Practical Periodontics
A Review of Core Periodontal Treatment Principles
Authored by Gary Greenstein, DDS, MS

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Practical Periodontics
A Review of Core Periodontal Treatment Principles

LEARNING OBJECTIVES:
After reading this article, the individual will learn:
• core principles that result in a successful clinical practice, and
• how to manage problems that arise when treating periodontal patients.

ABOUT THE AUTHOR
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INTRODUCTION
In a general practice or a practice limited to periodontics, numerous clinical and professional issues arise related to the diagnosis and treatment of periodontal diseases in our patients. This article provides an overview of useful information assimilated over a period of time that can enhance the management of patients.

CORRECT CLINICAL TERMINOLOGY
Listed below are clarifications of several terms that are often misused.
• Pathosis means disease. It is not accurate to say there is pathology when referring to a diseased site. Pathology is the study and diagnosis of disease.
• Granulomatous tissue is inflamed tissue that is debrided or removed. It is not proper to refer to it as granulation tissue, which is healing tissue.
• Mucogingival flaps are often apically positioned during periodontal surgery, so it is redundant to call it an apically repositioned flap.
• Infrabony defect is a generic term for a vertical defect. The word intrabony specifically denotes a 3-wall defect.
• Biologic width refers to the junctional epithelium and connective tissue attachment coronal to the bone; it does not include the depth of the gingival sulcus.
• Probing depth. It is unnecessary to say pocket probing depth.
• Keratinized gingiva. Gingiva is keratinized; it is not necessary to say keratinized.

COMMENTS ABOUT DIAGNOSIS
Probing Evaluations
When explaining to patients how to interpret the meaning of probing measurements, consider using the following explanation:
• One to 3 mm probing depths reflect normal sulci. Elimination of inflammation (redness or bleeding upon probing) is a cardinal objective of therapy, and this concept pertains to any probing depth.
• 4-mm depths—Considered to be in the “gray area” (possibly an early lesion).
• 5-mm depths—Usually indicates previous history of the disease process; this depth is not overly troubling if the gingival tissues are pink, firm and there is no bleeding upon probing. Remember that the junctional epithelium is approximately one mm in length, and it is almost penetrated during routine probing (approximately 0.8 mm). Therefore, a 5-mm probing depth histologically reflects approximately a 4-mm pocket.
• > 6 mm inflamed pockets—Identifies sites that may need surgical pocket reduction if inflammation and...
increased probing depth cannot be resolved nonsurgically (e.g., scaling and root planing).

- On average, in a healthy situation, the mid-interproximal location is approximately one mm deeper than the probing depth at the line angle of the tooth.\(^3\)

**Bleeding Upon Probing**

Bleeding upon probing represents an inflammatory lesion in the connective tissue. In general, a gentle probing force of 25 grams or 0.25 Newtons (one Newton is approximately 100 gram forces) should be used to evaluate bleeding. This force is approximately the pressure needed for a periodontal probe to blanch a fingernail (Figure 1).

**Radiographic Assessment**

There are linear distortions on radiographs that need to be considered when making clinical decisions, especially during implant placement (Table 1).\(^4\) Furthermore, periapical radiographs underestimate bone loss by 9% to 20%.\(^5\)

**Furcation Locations**

When evaluating furcation involvements, it is important to recognize that furcations on buccal, lingual, and proximal surfaces of molars on different teeth are located at different distances from the cemento-enamel junction (Table 2).\(^6\) It is easier to assess maxillary furcations from the palatal aspect where the interproximal areas are wider.

