Providing Edentulous Patients Optimal Design and Options in Implant Retained/Supported Prostheses

Samantha W. Chou, D.M.D.
2325 N. Southport Ave.
Chicago, Illinois 60614
Phone: 312-608-6881
Fax: 773-296-0601
Samanthawchou@gmail.com
What is our role as the dentist?
"We live in a culture in which people are often judged by their facial expression, especially the smile as an indication of intelligence, competence, inner reflections, thoughts and emotions."

Harold Slavkin, D.D.S. Director, National Institute of Dental and Craniofacial Research.
What do our patients ask of us?

- People want to look good - more so now than ever
- People want to be able to chew
- Improved oral health
- Improved overall health and well being
- People have active lifestyles during their treatment
Our Role as the Dentist

- Exam and diagnose
- Be attentive to patient’s needs and desires
- Be aware of the current treatment philosophies
- Be able to compare and contrast advantages vs. disadvantages of various treatment options
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
The patient’s
1. Complaints,
2. Anatomy,
3. Desires, and
4. Financial commitment
determine the amount of implant support, retention, and stability required.
ANATOMY OF THE EDENTULOUS MAXILLA
• Supporting Structures
  • Bone (residual ridge)
  • Incisive foramen
  • Maxillary tuberosity
  • Sharp spiny processes
  • Torus Palatinus
ANATOMY OF THE EDENTULOUS MANDIBLE
- Crest of residual ridge
- Buccal shelf
- Retro-molar pad
- Mylohyoid ridge
- Mental foramen
- Genial Tubercles
- Torus Mandibularis
The needs, concerns, and expectations of patients often exceed the mere restoration of oral function.

It is therefore essential to have a clear understanding of smile zone and functional and skeletal anatomy for more effective treatment planning.

Myron Nevins and James Mellonig

Implant Therapy: Clinical Approaches and Evidence of Success
MAXILLARY/ MANDIBULAR PROSTHETICS

- Mandibular Prosthetic options are governed by availability of bone and function.
- Maxillary Prosthetic options are dictated by function and esthetics.
PROSTHETIC OPTIONS

- Denture
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  - Implant retained/supported, tissue supported
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  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
Maxillary Denture

- Examine the maxillary ridge morphology
  - Ridge height
  - Vestibular depth (anterior and buccal)
  - Frenum attachments
  - Palate morphology
  - Maxillary tuberosity definition
  - Pterygomaxillary notch definition
  - Palatal throat form (does the soft palate drop)
  - Vibrating line position
  - Sufficient space between coronoid process and tuberosity?
Mandibular Denture

- Examine the mandibular ridge morphology
  - Ridge height
  - Vestibular depth (anterior and buccal)
  - Frenum attachments
  - Muscle attachment
  - Arch form
  - Buccal shelf
  - Lateral throat form
Diagnostic/ Final impression

Make sure the anatomical landmarks are captured
PATIENT PROSTHETIC COMPLAINTS

- Dentures are loose
- Dentures do not fit adequately
- Cannot feel or taste food appropriately
- Dislike removable appliances
- Dentures are more high maintenance
- Psychological effects of dentures
If residual ridge morphology is severely resorbed, unable to fabricate complete dentures that are retentive or stable.......
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
Advantages of Implant Overdentures

- Prevent bone loss
- Maintain facial esthetics
- Reduce or eliminate prosthesis movement
- Create reproducible CO
- Eliminate soft tissue abrasions
- Improve chewing efficiency
- Increase occlusal forces
Advantages of Implant Overdentures

- Increase prosthesis Retention, Stability and Support
- Improve speech
- Reduce or eliminate denture size
- Remove easily at night to control nocturnal parafunction
- Repair easier than fixed prosthesis
- Shorter prosthetic appointments
BIOMECHANICS AND PROSTHODONTICS

- RETENTION
  - Quality inherent in the prosthesis acting to resist the forces of dislodgement along the path of placement.
RETENTION
BIOMECHANICS AND PROSTHODONTICS

- RETENTION
  - Quality inherent in the prosthesis acting to resist the forces of dislodgement along the path of placement.

