A Retrospective Analysis of Maxillary Sinuses and Implant Survival after Lateral Window Sinus Sinus Augmentation

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Maxillary Sinus Augmentations

Maxillary sinus augmentation, through the lateral window approach, has been successfully used to increase bone dimensions to allow for dental implant placement.
Bone Grafting

BioOss
Xenograft (Bovine)
Osteoconductive
Large or small particles
Slow Turnover

Puros
Allograft (Human)
Osteoconductive
Large or small particles
Rapid turnover
Plasma Rich in Growth Factors (PRGF):

• 100% Autologous pure platelet-rich plasma (P-PRP) product
• Does not contain leukocytes - avoiding their proinflammatory activity.
• PRGF releases growth factors and proteins that are involved in wound healing: Fibrinogen, fibronectin, vitronectin, platelet derived growth factor (PDGF), transforming growth factor β (TGF-β), vascular endothelial growth factor (VEGF), insulin like growth factor (IGF), angiopoietin, platelet factor 4, and thrombospondin.

Anitua 1999
Activator

Separating rich from poor layer

Mix of bone graft with PRGF

Endoret’s protocol
Treatment Protocol

Window Preparation → Lifting the Sinus Membrane → PRGF + Bone Graft → Graft Placement

Collagen Membrane over Window → PRGF Membrane → PRGF Membrane over Window → Primary Closure
Aim

To retrospectively analyze lateral window maxillary sinus augmentation parameters using CBCT Scans and patient charts:

• Sinus Morphology
• Perforation Rate
• Infection Rate
• Implant Survival on PRGF treated sites
Study design
Retrospective analysis of CBCT

Inclusion Criteria:

• All patients received maxillary sinus augmentation through a lateral window approach with the use of PRGF.
• All patients had subsequent dental implant placement at least 6 months post sinus augmentation.
• All surgeries were performed by periodontics residents under the supervision of faculty who are board-certified periodontists.
Demographic Data

The following demographic parameters were extracted from each patient’s file for:

- Gender
- Age
- Side (right/left) of the sinus assessed
- Smoking (Yes/No) at the time of treatment.
Data collected

Surgery-related parameters included

- Type of graft material mixed with PRGF
- Type of implant placed (brand, length, width),
- Implant stability measured with implant stability quotient (ISQ) at the time of implant placement and stage 2 surgery
- Sinus membrane perforation at the time of surgery
- Post-operative complications including sinus graft infection and sinusitis.
Radiographic Analysis

The following variables were assessed:
- Residual bone height (RBH)
- Thickness of the sinus membrane
- Presence or absence of septae
- Presence or absence of posterior superior alveolar artery
- Morphology of sinus membrane
Healthy: No thickening

Flat: shallow thickening without well-defined outlines.

Semispheric: thickening with well-defined outlines rising in an angle of > 30 degrees from the floor of the walls of the sinus.

Soikkonen and Ainamo 1995
Mucocele-like: complete opacification of the sinus

Mixed flat and semispherical thickenings

Soikkonen and Ainamo 1995
Implant Success

- Periapical radiographs that were taken at time of implant placement, uncovery, restoration placement and 12-month recalls were also reviewed.
- Misch criteria for success was used to assess implant outcomes.
<table>
<thead>
<tr>
<th>Implant Quality Scale Group</th>
<th>Clinical Conditions</th>
</tr>
</thead>
</table>
| I. Success (optimum health) | a) No pain or tenderness upon function  
                              b) 0 mobility  
                              c) <2 mm radiographic bone loss from initial surgery  
                              d) No exudates history |
| II. Satisfactory survival   | a) No pain on function  
                              b) 0 mobility  
                              c) 2–4 mm radiographic bone loss  
                              d) No exudates history |
| III. Compromised survival   | a) May have sensitivity on function  
                               b) No mobility  
                               c) Radiographic bone loss >4 mm (less than 1/2 of implant body)  
                               d) Probing depth >7 mm  
                               e) May have exudates history |
| IV. Failure (clinical or absolute failure) | Any of following:  
                              a) Pain on function  
                              b) Mobility  
                              c) Radiographic bone loss >1/2 length of implant  
                              d) Uncontrolled exudate  
                              e) No longer in mouth |

Misch 2008
## Results

### Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Patients</td>
<td>53</td>
</tr>
<tr>
<td>Age at first visit</td>
<td>61.59 ± 8.85</td>
</tr>
<tr>
<td>Gender (men)</td>
<td>20 (37.74%)</td>
</tr>
<tr>
<td>Smoking (yes)</td>
<td>9 (16.98%)</td>
</tr>
<tr>
<td>N of Lateral windows</td>
<td>67</td>
</tr>
</tbody>
</table>

