When faced with teeth exhibiting severe periodontal destruction, we often encounter gingival architecture which is not in harmony with the more natural contours of less involved teeth. Following the extraction of teeth deemed periodontally hopeless, it is common to observe severe gingival recession resulting from the loss of bony housing. This, in turn, results in the loss of interproximal papillae.

Clinical treatment planning for the edentulous space which will be left following the extraction of periodontally-hopeless teeth must focus on two key factors to achieve an esthetic restoration: the retention or re-creation of sufficient bone and soft tissue and the preservation of adequate crestal height and contours.

As always, we look forward to continuing opportunities to work with you in the care of your patients and to consult with you prior to the extraction of teeth.

Figure 1. Extraction of this maxillary premolar shows the tooth had a three-rooted anatomy.
If the height of the remaining alveolus is compromised, it is usually at the expense of the labial plate of bone. Without sufficient bulk or height of the remaining periodontium, producing an esthetic fixed bridge or a cosmetically-acceptable implant-supported tooth replacement is almost impossible.

Traditional methods of tooth extraction often result in loss of the labial plate of bone. This is especially common with respect to anterior and bicuspids due to the naturally occurring anatomy of the alveolus in these areas.

The bone loss has been attributed to trauma to the thin facial bone caused by conventional instrumentation with forceps and elevators.

Additionally, if a bony dehiscence exists apical to the free gingival margin, or the labial bone is very thin, it may undergo significant resorption during the natural healing of the socket regardless of the method of extraction.

The increased emphasis on cosmetics has brought a renewed interest in atraumatic methods of tooth extraction. Current attention to the preservation of the alveolus is also driven by the desire to minimize the need for ridge augmentation and to facilitate successful implant and conventional prosthetic treatment.

When faced with the extraction of a tooth, enhanced sensitivity to protection against loss of alveolar bone may spare the patient from multiple plastic and reconstructive surgical procedures to regain it.

### Preserving Alveolar Crestal Height

Atraumatic methods of extraction focus on gently severing the periodontal attachment using micro-instrumentation. The intention is to preserve alveolar crestal height in all three dimensions.

Traditional methods of extraction assault the buccal and lingual bone. Conventional techniques involve luxating the tooth using elevators. Most elevators are simply too large to successfully negotiate the periodontal ligament (PDL) space without injury to the supporting bone.

Additionally, since the proximal PDL is largely inaccessible, teeth to be removed are generally mobilized using lateral pressures beneath the contact points. When lateral forces are generated with an elevator and buccal-lingual forces are applied with extraction forceps, fracture of the thin facial bone is inevitable.

The atraumatic approach to tooth removal employs a modified set of principles designed to carefully preserve the socket bone and the periosteum which lines it. To predictably achieve preservation of the socket, one must use specially designed, non-traditional instrumentation.

From an historical perspective it is interesting to note that the design of extraction forceps has not changed substantially in the last 150 years. However, new forceps with anatomical designs that fit the contours of each tooth precisely are now commercially available. A clinician may now select a forceps which is appropriate to the specific tooth to be extracted. In fact, some of the new forceps have been specifically-designed to securely engage the roots of teeth in which the crown has been substantially compromised.

Instead of the conventional buccal-lingual luxating method, the atraumatic...
approach employs gentle, circumferential rotation for 30 seconds. The rotation stretches the periodontal ligament and stimulates the release of lysozomal enzymes and bleeding in the periodontal ligament space.

This, in turn, initiates a process which begins to dissolve the periodontal ligament fibers and creates a hydrolic pressure in the ligament, further helping to loosen the tooth. Lateral, destructive forces are assiduously avoided!

Following application of the rotational forces described above, the gingival attachment and most coronal portion of the periodontal ligament are severed around the entire circumference of the tooth. This is accomplished using a thin bladed ligament knife or periotome, which protects the periosteum from being torn when the tooth is extracted. An additional benefit to this approach is that it permits less traumatic access to the sulcus.

When the tooth is sufficiently mobile, it may then be gently removed using a reciprocating rotational movement while elevating along its long axis.

No lateral (buccal-lingual) forces are applied until the tooth can be moved superiorly at least 2mm. This avoids fracture of the root or trauma to the labial plate of bone.

In most cases, a 12-minute waiting period following the first 30 seconds of rotation will release sufficient periodontal ligament enzymes to further loosen the tooth. One has to be patient, permitting this “physiologic” loosening of the tooth to occur. If the tooth cannot be gently removed after 12 minutes, an additional ten minutes is generally sufficient. Teeth with multiple roots will often require sectioning with each root being retrieved separately while preserving the maximum amount of surrounding alveolar bone.

