Maxillofacial Concept™

help your most challenged patients face the world again
# Index

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Historical perspective</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>Anatomical considerations</td>
<td>5–6</td>
</tr>
<tr>
<td>III</td>
<td>Armamentarium</td>
<td>7</td>
</tr>
<tr>
<td>IV</td>
<td>Surgical considerations</td>
<td>8–9</td>
</tr>
<tr>
<td>V</td>
<td>Prosthetic considerations</td>
<td>10</td>
</tr>
<tr>
<td>VI</td>
<td>Healing period</td>
<td>11</td>
</tr>
<tr>
<td>VII</td>
<td>Management of radiated patients</td>
<td>12</td>
</tr>
<tr>
<td>VIII</td>
<td>Long term maintenance</td>
<td>13</td>
</tr>
<tr>
<td>IX</td>
<td>Multicenter treatment outcomes</td>
<td>14</td>
</tr>
<tr>
<td>X</td>
<td>Clinical case 1–4</td>
<td>16–19</td>
</tr>
</tbody>
</table>

---

**Forwarded by:**  
[Image: Professor PI Brånemark]

**Edited by:**  
[Image: Edmond Bedrossian, DDS Diplomate, American Board of Oral & Maxillofacial Surgeons]  
[Image: Marcelo Ferraz de Oliveira, DDS Maxillofacial Prosthodontist]

**Contribution by:**  
[Image: Kenji Higuchi, DDS Diplomate, American Board of Oral & Maxillofacial surgeons]  
[Image: Steven Parel, DDS Diplomate, American Board of Prosthodontists]  
[Image: Patrick Henry, DDS Diplomate, American Board of Prosthodontists]
“Osseointegration has the same principles and needs irrespective of the severity of the tissue damage. Using the most subtile surgical techniques and precision made titanium components, it is possible to satisfy the demands of the human frame.”

P-I Brånemark
The treatment of patients with Maxillofacial defects is pioneered by Professor PI Brånemark.

The extraordinary lifetime achievements and humanitarian activities of Professor Per-Ingvar Brånemark has been the reason for the development of procedures to treat patients with Maxillofacial defects.

Using the creative genius, intuitive empathy, and relentless determination, Professor Brånemark has improved the quality of life for patients throughout the world. In turn, he has provided the rest of us in the healthcare profession the understanding and ability to care for our fellow human beings better.

The Brånemark Institute in Bauru Brazil continues Professor Brånemark’s vision of treating the patients with Maxillofacial defects with its philanthropic programs. Clinicians from around the world volunteer their time and skills to treat these patients under the supervision of Professor Brånemark.

Isura was one of the early patient’s treated in Brazil by Professor Brånemark and his team in 1992. She is now able to interact and take care of her grandchildren every afternoon. The only image the children have of their grand-mother is one of a smiling and a happy woman.
Anatomical considerations

Having adequate residual boney volume for placement of osseointegrated implants is obviously paramount. However, as important is the presence of healthy overlying soft tissues. Whether cutaneous or mucosal tissue, the clinicians must be very aware of the thickness of the tissues in order to allow a maintainable environment around the prosthetic substructures by the patient and the Maxillofacial Prosthodontist.

Planning with the oncological surgeons prior to resection of patients with maxillary tumors is essential in order to maximize the residual volume of Zygomatic bone remaining after the tumor ablation surgery. The Zygomatic bone serves as an essential boney landmark in treatment planning anchorage positions for implants during the treatment planning with the Maxillofacial Prosthodontist.

The transition line of the prosthesis with the patient’s skin should be as subtle as possible to allow a life like appearance. In order to allow adequate room for the emergence profile of the abutments as well as the retaining components of the Maxillofacial prosthesis, considerations of the “depth” of the defect is critical.

In cases of orbital exenteration, the free flap reconstruction must allow for a residual “concave” defect. If the depth of the defect is not adequate, pre-prosthetic soft tissue surgery may be necessary in consultation with the Maxillofacial Prosthodontist and/or the Anaplastologist.
Anatomic considerations

Complex cases including maxillectomies and orbital exenteration, free flaps are not necessary in order to allow fabrication of the prosthetic substructure with bilateral anchorage. Implants are placed in residual supra-orbital rim on the effected side. Bilateral anchorage is possible by placing additional implants in the contralateral Zygomatic bone. The final prosthetic substructure will have bilateral anchorage and adequate depth for a life like transition margins of the maxillofacial prosthesis.

