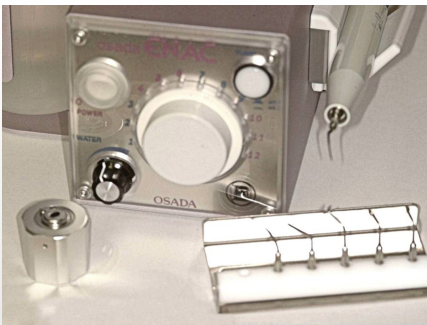
New Types of Forceps

Compared to the traditional 150 or 151 forceps, the apical retention forceps (Figure 7), have beaks that are wider at the tip but are also straighter and thinner, with less bulk. They allow a more secure hold on the tooth that can be re-applied more apically as the tooth emerges from the socket – thus helping prevent root fracture.

A recently introduced innovative forcep (Figure 8) is a paradigm shift from the traditionally shaped extraction forceps. They are called the Physics Forceps.¹³ With a beak positioned on the lingual of a tooth at the bone level and the plastic-covered “bumper” placed buccally on mucosa near the apex of a tooth, the force is rotated slowly and firmly to the buccal – being

careful not to squeeze the handles. After a few (1-4) minutes of pressure, the tooth's periodontium bends a fraction of a millimeter. This gradual bending is also known as "creep". Creep is a phenomenon whereby a material continues to change shape over time under a constant load. Creep allows enough coronal movement (approximately half a millimeter), or "lift", to stretch the PDL to the breaking point - at which time the ligament "snaps", releasing the root. This minor bending of buccal bone is generally insufficient to fracture the buccal plate.

FIGURE 9a



The Osada ENAC piezoelectric surgery device.

FIGURE 9b



One of the piezoelectric cutting tips for exodontia.

FIGURE 10



An example of a "tooth extraction system", the Easy X-Trac.

These new forceps allow an extraction to be completed faster than normal. Once the technique is learned, the extraction can certainly be "atraumatic". They are especially useful for multiple extractions. Dentists serving on volunteer "mission" trips speak highly of them. Disadvantages include: 1) a steep learning curve (videos help this process); 2) a need to be very careful in the mental foramen area; 3) they can be sometimes difficult to apply on second and third molars (a different set of Physics Forceps can be purchased for this purpose); 4) deep buccal undercuts require special attention; 5) lower molars should be sectioned before forceps application; 6) there must be solid lingual root structure on which to place the lingual "beak", and; 7) they are more than twice as expensive as regular forceps.

Piezoelectric Devices and Lasers

Two types of instruments now being used for surgical extractions are piezoelectric devices and hard tissue lasers. Each instrument functions much in the same way as periostomes or luxators in that they cut narrowly (about 0.7 mm wide) along the PDL towards the apex. Unlike periostomes and luxators, they rely on piezoelectric and laser energy, rather than the force of the operator's hand, to strip the PDL around the tooth. The tooth or root can then be lifted easily out of the socket. An example of a piezoelectric device and its cutting tip are shown in Figure 9a and 9b. At this writing, the author is aware of five different brands of piezos that can be used for extractions, ranging from \$2,600 to \$19,000. Some of them have several different applications in the dental office, including periodontal scaling, removing broken endo files, doing endodontic surgery, removing implants (instead of a trephine bur), and various osteotomy procedures. Another device in this category is the Powertome that utilizes pneumatic energy and sounds like a "jack hammer". Blades of the peizo devices and the pneumatic device are similar.

Extraction "Systems"

A relatively new category of devices is meant to disengage roots from sockets by screwing a drill tightly into the root canal of a broken tooth and utilizing leverage to pull on the drill. An example of this type of device is shown in Figure 10. First, a periostome severs the gingival attachments. Then the drill, which is engaged into the root canal, is connected to a leverage apparatus that pulls on the root with sufficient traction to stretch and sever the PDL. It is truly "atraumatic" in that adjacent bone is not compromised in any way. Even in those infrequent situations where the root cracks during insertion of the drill, the tooth typically splits lengthwise and a luxator can usually take the pieces out of the socket. Examples of devices are the Easy X-Trac System, Benex/Messinger System, and Sapien Root Remover System. Another new device (Logan Dental's Endo Handle) incorporates a handle for screwing a Hedstrom endodontic file into a root tip. The clinician then applies traction with the handle/file for removal. An assortment of custom-shaped files, matching the diameter of the canal in the root being removed, is provided.