### Sinus-specific characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number (Percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perforation (yes)</td>
<td>22 (32.83%)</td>
</tr>
<tr>
<td>Septa (present)</td>
<td>10 (14.92%)</td>
</tr>
<tr>
<td>Vessel (present)</td>
<td>4 (5.97%)</td>
</tr>
<tr>
<td>Infection</td>
<td>1 (1.57%)</td>
</tr>
<tr>
<td>Residual ridge height before grafting (mm)</td>
<td>4.54 ± 1.88</td>
</tr>
<tr>
<td>Residual ridge height after grafting (mm)</td>
<td>15.77 ± 3.4</td>
</tr>
</tbody>
</table>
SINUS MORPHOLOGY

- Healthy: 66%
- Flat: 25%
- Semispheric: 7%
- Mucocèle-like: 0%
- Mixed flat and semispherical thickening: 2%
Xenograft: 57%
Allograft: 30%
Allograft + Xenograft: 13%
BONE GRAFT
Implant Data

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implant Placed</td>
<td>102</td>
</tr>
<tr>
<td>Implant Failures</td>
<td>0</td>
</tr>
<tr>
<td>Follow-up</td>
<td>20.5 ± 12.05 months</td>
</tr>
</tbody>
</table>

Implant Systems

- BIOMET 3i: 66%
- Astra Tech: 7%
- Straumann: 7%
- Nobel Biocare: 4%

Zimmer Biomet: 10%
**Discussion**

**SINUS MORPHOLOGY**

- Healthy: 35%
- Flat: 46%
- Semispheric: 6%
- Mucocele-like: 4%
- Mixed flat and semispherical thickening: 9%

**LSU PERIO**

- Healthy: 66%
- Flat: 25%
- Semispheric: 7%
- Mucocele-like: 0%
- Mixed flat and semispherical thickening: 2%

**SCHNEIDER 2013**

- Healthy: 35%
- Flat: 46%
- Semispheric: 6%
Perforation Rate

32.83%
LSU Perio 2018

7%
Wallace 2007
Infections

1.57%
LSU PERIO 2018

7.1%
Moreno 2014
Implant Survival

100%
LSU Perio 2018

No PRGF
95% - Starch-Jensen 2018
99.6% - Silva 2016

PRGF
90% - Khouly 2017
100% - Anitua 2009
Conclusion

• Implants placed after sinus augmentation using PRGF and bone grafts have a survival rate of 100%.

• Most common sinus pathology was flat: shallow thickening without well-defined outlines at 25%.

• Perforation rate was 32.83%.

• Infection rate was 1.57%.
Abstract:

**Background:** Plasma Rich in Growth Factors (PRGF) have been using in sinus augmentation procedures to improve healing and implant survival. The aim of the present retrospective study was to assess implant survival after lateral window sinus augmentations using PRGF in combination with various bone graft materials in a periodontics residency clinic.

**Methods:** Cone beam computed tomography (CBCT) scans and Axium charts of 53 patients seen in the Louisiana State University Periodontics clinic were reviewed. Patients were previously treated for lateral window sinus augmentations with bone grafts and PRGF. Rough surface implants were placed 6-9 months after sinus augmentation. Implants were reviewed for survival at follow-up visits.

**Results:** The average residual ridge height before grafting was 4.54 ± 1.88mm and the average residual height after grafting was 15.77 ± 3.4mm. Pathology reported was flat at 25%, semispheric at 7%, mixed flat and semispherical thickenings at 2%. Septae were noted in the CBCT scans in 10 (14.92%) cases. The posterior superior alveolar artery was noted in the CBCT scan in 4 (5.97%) of cases. Perforations of the sinus were noted in 22 (32.83%) of the cases. There was only 1 (1.57%) infection reported. There were 102 rough surface implants placed after lateral window sinus augmentation using PRGF. There were no implant failures recorded.

**Conclusion:** Implants placed after sinus augmentation using PRGF and bone grafts have a survival rate of 100%. The most common pathology was flat: shallow thickening without well-defined outlines at 25%. The perforation rate was 32.83%. The infection rate was 1.57%.
Thank you
Dr. Dragonas
Dr. Maney
Dr. Palaiologou
Dr. Lallier
Co-residents