

Endodontic/Implant Algorithm

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K E N S E R O T A , D D S , M M S C

V O L U M E I I , I S S U E I

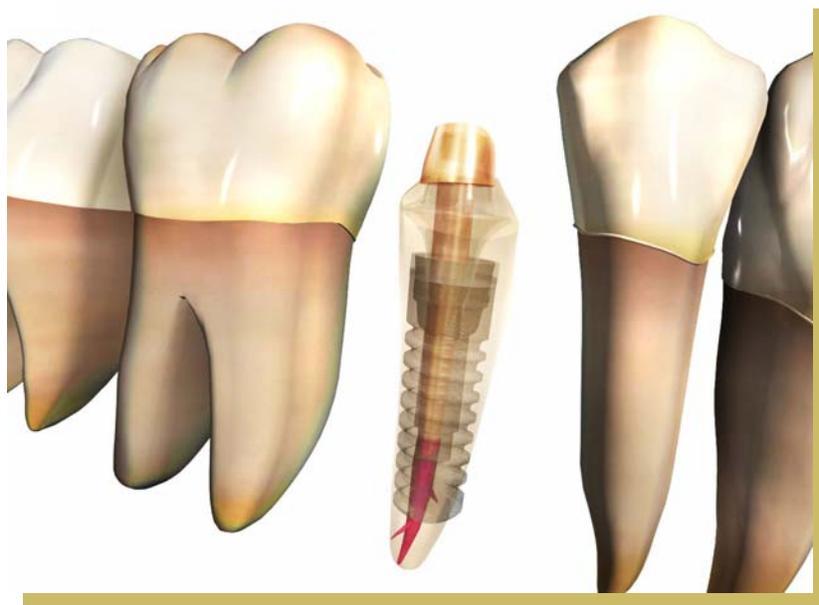
J U N E 2 0 0 7

Dear Colleague:

The intent of this ongoing series of newsletters is to change the traditional format from abstracted articles on various topics to one that can include the incorporation of e-learning and rich media. E-learning is a general term used to refer to computer-enhanced learning. It is an amalgam of screencasts, ePortfolios, Palm pilots, MP3 Players, web-based teaching materials, web sites and web 2.0 communities, collaborative software, e-mail, blogs, educational animation, and learning management software. The term rich media was coined to describe a broad range of digital interactive media. Rich media can be downloadable or may be embedded in a webpage. If downloadable, it can be viewed or used offline with media players such as Real Networks' RealPlayer, Microsoft Media Player, or Apple's QuickTime, among others. The defining characteristic of rich media is that it exhibits dynamic motion. This motion may occur over time or in direct response to user interaction. I refer you to <http://dentsply.amberginc.ca> and the .pdf download in the upper right corner.....it requires Acrobat Reader 8.0 from www.adobe.com.

In addition, I'd encourage you to visit my friend Dr. Ovidiu Ciobanu's www.cyberdent.ca. Ovidiu is responsible for many of the graphics that you will see in the forthcoming issues and as you'll see by clicking on the topics, he is a wealth of talent in the area of dental informatics. He has been very supportive in this educational outreach effort and I am indebted to him for the depth of the resource he provides.

The intent is to create a true mix of interactive materials, imagery, text based learning as well as to provide a vehicle for treatment planning and comprehensive care beyond the traditional and further the concept of a "cybercommunity". Your input of case material is welcomed and in time, I hope to develop an expanded format among colleagues who know one another no matter how circuitously. The end game is the realization of the power of this type of communication and its use to "raise the collective and collaborative bar".