**Injection Techniques**

In order to reduce and eliminate discomfort during injections the following approaches can be considered: nitrous oxide, topical anesthetic, distract the patient by shaking their cheek before and during an injection, using a 30 gauge needle, and most importantly, inject the anesthetic solution slowly. When administering a na-sopalatine injection, inject first on the buccal surface and then penetrate through the papilla to anesthetize the palatal tissue. In general, inject supraperiosteally and withdraw the needle one mm after touching the bone. If the injection is administered under the periosteum, it raises the periosteum and it will cause pain later. Also, in the mandibular molar areas there sometimes is additional innervation from C2 and C3 (cutaneous coli nerve of the cervical plexus).\(^7\) Therefore, if symptoms indicate an effective mandibular block injection, but the patient is still sensitive, anesthetic should be infiltrated on the lingual aspect of the molar teeth.

**Table 1. Linear Distortion on Radiographs and Radiation Dose.**\(^6\)

<table>
<thead>
<tr>
<th>Type of film</th>
<th>Average mm Error (range)</th>
<th>%, Radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periapical</td>
<td>1.9 mm (0 to 5 mm)</td>
<td>14%, 250 mr (millirads)</td>
</tr>
<tr>
<td>Panoramic</td>
<td>3 mm (0.5 to 7.5 mm)</td>
<td>23%, 1250 mr</td>
</tr>
<tr>
<td>CT scan</td>
<td>0.2 mm (0 to 0.5 mm)</td>
<td>1.8%. 3.5 r (rads)</td>
</tr>
</tbody>
</table>

**Table 2. Furcation Location Relative to the Cemento-Enamel Junction.**

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Furca Location</th>
<th>Distance to CEJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxillary First Molar</td>
<td>buccal</td>
<td>4 mm</td>
</tr>
<tr>
<td></td>
<td>mesial</td>
<td>4 to 5 mm</td>
</tr>
<tr>
<td></td>
<td>distal</td>
<td>5 to 6 mm</td>
</tr>
<tr>
<td>Maxillary Second Molar</td>
<td>buccal</td>
<td>6 mm</td>
</tr>
<tr>
<td></td>
<td>m &amp; d</td>
<td>&gt; 6 mm</td>
</tr>
<tr>
<td>Mandibular First and Second Molar</td>
<td>buccal</td>
<td>3 mm</td>
</tr>
<tr>
<td></td>
<td>lingual</td>
<td>4 mm</td>
</tr>
</tbody>
</table>
THERAPEUTIC SUGGESTIONS AND COMMENTS RELATED TO PERIODONTAL PROCEDURES

Preprocedural Rinsing to Reduce Bacteria in Aerosols and the Saliva

Bacteria in aerosols caused by use of a handpiece or an ultrasonic tip can be reduced > 90% by rinsing with the following agents: chlorhexidine (0.12%), rinse for 30 seconds; Listerine (McNeil-PPC/Johnson & Johnson), rinse for 30 seconds.

ENHANCED PATIENT MANAGEMENT

• Ultrasonic scalers are as efficient as manual scaling and root planing and cause less root sensitivity. Thin tips should be used in furcations because the curette (one mm in width) is often too wide to penetrate into the roof of the furcation.

• Employ a No. 12 blade (curved scalpel blade) in the mandible; the curved blade is easier to use than a No. 15 blade. Utilize a No. 12 blade on the distal of maxillary second molars; it is easy to make an incision adjacent to the distal aspect of the last molar (Figure 2).

• Use an Oschenbein chisel to remove tissue distal to the maxillary or mandibular second molar when performing a distal wedge procedure.

• Sharpen periosteal elevators.

• Have the assistant hold the elevated flap with a periosteal elevator.

• The assistant should suction on bone, not tissue. This avoids trauma to the tissues and reduces postoperative edema.

• Have steroid paste available in the office for the unusual occurrence of exposing the pulp when a lesion such as external root resorption is debrided. This will preclude development of an acute pulpitis.

• In general, after mucoperiosteal flap procedures, use resorbable sutures based on their tensile strength: gut (5 to 7 days) or chromic gut (7 to 10 days). Employ Vicryl sutures when it is desired to retain sutures for 21 days (guided bone regeneration procedures).

• For patients on anticoagulant therapy who stopped using Cou-madin prior to periodontal surgery, consider placing extra silk sutures to ensure that sutures remain in place until they are to be removed.

