Surgical Techniques to Enhance Prosthetic Rehabilitation -- Oral and Dental Oncologic Principles

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History

- Artificial facial parts found on Egyptian mummies
- Ancient Chinese known to have made facial restorations
- Grover Cleveland and Sigmund Freud
- 1953 -- American Academy of Maxillofacial Prosthetics founded
Overview

- Maxillofacial prosthetics a branch of prosthodontics
- General prosthodontics a branch of dentistry
- Goal is functional and cosmetic rehabilitation
Maxillofacial Prosthetics

• “the art and science of anatomic, functional, or cosmetic reconstruction by means of nonliving substitutes of those regions in the maxilla, mandible, and face that are missing or defective because of surgical intervention, trauma, pathology, or developmental or congenital malformations”
Types of Rehabilitation

- Preventative
- Restorative
- Supportive
- Palliative
Prosthetic vs. Surgical Rehabilitation

• Individualized decision between patient and doctor
• Removable prosthesis allows for cancer surveillance
• Not mutually exclusive
Intraoral versus Extraoral

- **Intraoral -- mostly functional**
  - Mandible
  - Maxilla

- **Extraoral -- cosmetic**
  - Ear
  - Nose
  - Orbit
Psychosocial Issues

- Ultimate goal is restoration of quality of life
- Functional deficits may be as isolating as cosmetic ones (i.e. has to eat alone)
Psychosocial Issues
Table 1. Pretreatment Characteristics of Best Candidates for Successful Postoperative Period and Rehabilitation

- Good past medical and surgical experience
- Good relationships with family members
- Good social relationships in general
- Good relationships with previous physicians
- Ability to verbalize fears openly
- Good adaptation to previous stressful situations
- Good work records

*(Adapted from Miller RN: Psychological problems of patients with head and neck cancer. In Rehabilitation of the Cancer Patient. Chicago, Year Book Medical Publishers, 1972.)*
Preoperative Evaluation

- Discussion of patient’s expectations and desires
- Consultation with appropriate services
- Preoperative imaging
- Status of current teeth and XRT
Poor Oral Hygiene
Dental Impression

- Surgeon has marked resection for prosthodontic planning
Radiation and teeth

- Obliterative endarteritis
- Xerostomia -- rampant dental caries
- Meticulous oral hygiene -- fluoride
- Hyperbaric oxygen if surgery needed
- Osteoradionecrosis
Radiation

• Prosthesis may assist in consistent positioning of tongue, lips
Carious teeth after radiation
FIG. 70-2. The universal numbering system for the permanent dentition begins with the maxillary right third molar. Similarly, the 20 teeth of the deciduous dentition are lettered from A to T, beginning with the maxillary right second deciduous molar.
Universal Tooth Numbering
Normal function of Oral Cavity

• Speech
• Mastication
• Deglutition
Speech

• Complex process
• Oral-nasal partition
• Palatal augmentation prosthesis can lower palate to provide better function for a compromised tongue
Deglutition (Swallowing)

- Tongue pulsion
- Nasopharyngeal closure
- Pharyngeal clearance
- Airway protection
- UES opening
Palate Augmentation Prosthesis
Palate Augmentation Prosthesis
Soft Palate

• Serves to intermittently couple and uncouple oral and nasal cavities
  – production of consonant phonemes
  – during deglutition
• May be better to remove all versus part unless needed for prosthesis retention
Soft Palate

- May be better to remove all of soft palate than partial resection
• Extension obturates nasopharynx
Soft Palate Prosthesis

- Small hole may be plugged
- May close enough with time for flap closure
Mastication

- Precursor to deglutition
- Involves
  - Reduction of food particle size
  - Sorting of food particles
- Masticatory efficiency = ability to reduce food to a given size in a given time
Mastication

• Masticatory efficiency related to occlusal surface
• Superior masticatory efficiency leads to greater reduction of particle size at swallowing threshold
• Afferent sensory input improves efficiency
  – Experiment: unilateral anesthesia
Prosthetic Teeth and Masticatory Efficiency