The same principles apply whether a clinician is planning a tooth-supported or fixture-supported restoration. When a fixed bridge is planned in the esthetic zone and the goal is to develop a harmonious and natural-looking gingival architecture, utilizing an “ovate” pontic may be the prosthetic strategy of choice at the time of tooth extraction.

As first described by Dr. Leonard Abrams, the apical portion of an “egg shaped” pontic is placed 2 – 3mm into the extraction site. During the healing process, a gingival margin-like depression develops creating a prosthetic illusion of a gingival sulcus. The morphology results from the combination of soft tissue proliferation and hard tissue loss.

Loss of Alveolar Height Following Extraction

Independent research by Lekovic, Simion and Iosella, as well as early extraction site studies by Boyne and others, show that following extraction, the height and width of the anterior alveolus predictably undergoes a loss of 1-2 mm in all three dimensions. This generally results in a mid-socket depression followed by a remodeling of the crestal socket walls.

Historical dental literature suggests that there may be as much as an eight times greater loss of alveolar height when periodontally-compromised teeth are extracted as opposed to leaving them in place. Consequently, modern dental practice emphasizes procedures which enhance the preservation of the post-extraction alveolus.

Several investigators have shown that socket preservation grafting, performed at
the time of tooth extraction, preserves the
crestal height of the alveolus significantly
better than extraction in the absence of
socket grafting. In fact, using the evi-
dence-based approach, the 2003
Workshop on Contemporary Science in
Clinical Periodontics concluded “There
is a moderate level of evidence to support
the use of socket bone augmentation for
localized ridge augmentation.”

The Ideal Bone
Grafting Material

A variety of bone grafting materials
have been advocated over the years for
socket preservation procedures. As a result,
there is considerable controversy among
clinicians regarding the most efficacious
material. An ideal bone grafting material
would possess the characteristics of osteoin-
duction, osteoconduction, resorbability and
replacement by new host bone.

Finding the perfect material has
proven to be extremely elusive. Most
graft materials act by providing an ose-
toconductive surface or matrix on which
new bone forms. Some materials resorb
completely, but most resorb partially and
slowly over time, six to 24 months.

Most histology of grafted sites with
implants show a new bone interface
between the titanium surface and the
grafted bone particle. There have also
been reports of tissue interface between
the implant surface and certain graft
materials. This would result in an unfa-
vorable long-term outcome for implant
retention.

Many clinicians use human allograft
material such as freeze-dried, demineral-
ized and mineralized bone; xenograft
materials such as bovine hydroxyapatite,
and synthetic materials such as bioactive
glass. While there is a lack of controlled
clinical studies which support the effica-
cy of one material over another around
implants, there are many published stud-
ies and case reports which demonstrate
success with all of these materials.

We have established that, subse-
quently to traditional tooth extraction, sig-
nificant facial-lingual bone loss is likely
to occur, especially if the labial plate of
bone is missing or thin. This loss of
alveolar width invariably results from
resorption, the pattern of which generally
occurs from labial to lingual.

Therefore, it is axiomatic that
socket preservation should be the
treatment of choice to prepare the
remaining alveolar ridge for conven-
tional or fixture supported restora-
tions. This is especially true in estheti-
cally sensitive areas such as the upper
anterior region.

The methodology which has gained
the most universal support advocates the
use of allograft or xenograft materials, or
composite grafts of autogenous bone and
bioactive glass. Along with most peri-
odontists, we use a resorbable barrier
membrane to maximize the osseous fill
of the socket.

Should the facial profile of the soft
tissue be deficient after a socket preser-
vation bone graft, a connective tissue
graft may be utilized for pontic receptor
sites. The resulting increase in soft tis-
sue bulk will provide the most flexibility
for achieving esthetic contours. It is
noteworthy that soft tissue grafts are not
susceptible to the continuous, subjacent
ridge remodeling that may occur for sev-
eral years following osseous grafting.

As we can see, then, it is extremely
important to envision a functionally- and
cosmetically-acceptable tooth replace-
ment and consider ridge preservation or
immediate implant placement before the
removal of any tooth. We encourage
you to consult with us regarding the
most efficacious way to handle such
treatment. In concert, the periodontist
and the restorative dentist can then
develop treatment plans and appropriate
therapeutic sequences which will ensure
predictable clinical outcomes.

By anticipating the possibility of
alveolar loss subsequent to the extraction
of a tooth, we can also minimize the
number of surgical procedures a patient
may have to endure to achieve optimal
treatment results.

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