• For patients predisposed to gagging, place salt on the tongue to reduce the gag reflex.

• Keep gauze moistened with defogging solution on the bracket table to clean the intraoral mirror.

• Use short needles in general, except for extraction of maxillary third molars. For the latter situation, use a long needle to ensure anesthetizing the posterior superior alveolar nerve.

• Purchase a portable Bovie, battery operated cautery device to facilitate attaining rapid hemostasis (Figure 3).

• During guided tissue regeneration procedures, barriers (eg, collagen) are used to inhibit in-growth of epithelial and connective tissue. However, for small osseous defects, another cost effective barrier can be placed. Purchase medical grade calcium sulfate (Plaster of Paris, one pound from a pharmacy). Place a tablespoon of Plaster of Paris in a sterilization bag...
and autoclave it (Figure 4). Have these sterilized bags available, and when needed, mix the Plaster of Paris with saline and apply it as a barrier over bone grafts.\textsuperscript{11}

- Emdogain (Straumann USA) is useful in defects with one or 2 bony walls where bone grafts are not effective. However, it is unnecessary to use a complete cartridge per defect. Instead, express some Emdogain onto an instrument (eg, periosteal elevator). The needle of the cartridge should not be inserted into the patient’s mouth or touch any instruments, to avoid contamination of the needle. In this manner, one cartridge can be used to dispense Emdogain for multiple sites.

- Purchase fiber optic lighting that connects to the high-speed evacuation tip (Figure 5).

- To resist rusting, use an anti-corrosion solution (“milk bath”) for surgical instruments.

- A No. 15 surgical blade is 10 mm long; this distance can be used to guide the depth of the incision when performing a subepithelial connective tissue graft.

- The bevel on a No. 15 blade is 1.0 mm wide; this can be used as a guide when harvesting a free gingival graft.

- If teeth manifest hypermobility, only perform an occlusal adjustment on teeth with fremitus. It will not help to adjust loose teeth if there is no occlusal contact with the opposing dentition.

**Local Drug Delivery**

Before local drug delivery, there are several questions that should be considered. What is the magnitude of improvement beyond root planing provided by local drug delivery? How deep is the lesion to be treated? What is the desired clinical outcome? On average, root planing provides a mean pocket depth reduction of approximately one mm for probing depths of 4 to 6 mm, and a reduction of 2 mm for probing depths > 7 mm.\textsuperscript{12} Root planing plus local drug delivery on average attains a mean better result than root planing alone by about 0.3 mm.\textsuperscript{13} The percentage of sites that attain a 2 mm probing depth reduction is greater with combined therapy. However, to truly determine the clinical significance of this improvement, it is worthwhile to calculate the number of sites that need to be treated (referred to as the number needed to treat [NNT]) with adjunctive local drug delivery to attain one additional site with a 2 mm probing depth reduction greater than the reduction achieved with root planing alone.\textsuperscript{14} For example, if the percentage of sites attaining a 2 mm change with combined therapy was 30\% versus 20\% with root planing alone, first calculate the difference, which is 10\%. Then divide that into 100. The NNT indicates that you would need to treat 10 more sites with local drug delivery to attain one additional site with a 2 mm reduction greater than root planing alone.

**Blood Loss During Flap Procedures**

The normal blood volume in humans is approximately 5,000 ml, or 5 liters. When people donate blood, they give one pint, or 473 ml. The amount of blood loss during a flap procedure will vary based on numerous factors such as time, content of the surgery, vasoconstrictor use, and preoperative inflammation. It has been determined that routine flap surgery results in blood loss of approximately 125 ml (maxilla 110 ml, mandible 151 ml).\textsuperscript{15} The range of blood loss per sextant in one study ranged from 16 to 592 ml. Importantly, if the patient’s blood pressure decreases more than 20 mg, or blood loss is > 500 ml, or there is an increased heart rate of 20\%, IV solution should be provided. The patient may need a transfusion if 25\% blood loss occurs.\textsuperscript{16}
Subepithelial Connective Tissue Grafts