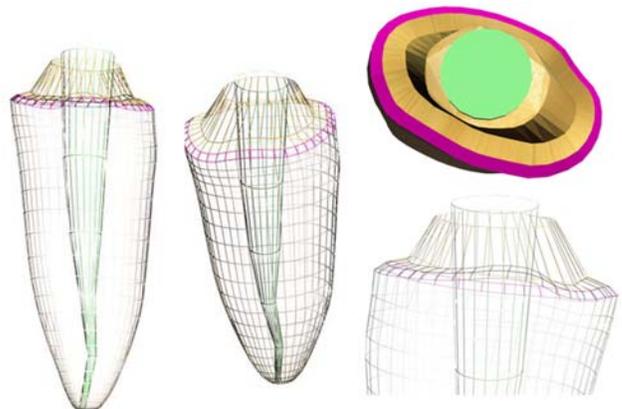
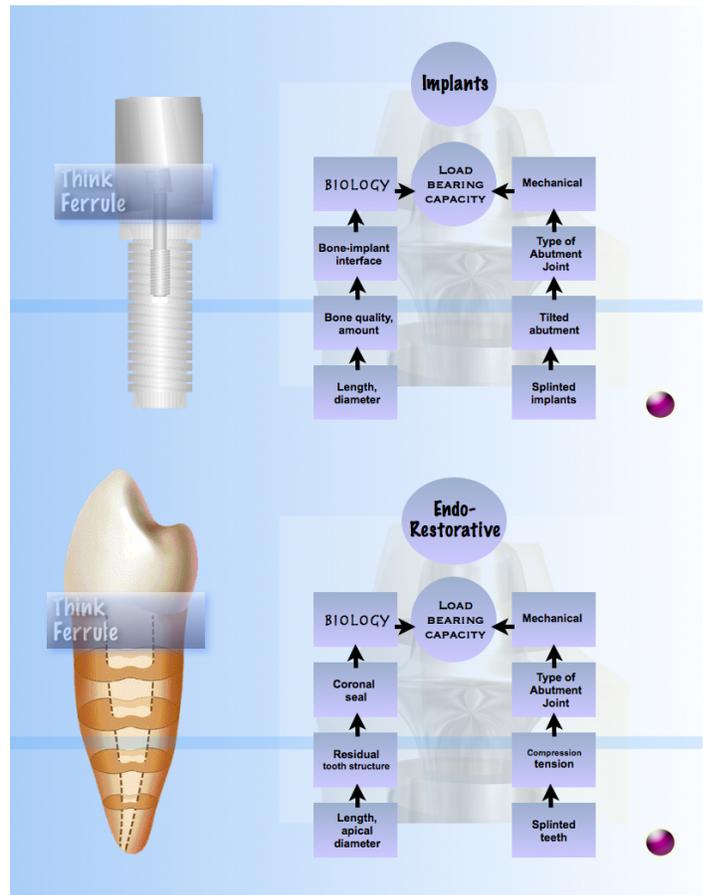


- Implant-Abutment MicroGap
- Practical Surgical Management for Sinus Augmentation
- When to Save or Extract in the Esthetic Zone

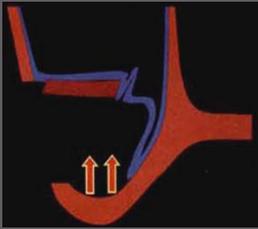
Implant-Abutment Microgap—Is there a correlation between a ferrule and an implant-abutment connection?...(to be cont'd)

Norton 2006 Int J Oral Maxillofac Implants The marginal bone loss from the implant-abutment microgap to the bone crest between multiple freestanding implants functionally loaded for up to 7.5 years in the posterior jaws showed a frequency of bone loss $>$ or $=$ 1.0 mm of 25.0% in the maxilla and 36.0% in the mandible. **Implant configurations incorporating interfaces will be associated with biological changes regardless of interface size and that mobility between components may have an early influence on wound healing around the implant.**

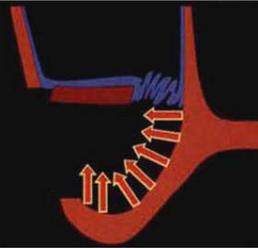
Scarano et al 2005 J Oral Implant. **A microgap can be colonized by bacteria, and this fact could have relevance on the remodeling of the peri-implant crestal bone and on the long-term health of the peri-implant tissues.** In the implants with screw-retained abutments, a 60-microm microgap was present at the level of implant-abutment connection. Bacteria were often present in the microgaps between implant and abutment and in the internal portion of the implants. In implants with cement-retained abutments, a 40-micron microgap was found at the level of the implant-abutment connection. Screw-retained abutments the microgap can be a critical factor for colonization of bacteria, **whereas in cement-retained abutments all the internal spaces were filled by cement.**



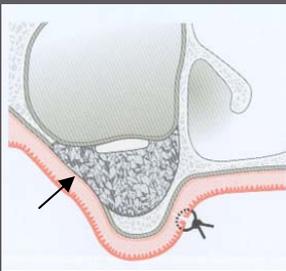
Practical Surgical Management for Sinus Augmentation Surgery—Steven Wallace



Improper sinus elevation



Proper sinus elevation



Two-stage sinus lift..... window is visible (arrow) ... lining has been lifted from the floor of the sinus and the bony window has been displaced superiorly. Particulate bone graft material is used .. Cases with less than 7mm of residual bone can be augmented to receive 14 to 17 mm implants.