• Fixed partial, rigid support
• Removable partial supported by
  – teeth only
  – teeth and edentulous ridge
  – edentulous ridge only
FIG. 126-2. Areas that may support prosthesis should be conserved, consistent with disease removal. In the maxilla, these areas include the tuberosity, alveolar ridge, and hard palate. In the mandible, they are the retromolar pad, alveolar ridge, and buccal shelf.
Maxillary defects

- Maintain Premaxilla
  - can clasp teeth further apart
  - force distributed among more teeth
- Use palatal mucosa if possible
- May need to take turbinates
Premaxilla Preserved
Premaxilla Preserved

- Cut through tooth socket
Palatal Mucosa Preserved
Mucosa Not Preserved

- Rough edge uncomfortable for patient
Obturator

- Restores oro-nasal partition
- At times can be added to prior dentures
Skin Grafting of Defect

- Less pain while healing
- Less contracture of scar band which obscures cancer surveillance
- Accomodates obturator better
Maxillary Prosthesis

- Articulates with scar band
- Hollowed to be lightweight
Maxillary Prosthesis

- Can be made with a reservoir to hold artificial saliva
Timing

• Immediate (Intraoperative)
  – hold in packs
  – provide early function

• Interim

• Definitive
  – 3 to 6 months
Prosthetic Materials

• Acrylics
• Polyurethanes
• Silicone Elastomers
  – Room-temperature vulcanizing
  – High-temperature vulcanizing
Mandible

- Mandibular reconstruction revolutionized by microvascular and plating techniques
- Prosthetics mainly restore occlusion and occlusal surface
- Implants able to restore high degree of function
Mandible

- Skin graft preserves alveolar ridge for denture support
Postoperative Malocclusion

- Deviates to surgical side
Maxillary Ramp
Maxillary Ramp
Guide Plane Prosthesis
Guide Plane Prosthesis
Physiotherapy
Physiotherapy
Adjunctive Preprosthetic Measures

- Vestibuloplasty
- Lowering of Floor of Mouth
- Implants
Lowering the Floor of Mouth

- Goal is to reposition mylohyoid muscle
Lowering the Floor of the Mouth
Edentulous Mandible
Mental Foramen
Implants
Implants

- Branemark in the 50's studying bone temp during drilling
- Found temp probes couldn’t be removed from bone without fracturing
- Led to study of osseointegration
Implants

- Made of titanium
- Have to be drilled at low speed
- Oxide on metallic surface is dipole
- Plasma proteins adhere
Implants

• Implant placed first -- closed primarily
• Abutment placed 4-6 mo later
• Appliance attached
  – rigidly
  – removable
  – samarium-cobalt magnets
Implants

• Factors that influence success
  – material
  – macrostructure
  – microstructure
  – implant bed
  – surgical technique
  – loading conditions
Implants

Implants in irradiated patients

Number of implants

Integrated

Lost

Temp
Front
Zyg
Max
Mand
Implants in Irradiated Patients and HBO
• Implants can be placed in grafted fibula
Implants

- Want to avoid large step-off if possible
Extraoral Prostheses
Extraoral Prostheses -- General Principles

- Goal is cosmetic
- Retained with
  - adhesives
  - implants
- Skin grafting may help
- Smooth edges
Extraoral Prostheses -- Ear

- Retain tragus if possible to camouflage anterior border
Extraoral Prostheses -- Ear
Extraoral Prostheses -- Ear
Extraoral Prostheses -- Ear

- Tragus hides attachment
Extraoral Prostheses -- Orbit

- Skin graft provides base for prosthesis
Extraoral Prostheses -- Orbit

- Glasses help hide margin
Extraoral Prostheses -- Nose

- Skin graft provides base for prosthesis
- Alar tag undesirable
Extraoral Prostheses -- Nose
Extraoral Prostheses -- Nose
Extraoral Prostheses -- Nose
Conclusion

• Restore function and cosmesis
• Use techniques during surgery to aid prosthetic management
• Consultation with maxillofacial prosthodontist for optimal rehabilitation
Case Presentation

• 30 yo WM with palatal tumor
• Otherwise healthy
• Path SCCa
Case Presentation