Augmentation of the gingiva using a subepithelial connective tissue graft is often recommended for various reasons (eg, aesthetic defect as a result of recession). The donor site is the palate. It is important to evaluate the height of the palatal vault to determine the size of the graft that can be obtained without encroaching on the palatal artery. The greater palatine foramen is located between the second and third molar and medial to the third molar, usually halfway between the alveolar crest and the median raphe of the palate. It is prudent to leave 2 mm distance between the artery and the depth of the surgical incision when harvesting a connective tissue graft from the palate. The distance between the CEJ and the neurovascular bundle depends on the height of the palatal vault: low vault (flat)—7 mm; average palate—12 mm; high vault (u-shaped)—17 mm.

Flap Management Under a Pontic

The gingival tissue under a pontic can be elevated to the buccal or lingual when treating periodontal defects on adjacent teeth. Figures 6a to 6d demonstrate elevation of the tissue towards the buccal. The palatal tissue adjacent to the pontic is incised several millimeters lingual to the pontic and elevated towards the buccal. Placement of the incision several millimeters away from the tooth facilitates primary closure when suturing. In addition, making an incision on the lingual side usually avoids creating aesthetic deformities on the buccal side.

Retaining Interdental Papilla in the Aesthetic Zone

In order to minimize recession in the aesthetic zone when performing periodontal surgery, retain the entire buccal papilla as part of the flap. On the palatal side, an inverse bevel or a sulcular incision is used, and interproximally the incision is extended from line angle to line angle of adjacent teeth, thereby preserving the entire interproximal tissue. When the flap is elevated, the entire papilla is reflected to the buccal, and it is ultimately replaced. This technique precludes attaining optimal probing depth reduction on the buccal; nevertheless, if there is a high smile line, it is a reasonable compromise.

Flap Advancement Procedures

Periosteal fenestration is a technique that can be used to coronally advance a flap (Figures 7a to 7c). To advance tissues coronally use the scalpel blade perpendicular to the base of the flap tissue and cut one mm into the periosteum. The bevel on a No. 15 blade is one mm wide; this can be used as a guide as to how far to insert the scalpel blade into the tissue (the periosteum is < 0.5 mm thick). When the flap...
is held under tension, upon cutting the periosteum the release of the tissue will be felt. To achieve additional tissue advancement, place a closed blunted scissor (e.g., Metzenbaum scissor) or a hemostat into the incision line. The instrument is held upright and is opened approximately 5 mm, thereby stretching apart the periosteum. Incising the periosteum can be repeated 3 to 5 mm away from the initial horizontal incision line to achieve greater flap advancement.

**Guided Bone Regeneration (GBR)**

When performing guided bone re-generation procedures (employing a bone graft and a barrier) to augment a ridge, the following sequence of events will facilitate therapy. Elevate the flap, fenestrate the periosteum from the underside to facilitate flap advancement, decorticate the bone adjacent to the site to be grafted, create a template for the barrier based on the osseous anatomy, transfer the design to the actual barrier, and then tack the barrier into place. When everything is prepared, place the bone graft and attain primary soft tissue closure. Figures 8a to 8f demonstrate expanding the ridge horizontally with a GBR procedure to facilitate implant placement.

**Bone Fracture During an Extraction**

When extracting a maxillary third molar with an elevator or forceps, sometimes the buccal plate of bone or a piece of the tuberosity will fracture off with the tooth. The tooth will appear to be loose, but it is not easily retrievable, because it is within the soft tissue. Do not try to remove the tooth with forceps, because the bone will cause a soft tissue tear. Instead, raise a flap to provide access for removal of the tooth and attached bone. When the tissue is elevated, tease the tooth loose by cutting remnants of the soft tissue attachment to the tooth. This same approach can be used at other locations in the mouth.