Advantages of all these extraction systems include: 1) no bone is removed around the root; 2) the device does not violate the soft tissue around the tooth; 3) they are gentle and atraumatic from the patient's perspective, and; 4) they are ideal for creating sites for immediate implant placement. The disadvantages of the devices are: 1) they are not as good for molars as they are for single-rooted teeth (the clinician usually needs to section a posterior tooth before using these instruments and they are somewhat awkward when applied in the posterior of the mouth); 2) they are costly, and; 3) they are not as effective if deep decay is present.

Conclusion

In a depressed economy, the general dentist is going to retain more procedures in the office and refer less. Also, because of the economy, patients will be more often opt for extractions instead of higher-priced treatment plans.

The bottom line is that the generalist now has more opportunities to remove teeth. Between 10-20% of extractions become “surgical” even though initially they may not have appeared to be that difficult. Therefore, it becomes incumbent on all general dentists to have a high degree of proficiency with

exodontia. This Guide has reviewed many surgical principles, and presented some new devices and techniques that will help the general dentist perform exodontia more quickly, more competently, more predictably, and less traumatically, as required in today’s clinical environment.

TABLE 1A

Which Teeth are Predisposed to Which Complications: MAXILLARY ARCH

TOOTH	POTENTIAL PROBLEM	SOLUTIONS
Incisors	- Fracture of labial plate.	<ul style="list-style-type: none"> • Adequate luxation. • Primarily rotation with forceps. • Luxator or other bone-conserving methods, such as piezoelectric device, extraction "system", Powertome, hard tissue laser, or malleting a straight periosteum. • Cut root in half lengthwise with a thin bur (like 700 XXL) followed by luxator, straight elevator, or root tip pick.
Canine	- Fracture of the canine eminence.	<ul style="list-style-type: none"> • During multiple extractions, remove this tooth first because adjacent teeth provide strength to the area. • Rotation not as successful as with incisors. • See incisor suggestions above.
1st Premolar	- Fracture of one of the bifurcated roots. - Possible sinus involvement	<ul style="list-style-type: none"> • Section between the roots. • Luxator or other bone-conserving methods, such as piezoelectric device, extraction "system", Powertome, hard tissue laser, or malleting a straight periosteum. • Extract with slight buccal inclination so that if a root breaks, it will be the buccal and not the lingual root. • May consider buccal semilunar incision and buccal fenestration in bone to access the buccal root.
2nd Premolar	- Potential sinus involvement. - Potential bifid root.	<ul style="list-style-type: none"> • See 1st premolar above.
1st Molar	- Facial bone loss. - Sinus may be pneumatized between the roots, easy to have sinus perforation or to have a root enter the sinus	<ul style="list-style-type: none"> • If doesn't readily come out, section the roots. • Use curved luxators (better for posterior). • Avoid the sinus. • Don't take section cuts too deep. • If have a sinus perforation, follow protocol according to the size of the perforation.¹¹
2nd Molar	- Facial bone loss. - Sinus issues (see 1 st Molar above). - This tooth usually easier to remove than a 1 st Molar. - Tuberosity fracture.	<ul style="list-style-type: none"> • See 1st molar above. • Avoid excessive force to prevent a tuberosity fracture.
3rd Molar (erupted)	- Fracture of the tooth at the gumline. - Tuberosity fracture.	<ul style="list-style-type: none"> • Avoid excessive force. • Sectioning is difficult because of deep furcations and difficult access for instruments • May need to make a triangular flap and incrementally remove some buccal bone