A. In order to replace the 2.6, a sinus graft/elevation is planned. Orthodontic up-righting of the 2.7 will incorporate bodily movement of the 2.5 into a more idealized position for fixture placement (2.4). The teeth will be retained in position during the 10 to 12 month period of osseous generation.

The critical measurement for lateral window sinus augmentation is the functioning implants placed therein for one year or more. The literature shows a mean cumulative implant success of 91.8%. However this ranged from an extremely low 61.4% to 100%. The variables that seemed to make the difference were:

- 1) The use of particulate rather than block graft in the sinus
- 2) The use of roughened rather than machined surface implants
- 3) The placement of a barrier membrane over the sinus access window.

Implants placed in unaugmented posterior maxilla had a cumulative success of 95.1%. The cumulative score for implant success in all sinus lifts in the systematic review as stated earlier was 91.8%. However, use of roughened implants raised this to 94.5% and additional use of a barrier membrane to 98.6%. This is a similar success rate to type 3 bone found in the anterior maxilla. The data implies that implants in sinus lifted sites perform better than in unaugmented normal posterior maxilla.

Flap Design

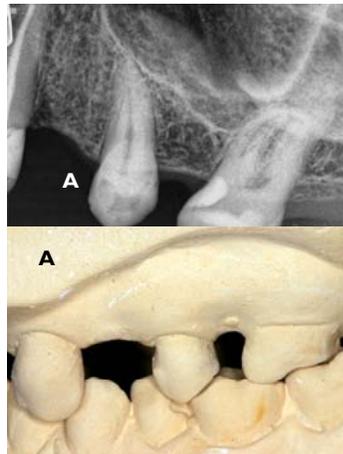
Incision lines should be kept as distant as practical from the intended window. For improved access, visibility and passive flap retraction during surgery, a larger flap is created by incising towards the palatal aspect in areas where inferior margin of the window is likely to be near the crest of the alveolus. This also leaves margin for error should the window needed to be widened or repositioned during surgery. The most common error is making the mesial vertical releasing incision too distal .

Window design

The margins of the window should be: **superior**—at least 15mm from the alveolar crest, **inferior**—2-3mm above floor of sinus, **mesial**—2-3mm from anterior wall of sinus, **posterior**—far enough to accommodate a number of implant mesio-distal widths with adequate intervening bone.

The window can be: removed as a plate of bone, inwardly elevated as a plate attached to the membrane, hinged and elevated inwards or removed by piezosurgery

There is no evidence to suggest that the bone of the window serves any



additional benefit to bone formation if left attached to the membrane or introduced into the sinus en bloc or piecemeal. The ideal approach for the lateral window technique is piezosurgery, which allows rapid and clean bone removal with minimal risk of damage to both the membrane and any blood vessels running across the window. A recent paper in the IJPRD revealed a 5% perforation rate by hand and 0% by piezosurgery in a controlled study.

The most common errors in window preparation were those of positioning in relation to remaining alveolus and septa. Part of the osteotomy line is thus left on thick crestal alveolus or at the base of a septum. In these cases, the margin can simply be repositioned in the appropriate direction, and a kidney bean shaped incision developed to accommodate the septal base in the inner concavity of the osteotomy line. The membrane will appear blue grey as the bone is thinned to the point where it can be accessed.

Membrane elevation

Containment of the particulate graft is of paramount importance in the success of this procedure. Thus, sinus membrane integrity is a primary objective. The most common reasons for membrane tearing were lack of adequate access both visually and physically, no three dimensional knowledge of the interior architecture of the sinus, septation at the level of elevation, or if the membrane was very thin which is found in healthy sinuses. There is also a greater frequency of perforation with the reduction of the angle between the buccal wall and the medial wall in the coronal plane.

Membrane elevation is carried out using instruments with a sharp leading edge for effortless membrane elevation off the bone and smooth, broad backs for lifting the membrane upwards. It is important not to push too hard in one spot but rather develop a radial, gradually progressive technique for freeing and lifting the fragile tissue.