**Bone Perforation After an Extraction or Periodontal Surgery**

In the mandibular posterior region, sometimes days to weeks after periodontal surgery or an extraction the thin lingual shelf of bone perforates the lingual mucosa. It may come through as a sharp point and irritate the tongue.
When this occurs, use a round bur without anesthesia to smooth the bone. Feel the osseous crest to make sure it is smooth. Repeat this procedure as needed over the next several weeks. Another option is to reflect a flap to gain access to the bone, but this is not usually necessary.

**Use of Systemic Antibiotics**

The biological rationale for using antibiotics in the treatment of periodontal diseases is that bacteria are the main etiologic factor. However, drug therapy usually is not needed in the routine management of chronic periodontitis (formerly called adult periodontalisis). For patients who manifest any of the following conditions, antibiotics may be indicated: ongoing periodontal disease progression despite meticulous mechanical instrumentation, refractory chronic or aggressive periodontitis related to persistent subgingival pathogens or perhaps impaired host resistance, and acute infections. Anti-biotics may also be appropriate for certain medically compromised patients.

There are a variety of antibiotics that can enhance periodontal therapy. Four frequently used antibiotics are metronidazole (500 mg, tid), clindamycin (300 mg, quid), doxycycline (100 mg/td), and augmentin (500 mg, tid). In nonresponding patients, especially in individuals with a history of antibiotic therapy, it may be worthwhile to perform a microbiologic test to determine which pathogens are present and the antibiotics to which they are sensitive. Furthermore, drug sensitivity testing prior to administration of systemic antibiotics ensures optimal therapeutic results. However, an antibiotic is usually selected empirically, and microbiologic testing is employed only if the patient does not respond to therapy or if there is a history of treatment failure. In addition, there are situations where initiating therapy with antibiotics may be useful: if a patient complains of extreme pain upon probing or presents with erythematous tissues that profusely bleed when brushed, or if there are signs of necrotizing gingivitis (acute necrotizing gingivitis, ANUG). After one week of antibiotic therapy these patients will experience relief of pain and can undergo routine care.

**WOUND HEALING**

**Rate of Tissue Healing**

Knowing the time required for tissues to heal is useful information. The following reflects average healing rates: epithelium—12-hour lag, then 0.5 mm to one mm daily; connective tissue—0.5 mm daily; bone—50 µm daily (1.5 mm per
Sinus lift—one to 2 mm bone per month, Schneiderian membrane (epithelium)—0.5 mm to one mm daily.19-21

**Clot Formation**

Sometimes after periodontal surgery there is formation of what is called a liver clot. It represents incomplete fibrin clotting and manifests as a slowly developing, red-brown clot. It is usually due to venous hemorrhage. The patient may have difficulty controlling the bleeding with pressure alone. If the patient calls from home, have them wipe away the clot with a piece of gauze and apply pressure for 10 minutes. In the office, inject bleeding sites with 1/50,000 epinephrine, curette the oozing fibrin clot away, and suture the area.

**Ecchymosis**

Subsequent to surgery, sometimes an ecchymotic area (black and blue spot) will be noted. It reflects hemorrhage that occurred under the flap. It may follow the facial planes and extend quite a distance. It also often extends below the surgical site due to gravity (Figure 9). Color changes associated with an ecchymosis follow a predictable pattern as the hemoglobin is resorbed. Initially, it appears reddish, which reflects blood. Within a few hours, it appears black/blue or dark purple. By day 6, the color changes to green (biliverdin). At days 8 to 9, it is yellowish-brown (bilirubin). In 2 to 3 weeks, the wound is healed and the discoloration is resolved.22 Ecchymosis requires no therapy, besides reassurance for the patient.

