The Brown

PerioDontaLetter

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Summer

From Our Office to Yours...

Our respective offices are unconditionally committed to the lifelong retention of natural teeth in function and health.

However, we are frequently faced with the difficult decision of how to most appropriately manage severely-compromised teeth from a periodontal or restorative standpoint.

This newsletter addresses the clinical challenges which result from the extraction of periodontally-hopeless teeth.

Treatment planning and atraumatic management of extraction sites must focus upon the retention or re-creation of sufficient volume of bone and soft tissue and adequate crestal height and contours to achieve esthetic and functional restorations.

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.

Atraumatic Extraction and Ridge Preservation

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.

Figure 1. Extraction of this maxillary premolar shows the tooth had a three-rooted anatomy.

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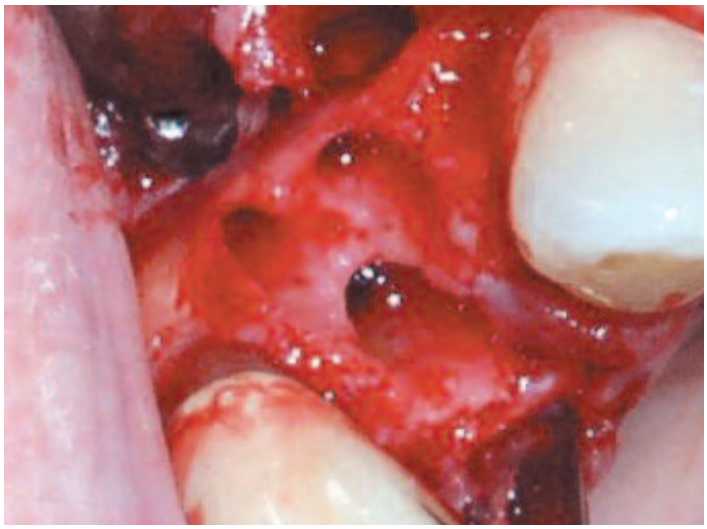

Figure 2. The removal of the tooth resulted in three separate sockets.

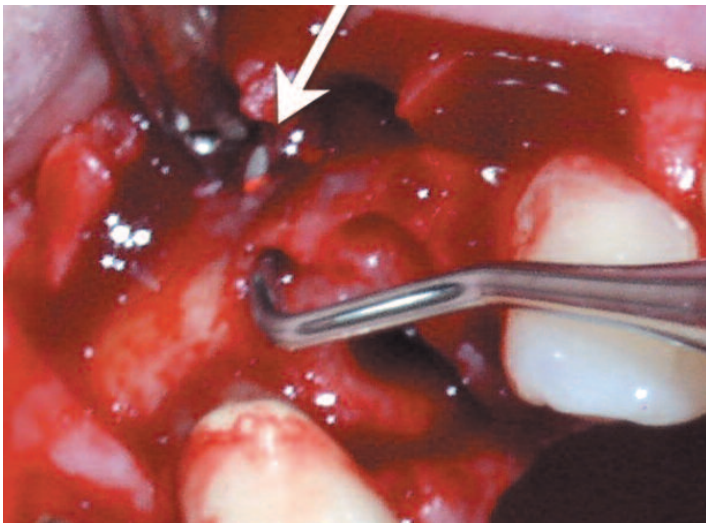

Figure 3. A currette placed into the distal buccal socket revealed a perforation through the buccal plate.

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 bicuspid teeth 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

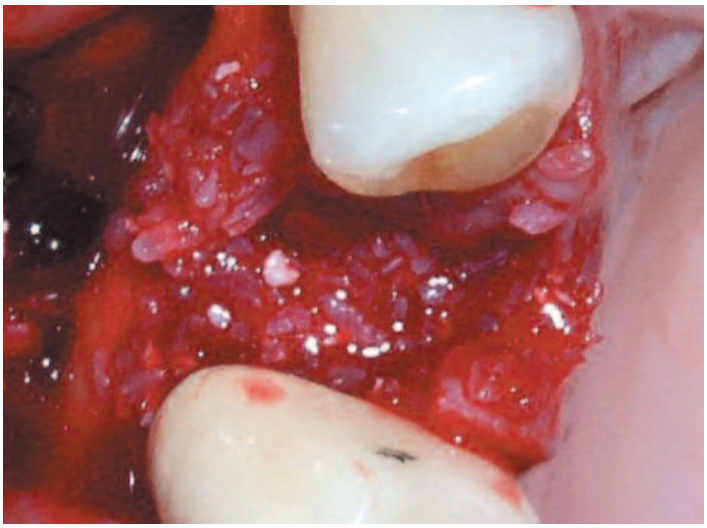

Figure 4. The socket was filled with a bone graft primarily to preserve buccal-lingual alveolar width for implant placement in five to six months.

Figure 5. A barrier membrane was placed to protect the bone graft and prevent soft tissue invagination into the healing socket.

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

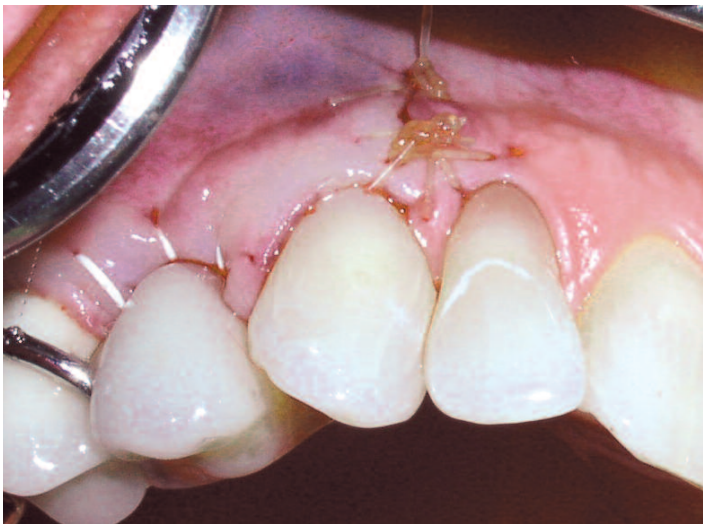

Figure 6. Following primary closure of the soft tissue utilizing goretex sutures, a temporary partial was placed.

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 evidence-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 osteoinduction, 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 osetoconductive 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 unfavorable long-term outcome for implant retention.

Many clinicians use human allograft material such as freeze-dried, demineralized 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 efficacy of one material over another around implants, there are many published studies and case reports which demonstrate success with all of these materials.

We have established that, subsequent to traditional tooth extraction, significant 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 conventional or fixture supported restorations. This is especially true in esthetically 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 periodontists, 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 preservation bone graft, a connective tissue graft may be utilized for pontic receptor sites. The resulting increase in soft tissue 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 several years following osseous grafting.

As we can see, then, it is extremely important to envision a functionally- and cosmetically-acceptable tooth replacement 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.