Window design must be continually evaluated, especially mesially and inferiorly. If the window margin is too far distal for the anterior chamber to be accessed easily or too far apical for access to the floor, further bone removal at the periphery of the window must be carried out rather than continuing with blind elevation.

The most vital factor after maintaining membrane integrity is the elevation of the medial aspect of the membrane off the lateral nasal wall to at least the height of the superior aspect of the buccal window. Since the lateral wall is perforated and the distal wall is too far distal for most grafts to have access to the blood supply, most of the blood supply comes from the mesial, inferior and medial walls of the sinus. The medial wall is the most important with the posterior superior nasal artery providing much of the blood supply. Thus complete elevation of the membrane from the medial wall is mandatory for adequate blood supply and healing.

The most common error in packing the bone seemed to be limited access to the anterior chamber of the sinus, which can often be left unpacked due to limited visibility. Hence Professor Wallace advised making the mesial edge of the window close to the anterior wall and packing the mesial chamber first.

The literature supports sinus elevation procedure as actually reducing the severity and incidence of sinusitis, presumably by allowing more efficient drainage and reducing sinus volume. Physiologically there appears to be no effect on normal function following sinus elevation procedures.

Placement of barrier membrane

Placement of a barrier membrane ensures more complete bone formation in the sinus and access window site. This simple membrane placement procedure has also now been shown to improve survival of the implants in sinus lifts by over 5%! The only proviso was that the membrane

should not shift during flap closure. This validates the need for adequate flap release and elevation around the access window to allow easy retraction and space to rest a membrane on at least 3mm of sound bone all around the access window without displacing it during suturing.

There appeared to be no difference in whether the membrane was a resorbable or ePTFE, though the latter should be removed at implant placement. Resorbable was recommended if concurrent implant placement was contemplated.

Suturing

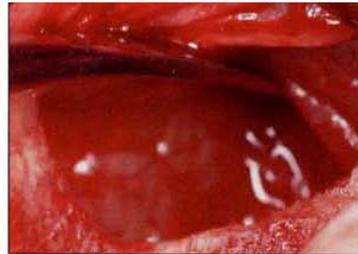
Since the suture line should be away from the window, the type of suture does not make a difference in the end result as long as flap management was suitably handled and the suturing technique acceptable.

Experience-based complication management

The most common complication is membrane perforation. There is a correlation between perforations and narrowing sinus floor angle in the coronal plane. Membrane thickness also makes a difference. Membranes over 1.5mm thick tear approximately 16.6% of the time compared with 41% tear rate for membranes under 1.5mm thick. Thus, healthy patients with no sinus membrane thickening are at greater risk of perforations. This variable was actually more significant than presence of septation.

Septation itself was rarely a great problem unless undiagnosed and unexpected and approached incorrectly. Velasquez-Plata in JOMI in 2002 showed that most septation was partial and mainly related to the medial wall. Complete division of a sinus into two distinct compartments by a septum was very rare. Three di-

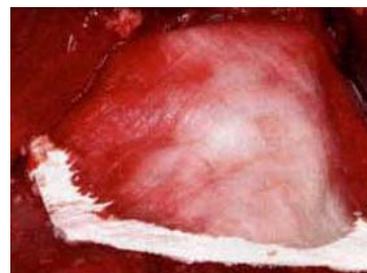
mensional analysis pre-operatively would allow an approach to septae that would enable the operator to elevate the membrane from either side till the crest was reached without perforation. Access and visibility and good window design were important in the correct approach.



Membrane elevation is completed up to the medial wall of sinus



DBX allograft has been placed to a height of 15 mm



BioGide resorbable collagen barrier is in place over the graft

Antimicrobial Usage for Tx of Infection:
 Amoxicillin/clavulanate (500 mg),
 Azithromycin (Zitromax) - 500 mg—
 do not use Clindamycin

According to Abrahamsson and Cardaropoli June 2007 the epithelium will attach to any clean sterilized metal surface in the 'marginal zone' of the implant.

The following was abstracted from a course by Dennis Tarnow

WHEN TO SAVE OR EXTRACT IN THE ESTHETIC ZONE? The Endodontic/Implant Algorithm continues.....