**MANAGEMENT OF A VARIETY OF PROBLEMS THAT PRESENT IN THE OFFICE**

**Gagging**

There are 5 cranial nerves that innervate the tongue and contribute to the sensitivity and motor function of the tongue.23 To reduce gagging try the following procedures: avoid touching the dorsum of posterior one third of the tongue, use topical anesthetic, local anesthetic, administer nitrous oxide, and as mentioned previously, place salt on the dorsum of the tongue (applied with a cotton tip applicator). For the uncontrollable gagging patient, prescribe prochlorperazine (eg, Compazine). It is normally used to treat nausea/vomiting, psychotic disorders, and anxiety. It should be avoided in patients with glaucoma, an enlarged prostate, Parkinson’s disease, and liver disease. It is given orally (5 or 10 mg, bid) and should be taken with 8 oz of water, with or without food.

**Vomiting**

If the patient starts to vomit when they are at home after taking a medication (eg, codeine), it may not be possible to administer an oral drug to control the vomiting, because the drug may be expelled. In this situation, prescribe Tigan Suppository, 200 mg t.i.d.

**Root Hypersensitivity**

There are numerous preparations that are sold over the counter and by prescription for patients with dental hypersensitivity. An agent that is very useful is Super Seal (Phoenix Dental).24 Apply it for 30 seconds and then air dry. Super Seal is oxalic acid po-tassium salt with a 3-way action: (a) it forms oxalate crystals on the dentine surface, (b) it blocks the dentinal tubules, and (c) potassium ions penetrate to the pulp to desensitize the dental nerve.

**Halitosis**

The main cause of halitosis is bacteria on the tongue. A tongue cleaner is recommended (eg, Oolitt [Oxyfresh]). Another aid in eliminating halitosis is Peridex (OMNI, a 3M ESPE company). Place several drops on a toothbrush prior to brushing the tongue. Additionally, the patient can eliminate halitosis by using a chlorine dioxide mouthwash (ie, Retardex [Periproducts]).25 Patients should be told to keep a diary with regard to the frequency of their halitosis (confirmed by someone else), because 30% of the time clinicians are dealing with the patient’s perception of phantom halitosis and they need to be reassured that they no longer have halitosis.
CONCLUSION

The objective of this article is to share clinical ideas gathered over time. Remember these axioms: always adhere to sound biologic principles, keep the therapeutic plan as simple as possible, be prepared to improvise, share your knowledge with others, maintain a standard of excellence, and finally, treat patients the way you would like to be treated.

REFERENCES

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POST EXAMINATION QUESTIONS

3. The maxillary buccal furcation is usually ____ mm from the cemento-enamel junction.
   a. 3
   b. 4
   c. 5
   d. 6

4. The length of a No. 15 scalpel blade is ____ mm.
   a. 5
   b. 7
   c. 10
   d. 12

5. Root planing plus local drug delivery usually attains a mean better result than root planing alone by ____ mm.
   a. 0.1
   b. 0.3
   c. 1.0
   d. 1.3

6. After periodontal surgery a patient may need an IV solution if their blood pressure decreases by ____.
   a. 5 mg
   b. 10 mg
   c. 15 mg
   d. 20 mg

7. The rate of healing per day for connective tissue is ____ mm.
   a. 0.1
   b. 0.5
   c. 1.0
   d. 1.5

8. The distance between the CEJ and the neurovascular bundle for an average palate is ____ mm.
   a. 7
   b. 9
   c. 12
   d. 17
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Please check the correct box for each question below.

1. ☐ a  ☐ b  ☐ c  ☐ d  5. ☐ a  ☐ b  ☐ c  ☐ d  9. ☐ a  ☐ b  ☐ c  ☐ d
2. ☐ a  ☐ b  ☐ c  ☐ d  6. ☐ a  ☐ b  ☐ c  ☐ d  10. ☐ a  ☐ b  ☐ c  ☐ d
3. ☐ a  ☐ b  ☐ c  ☐ d  7. ☐ a  ☐ b  ☐ c  ☐ d
4. ☐ a  ☐ b  ☐ c  ☐ d  8. ☐ a  ☐ b  ☐ c  ☐ d

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