- SUPPORT
  - Resistance to occlusal function; the foundation on which a prosthesis rests. Resistance to occlusal load.
BIOMECHANICS AND PROSTHODONTICS

- **RETENTION**
  - Quality inherent in the prosthesis acting to resist the forces of dislodgement along the path of placement.

- **SUPPORT**
  - Resistance to occlusal function; the foundation on which a prosthesis rests. Resistance to occlusal load.

- **STABILITY**
  - The quality of a prosthesis to be firm, steady, or constant, to resist displacement by functional horizontal or rotational stresses.
STABILITY
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
Maxillary Overdenture

- IMPLANT RETAINED TISSUE SUPPORTED
  - Anatomical conditions are good to excellent
  - Patient’s needs and desires are minimal: primarily related to lack of retention
  - Cost is a primary factor
  - Prosthesis all tissue supported, retained by implants
  - Common type of attachment used for this prosthesis is a locator, O-ring (“ball and socket”) or an ERA
Mandibular Overdenture

- IMPLANT RETAINED TISSUE SUPPORTED
  - Implants in position of canines, independent of each other in final prosthesis,
  - Allows prosthesis saggittal rotation, no horizontal rotation
  - Posterior ridge must have good anatomy, stability and denture retention
  - Prosthesis all tissue supported, retained by implants.
  - Common type of attachment used for this prosthesis is an Locater, O-ring ("ball and socket") or an ERA
Implants should be parallel to each other and perpendicular to the occlusal plane, at the same horizontal height.
Implant retained/ Tissue supported Overdenture

- Advantage: Cost
- Disadvantage:
  - Poor implant support and stability
  - Increase in prosthetic maintenance
Mandibular Overdenture

- **IMPLANT RETAINED TISSUE SUPPORTED**
  - Implants in the same position as the locator/ O-ring prostheses, but implants are splinted together by a bar without any distal cantilever.
  - Reduced loading forces than individual implants
  - Anatomical conditions are good to excellent
  - Posterior ridge must have good anatomy, stability and denture retention
  - Patient’s needs and desires are minimal
  - Patient can afford new prosthesis and connecting bar
BAR ALLOWS THE ANTERIOR CURVE OF THE ARCH RESULTS IN AN IMPROVED LINGUAL CONTOUR OF THE RESTORATION

BAR SHOULD NOT HAVE CANTILEVER TO THE DISTAL SIDE OF THE IMPLANTS

HADER BAR ATTACHEMENT WILL ALLOW MOVEMENT OF THE PROSTHESIS TO REDUCE FORCE ON THE BAR
- Greatest failure of implants is due to occlusal overload
- The metal connecting bar needs passive fit
- Take PA x-rays to verify seating
- Cut and solder if necessary
- Denture is tissue supported, implant retained
- Bar design must allow for sagittal rotation, if not posterior region will be a cantilever
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
Maxillary Overdenture

- IMPLANT RETAINED-SUPPORTED, TISSUE SUPPORTED
  - 4 implants are placed, joined by a rigid bar
  - Implant positions allow for a cantilever
  - Denture has less rotation, only that permitted by the bar attachments
  - Palate of the overdenture is maintained for tissue support
Palate is reinforced to prevent prosthesis fracture and also to prevent distal cantilever from placing too much occlusal load on the bar.
Maxillary Overdenture

- IMPLANT RETAINED-SUPPORTED, TISSUE SUPPORTED
  - Excellent retention and stability
  - Opposing occlusion must be stable
  - Design of this denture is according to implants A-P spread, opposing occlusion and patient’s previous dental history
Mandibular Overdenture