Considerations:

- Size of the defect
- Restorative needs
- Endodontic status "pulpless - > 5mm pathology" - hold the phone lad!!
- Periodontal breakdown rate
- Decay rate
- Aesthetic considerations
- Emotional needs of the patient
- Anatomical considerations "10 mm rule"
- Status of adjacent teeth"perio,resto. and endo"
- Financial considerations

Extract:

- If periodontal surgery will compromise the papilla
- If periodontal surgery will reduce facial tissue
- If patient needs RCT, post, crown and crown lengthening under previous crown.....hold the phone lad!!
- If the patient has a high decay rate
- **All implant restorations will not demonstrate decay**
- **Some implants are also resistance to peri-implantitis**
- If the patient is more born to periodontitis and preservation may risk more bone loss because of future infection.
- Abnormal root anatomy preventing successful RCT.
- If post preparation will compromise the final tooth strength i.e. tooth and post will not withstand occlusion without high risk of fracture.
- If a large periapical pathology is present on a non-vital tooth " > 5 mm size lesion".....again, hold the phone lad!!

PULPAL AND PERIAPICAL STATUS AND SUCCESS RATE (Friedman et al JOE 2004)* (Farzaneh et al JOE 2004) If endodontic treatment or retreatment is needed.* (Wang et al JOE 2004)*** If apicectomy and retrograde seal are needed.**

APICECTOMY IS USUALLY A PRE-IMPLANT SURGERY

If periodontal surgery will leave less than 10 mm bone for a future implant.....again Dennis—really?

Save:

If the patient has an emotional breakdown when you mention the word extraction.....trite Dennis, trite.....
If 2 implants will be adjacent to each other, then save one tooth if possible.

Increase implant success by....

- length of implant
- tapered implant...(body Dennis).....
- diameter of implant.....
- density of bone
- cross arch stabilization

* Treatment Outcome in Endodontics—The Toronto Study. Phase I: Initial Treatment

The 4- to 6-yr outcome of initial (first-time) endodontic treatment was assessed for Phase II of the "Toronto Study." In total, 442 teeth were treated by using flared preparation and vertical compaction of warm gutta-percha or step-back preparation and lateral compaction. The healed rate (combined sample, 85%) differed significantly for preoperative AP (absent, 93%; present, 79%), treatment technique (flared preparation and vertical compaction, 90%; step-back preparation and lateral compaction, 80%), gender (females, 90%; males, 79%), number of roots (1–92%; ≥2–81%), and root-filling length (adequate, 87%; inadequate, 77%). Logistic regression revealed increased risk of disease for preoperative AP (odds ratio = 3.3) and technique (odds ratio = 2.3). This study confirmed AP and highlighted **treatment technique as the main predictors of outcome in initial treatment.**

** Toronto Study. Phases I and II: Orthograde Retreatment

The 4- to 6-year outcome of orthograde retreatment was assessed for Phases I and II of the Toronto Study. In total, 523 teeth in 444 patients were retreated. The "healed" rate (81%) differed significantly for preoperative apical periodontitis (absent, 97%; present, 78%) and perforation (absent, 89%; present, 42%). Logistic regression revealed an increased risk of disease for preoperative perforation and adequate root filling quality, and postoperative lack of definitive restoration (odds ratios = 26.5, 6.6, and 14.0, respectively). Without perforation, inadequate intraoperative root filling length was also identified (odds ratio = 6.8). This study suggested that apical periodontitis, although a strong predictor, was secondary to preoperative perforation and root filling quality, **and to postoperative restoration, in predicting the outcome of retreatment.**

*** Toronto Study. Phases I and II: Apical Surgery

This study prospectively assessed the 4 to 8 yr outcome of apical surgery performed by graduate students in phases I and II of the Toronto Study. The study cohort included 155 teeth in 138 patients. The recall rate was 85% and the overall healed rate 74%. Healed rate was significantly higher for teeth with small (≤ 5 mm) than larger preoperative lesions (χ^2 , $p = 0.02$). Logistic Regression revealed an increased odds of disease persistence for teeth with larger preoperative lesions (OR = 3.81, CI = 1.2–12.1), and preoperative root-filling of adequate length (OR = 3.7, CI = 1.1–11.1). Preoperative lesion size and root-filling length were significant predictors of outcome of apical surgery.

Statistics can be used to manipulate perception...while these studies were well delineated and the results deduced from multivariate analyses, nonetheless the results are reflective only of samplings with considerable margin for error....the endodontic/implant algorithm must take into account the same degree of variability in implant placement and restorability considerations.....more to come.