TABLE 1B

Which Teeth are Predisposed to Which Complications: MANDIBULAR ARCH

TOOTH	POTENTIAL PROBLEM	SOLUTIONS
Incisors	- Fracture of facial bone.	<ul style="list-style-type: none"> • Adequate luxation. • Luxator or other bone-conserving methods, such as piezoelectric device, extraction "system", Powertome, hard tissue laser, or malleting a straight periosteum.
Canine	- Similar to maxillary canine, but not generally as bad.	<ul style="list-style-type: none"> • See suggestions on maxillary canine.
Premolars	- Proximity to mental foramen.	<ul style="list-style-type: none"> • Avoid releasing incisions close to the foramen or curetting an abscess at the apex. See "Incisors" solutions above.
1st Molar	<ul style="list-style-type: none"> - Roots usually long, wide, flared, and can also be curved. - Facial bone easily fractured. - Close proximity to facial artery and anterior facial vein. 	<ul style="list-style-type: none"> • Avoid long releasing incisions into the mucobuccal fold as they could cut the facial artery or anterior facial vein. • Use a cowhorn forcep, even if it does not remove the tooth, it facilitates luxation. • If necessary, section between the roots. • Don't remove buccal bone, instead, consider bone-conserving methods, such as a luxator, piezoelectric device, hard tissue laser, pneumatic periosteum, malleting a straight periosteum, or a small Cryer elevator in the socket (with or without some bone removal next to the root). • Also consider interradicular bone removal between the roots, then implode the roots into the middle.
2nd Molar	<ul style="list-style-type: none"> - Similar to 1st molar above yet tooth is easier to remove than the 1st molar. - Sectioning not required as often. 	<ul style="list-style-type: none"> • See 1st molar suggestions above.
3rd Molar (erupted)	<ul style="list-style-type: none"> - Can be extremely difficult, especially in an older person. - May have high bone level on the distal. - Like a 1st molar, roots can be long, wide, flared, and could also be curved. - Approximates anatomic spaces that can become infected and be difficult to treat. Could be life-threatening. - Close to lingual and inferior alveolar nerves. 	<ul style="list-style-type: none"> • Luxation including use of cowhorn forcep. • If no success, section between the roots. • Because it usually has a buccal shelf, a buccal trough (3-4mm deep and as wide as the bur) may be considered. • Consider some of the methods under mandibular 1st molar given above, such as: piezoelectric device, small Cryer elevator, and interradicular bone removal. • Distal troughing and small Cryer elevator if there is a broken distal root.

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POST TEST:

Internet Users: This page is intended to assist you in fast and accurate testing when completing the "Online Exam." We suggest reviewing the questions and then circling your answers on this page prior to completing the online exam. (1.0 CE Credit Contact Hour) Please circle the correct answer. 70% equals passing grade.

1. If more access is needed for a single extraction and the operator feels like a releasing incision is necessary, a surgical principle states that this incision should be made:
 - a. at the mesial line angle of the tooth being removed.
 - b. at the distal line angle of the tooth being removed.
 - c. one tooth away from the tooth being removed.

2. Handpieces acceptable for use with exodontia include:
 - a. a straight handpiece or a conventional highspeed handpiece.
 - b. a conventional highspeed handpiece or a "surgical" highspeed handpiece.
 - c. a straight handpiece or a "surgical" highspeed handpiece.

3. If you are only doing a simple or routine extraction, you don't necessarily need to have the patient go through the consent process which includes signing a form.
 - a. True
 - b. False

4. Long releasing incisions on the buccal of the mandibular arch taken beyond the mucobuccal fold could inadvertently cut into the:
 - a. maxillary artery.
 - b. inferior alveolar artery.
 - c. long buccal artery.
 - d. facial artery.

5. When removing mandibular molars, root tips could be pushed lingually beneath the mylohyoid muscle attachment into the:
 - a. ptrygomandibular space.
 - b. submandibular space.
 - c. facial space.

6. Throat packs should not be used because patients gag on them.
 - a. True
 - b. False

7. The percentage of routine extractions that can become "surgical" extractions is approximately:
 - a. 25-35%
 - b. 10-20%
 - c. 35-45%

8. If part of a tooth goes down the patient's throat, a chest x-ray is not necessary unless the patient experiences gagging or coughing.
 - a. True
 - b. False

9. Physics Forceps work by pushing the tooth coronally enough to snap the ligament.
 - a. True
 - b. False

10. Luxators typically can be pushed and wiggled approximately how far apically from the crestal bone level into the periodontal ligament?
 - a. 1-2 mm
 - b. 2-3 mm
 - c. 3-4 mm
 - d. 4-5 mm

REGISTRATION/CERTIFICATION INFORMATION (Necessary for proper certification)

Name (Last, First, Middle Initial): _____

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City: _____ State: _____ Zip: _____

Telephone: _____ Fax: _____

Date of Birth: _____ Email: _____

State(s) of Licensure: _____ License Number(s): _____

Preferred Dentist Program ID Number: _____ Check Box If Not A PDP Member

AGD Mastership: Yes No

AGD Fellowship: Yes No Date: _____

Please Check One: General Practitioner Specialist Dental Hygienist Other

FOR
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Participant Evaluation: Performing Atraumatic Surgical Extractions in General Practice

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