- IMPLANT RETAINED-SUPPORTED, TISSUE SUPPORTED

- Moderate to poor posterior anatomy
- Lack of retention and stability in the traditional denture
- Soft tissue abrasion from the traditional denture
- Speech difficulties from the traditional denture
- More demanding patient type
- 4-5 implants are placed, joined by a rigid bar
- Denture has less rotation, only that permitted by the bar attachments
PROSTHETIC OPTIONS

• Denture
• Over-denture
  • Implant retained, tissue supported
  • Implant retained/supported, tissue supported
  • Implant retained/supported
• Fixed-Removable Prosthesis
  • “All on 4” Hybrid prosthesis
• Fixed Prosthesis
Maxillary Overdenture

- **IMPLANT RETAINED-SUPPORTED**
  - Moderate- severe problems with traditional dentures
  - Needs or desires are demanding
  - Need to increase bulk of prosthesis
  - Inability to wear traditional prosthesis
  - Desire to abate bone loss
  - Unfavorable anatomy for complete dentures
  - Problems with function and stability
SECONDARY STRUCTURE OF THE MARIUS BRIDGE IS EMBEDDED IN THE REMOVABLE PORTION OF THE PROSTHESIS.
O- RINGS ON CAST PALLADIUM BAR
Maxillary Overdenture

- IMPLANT RETAINED-SUPPORTED PALATLESS OVERDENTURE

- The palate can be removed only if the A-P spread is adequate
- If not enough support and stability a partial palate will be maintained
LOCATOR ABUTMENTS ON CAD/CAM MILLED TITANIUM BAR
IF PATIENT DOES NOT WANT CO-CR METAL REINFORCEMENT, CAN EMBED TITANIUM MESH WITHIN THE ACRYLIC TO REINFORCE OVERDENTURE
Mandibular Overdenture

- IMPLANT RETAINED-SUPPORTED

- 4-6 Implants joined rigidly by a bar
- Cantilever is used
- Posterior bearing areas are not adequate
- Implants give enough support to avoid tissue contact
- Movement is minimum, only that permitted by attachments.
Mandibular Overdenture

- **IMPLANT RETAINED-SUPPORTED**

- Excellent retention and stability
- Opposing occlusion must be stable
- Design denture according to A-P spread and opposing occlusion
Disadvantages of Implant Overdenture

- Psychological (need for non-removable teeth)
- Prosthetic space required
- Long-term maintenance
  - Attachment
  - Relines
  - New prosthesis every 7 years
- Food impaction
- Movement, permitted by the attachments
Advantages of Implant Overdenture over Fixed Prosthesis

- Esthetics is easier to control providing more soft tissue support with labial flanges and denture teeth than with metal and porcelain in the fixed prosthesis.

- When parafunction is present, the prosthesis may be removed at night helping in the treatment.
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
FIXED-REMOVABLE PROSTHESIS

• Fixed-Removable Prosthesis
  • 4 or more implants
  • Cannot be removed by patient, only by dentist
  • Prosthesis is completely implant retained/supported
  • CAD/CAM milled bar or casted bar that has a processed denture over it
THE GREATER THE AP DISTANCE, THE MORE FAVORABLE THE SITUATION FOR A POSTERIOR CANTILEVER

A-P spread
FIXED-REMOVABLE PROSTHESIS

- Opposing dentition stable
- Prosthesis does not allow any type of rotation
- A-P spread must be adequate for posterior cantilever
What is an “All-on-4”?
All on 4 Prosthetic Technique utilizes the Immediate Load Concept
Introduction to All-on-4™

**Principle**
Four implants (two straight implants in the anterior and two angled implants in the posterior) supporting a provisional, fixed and immediately loaded full-arch prosthesis

**Indications**
Edentulous mandible or maxilla, terminal dentition

**Surgical Access**
- Open flap

**Available Implant Systems**
- All Nobel Biocare implant systems with Multi-Unit Abutments
Principles of All-on-4™

When speaking of the “All-on-4” history, research and application, it should really be divided up into the following pieces:

• immediate loading of the fully edentulous mandible
• immediate loading of the fully edentulous maxilla
• support for a full arch fixed restoration on 4 implants instead of the more common 6-8 for the maxilla and 5-6 for the mandible
• use of tilted implants in the posterior to avoid bone grafting
All-on-4™ Benefits

Benefits of Angled posterior implants:

• Help avoid relevant anatomical structures and can be anchored in better quality anterior bone
• Offer improved support of the prosthesis by reducing cantilevers
• Reduce the need for bone grafting by increasing bone-to-implant contact

Final restoration:

• Full-arch restoration with only 4 implants
• Fixed and removable final prosthetic solutions
• Flexible solutions

Efficient Treatment Flow:

• Immediately loaded for shorter treatment times and improved patient satisfaction
Dr. Paolo Malo is credited with developing the All-on-4 technique using Nobel implants that were specifically designed by him to provide torque.
2 weeks post op
PROSTHETIC OPTIONS

- Denture
- Over-denture
  - Implant retained, tissue supported
  - Implant retained/supported, tissue supported
  - Implant retained/supported (Marius Bridge)
- Fixed-Removable Prosthesis
  - “All on 4” Hybrid prosthesis
- Fixed Prosthesis
FIXED PROSTHESIS

- The patient wants to have non removable restorations
- Bone quantity and quality have to be optimal, if not, augmentation procedures will be necessary
- Lip support is close to adequate (no need of acrylic)
- Patient is committed to a long, complicated and expensive treatment
FIXED PROSTHESIS
Fixed Prosthesis
FIXED PROSTHESIS
FIXED PROSTHESIS

- The case is approached in a different manner
  - Provisionals
  - Bone grafting
    - Sinus Augmentation
    - Vertical and Horizontal Ridge Augmentations
  - Implant placements
  - Soft Tissue Management
  - Final Prosthesis
FIXED PROSTHESIS

- During treatment planning, if all remaining teeth in an arch needs to be extracted and patient would like to have fixed provisionals.
- Extractions and implant placements can be done in stages to allow fixed provisionals during treatment period.
### Treatment plan for the Edentulous Maxilla

<table>
<thead>
<tr>
<th>Arch Form</th>
<th>Number of Implants</th>
<th>Implant position in the premaxilla</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square</td>
<td>6</td>
<td>2 implants in Canines</td>
</tr>
<tr>
<td>Ovoid</td>
<td>7</td>
<td>2 canines and 1 incisor</td>
</tr>
<tr>
<td>Tapering</td>
<td>8</td>
<td>2 canines and 2 incisors</td>
</tr>
</tbody>
</table>
Maxillary arch form

<table>
<thead>
<tr>
<th>Square</th>
<th>Ovoid</th>
<th>Tapering</th>
</tr>
</thead>
<tbody>
<tr>
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<td><img src="image2.png" alt="Ovoid" /></td>
<td><img src="image3.png" alt="Tapering" /></td>
</tr>
</tbody>
</table>
Advantages of Fixed Prosthesis

- Psychological: “feels like teeth”
- Less prosthetic maintenance
  - Attachments
  - Relines
  - New Overdenture
- Less food entrapment
Mandibular Dynamics

- The mandible flexes towards the midline on opening or during protrusive movements as a result of the internal pterygoid muscle attachments on the ramus.
- The mandible also torques when the inferior border rotating out and up and the crestal region rotating lingually - the movements is caused by the masseter muscles during forceful biting or parafunction.
Mandibular Dynamics

- The flexure of the mandible during opening and protrusive movements occurs distal to the mental foramen.
- The amount of flexure depends on the bone volume and sites in question.
- From the first molar to the first molar region, the medial movement maybe 800 microns.
Implants that are placed behind mental foramen cannot be splinted together.

Fabricate three independent prosthesis or more when greater mandibular body movement is expected due to parafunction.