Independent treatment planning of each patient is absolutely necessary to individualize the anchorage sites as well as the substructure design and the prosthetic needs prior to initiation of the surgical procedures.
Armamentarium

Extra-oral implants:
The implants used are the regular platform implants. The extra oral implants used to date are the machined surface regular platform, 3.75 or 4.0 mm implants. Note; extra oral implants used for the BAHA appliance or to support a prosthetic ear, are not the regular platform Brånemark implants. The implants used for ear prosthesis are specially designed implants and are not a part of the scope of this brochure.

Intra-oral implants:
The intraoral implants are also the machined surface, regular platform implants. In cases where the Zygomatic bone was used for anchoring implants several approaches were considered. For patients having had partial or total maxilectomies, regular platform implants were used in the reaming portion of the Zygomatic body to allow for contra-lateral point stabilization of the prosthetic framework. In cases where the maxillary sinus and the maxillary residual arch were intact, the Brånemark Zygomatic implant with the 45 degree angulated platform was used.

Preparing the osteotomy:
The drilling sequence to prepare the osteotomy is the same as for conventional intraoral implants. The surgeon has to judge clinically the quality of bone while preparing the osteotomy.
The Maxillofacial Concept™ Software allows collaboration between the surgeon, the Maxillofacial Prosthodontist as well as the Anaplastologist in treatment planning the patient with the Maxillofacial defects prior to initiation of the treatment. The 2-dimensional DICOM files of the patients are converted into 3-dimensional format allowing better visualization of the remaining osseous tissues by the surgical team. The patient’s soft tissues can also be reformatted and superimposed onto the reconfigured 3-dimensional boney volume showing the topography of the patients remaining facial and or intra-oral architecture.

The Maxillofacial Prosthodontist and the Anaplastologists can assess the thickness of the soft tissues and guide the surgical team in the best location for the implants and consequently the abutments and the prosthetic frame work design.

By using the information provided by the Maxillofacial Concept™ Software, the entire team can plan the position of the implants which best complies with the surgical as well as the prosthetic principles.
**Surgical considerations**

**Orbits:**
Placement of three implants is generally adequate for support of the substructure and the orbital prosthesis. The preferred site is the supraorbital rim, if it has not been resected. However, implants may be placed in the residual periorbital boney rim.

**Noses:**
Placement of three implants is considered. One implant is placed in the nasal bone followed by two additional implants opposing each other in the floor of the nasal cavity. The implants are placed with their axis paralleling the plane of the hard palate when possible.

**Ears:**
The implants used for retention of the BAHA hearing aid device or a prosthetic ears, are specially designed implants and should not be treated using the Brånemark System®.

**Maxilectomies:**
Implants are placed in the remaining residual bone. The Zygomatic bone is considered when possible. Complex cases including combination of intraoral and extra oral defects: Individual planning of this patient group is necessary, the quality of bone while preparing the osteotomy.
Prosthetic considerations

In any type of defect, the fixtures should be placed with the planned prosthetic framework in mind. The angle of the implants should allow an emergence profile allowing for proper bar design without interfering with the ideal sculpture of the prosthesis. Misplaced implants may cause a poor esthetic outcome. Proper spacing and angles of the implants is necessary to allow the manipulation of the prosthetic screws using the needed drivers.

Abutment connection and impression taking:

The final abutments are placed approximately 4 weeks following the stage II surgery. This will allow the resolution of the soft tissue swelling around the temporary healing abutments installed at second stage surgery. The impression can be taken at this time.

Abutment types:

In majority of the cases the “standard abutment” is used as it allows the most freedom for the draw of the prosthetic substructure. In certain orbital cases, “multiunit abutments” may be considered. The Maxillofacial Concept™ Software can assist in the pretreatment determination of the path of insertion of the hard ware based on the treating teams ability to manipulate and treatment plan the best possible position for placement of the implants taking into consideration both surgical and prosthetic principles.
Healing period

The intra oral as well as the extra oral implant surgery is performed in the traditional 2 stage manner. After installation of the implants, cover screws are placed and the implants are submerged. All attempts are made not to load the surgical sites during the osseointegration period.

Stage II, for intra-oral implants, uncovering of the implants through the intra-oral mucosal tissue is performed 7 months after installation of the fixtures. Exposure of the extra-oral implants through the cutaneous tissue is performed 4 months following the stage I surgery.
Management of the irradiated patient

In cases of the irradiated patient planned for placement of intra oral and or extra oral implants, hypobaric oxygen treatments (HBO) should be considered.

The general protocol for HBO treatment in this group includes; 20 dives prior to the fixture placement followed by 10 additional dives after the placement of the fixtures.

The osseointegration period for the extra-oral implants is extended to 6 months in the irradiated patients.
Long term maintenance

Extra-oral application:
In order to increase the long term success of the extra-oral implants, maintenance of healthy cutaneous cuff around the extra-oral abutments is crucial. Daily cleansing of the percutaneous abutments using cotton swabs moistened with peroxide followed by application of chlorhexadine has shown to be sufficient. A soft bristled brush may also help in removal of debris. It is important to avoid the use of sharp or metal instruments around the percutaneous abutments. The prosthesis should also be cleansed daily using soap and water. Care should be taken to maintain a clean surface in order to avoid damage to the prosthesis. Bacteria and or fungal colonization on the surface of the prosthetic may cause skin irritation too. Sleeping with the prosthesis removed allows ventilation around the percutaneous abutments and should be encouraged.

Classification of skin Condition:
0 = No irritation
1 = Slight redness
2 = Red and slightly moist tissue.
3 = Red and slightly red tissue with presence of granulation issue around he percutaneous cuff.
4 = Overt signs of infection with fixture mobility.
Management of skin conditions:

• For grade 1 conditions: Application of Terracortil with Polymyxin B (An ointment with hydrocortisone acetate, oxytetracycline hydrochloride and Polymyxin n B sulphate).
• For grade 2 conditions: Terracortil
• For grade 3 conditions: Local soft tissue revision should be performed.
• For grade 4 conditions: Removal of the affected fixture.

Management of the Skin tissues around the extra-oral abutments:

Minimal soft tissue trauma during the surgical phase of the reconstruction in conjunction with the thinning of the subcutaneous tissues is critical for the long term maintenance of the extra-oral implants. Minimizing motion around the abutments by application of a pressure dressing will also help in stabilizing the soft tissue adaptation around the extra-oral abutments. The use of antibiotics and hydrocortisone applied to the pressure dressing will aid in reducing the inflammation as well as prevent bacterial colonization post operatively.
Epidemiology

Non-radiated Patient:
Treatment of patients with Maxillofacial defect using osseointegrated implants have been studied in multiple International centers. Success rates of 94.4%, 96.3% and 97% have been reported by these centers in the non-radiated patients.

- FDA Study, 24 Centers, Tolman D, Taylor P, IJOMI, 1996

Irradiated Patient:
Success of maxillofacial implants in the irradiated patients range from 57.9–64.7% as reported by Dr Parel.
A later study confirmed these outcomes by reporting a success rate of 62%.


“Through our broad based cooperation with International clinical teams, we can continue to spread the knowledge about osseointegration. At the same time we are, ourselves, enriched by meeting new and competent co-workers.”

PI Bränemark
Clinical case 1

1. Necrotic midface secondary to neoplastic lesion.

2. Post debridment surgery.

3. Placement of Quad zygoma implants.

4. Implant retained prosthetic bar, Dental prosthesis and facial

5. 6 years post reconstruction.
Clinical case 2

1. Pre-operative frontal view

2. Patient is missing her maxilla, nasal septum and nose.

3. Prosthetic substructure in place

4. Implant and prosthetic substructure

5. Patient with her grandchildren, 15 years post reconstruction
Clinical case 3

1. Pre-op showing orbital-nasal communication

2. Lateral orbital fixtures and obturator sealing the orbital-nasal communication

3. Orbital prosthesis; Magnet retained

4. Post-operative frontal view

5. Symmetrical orbital profile
Clinical case 4

1. Pre-operative frontal view
2. Post-operative film showing 3 fixtures placed
3. Retaining bar secured to fixtures
4. Clip retained nasal prosthesis
References


