Abstract
Prosthodontics is a branch of dentistry that deals with congenital and acquired defects of the head and neck. Maxillofacial prosthetics integrates parts of multiple disciplines including head and neck oncology, congenital malformation, plastic surgery, speech, and other related disciplines. This article deals with restoration of acquired defects, which may be intraoral or extraoral. Intraoral defects may involve the mandible, tongue, soft palate, or hard palate, while extraoral defect.

Introduction:

Intraoral Defects
Mandibular Defects
Cantor and Curtis classified mandibular defects into 6 different categories based on extent of the defect and the method of restoration in edentulous patients.
Class I - Radical alveolectomy with preservation of mandibular continuity
Class II - Lateral resection of the mandible distal to the cuspid area
Class III - Lateral resection of the mandible to the midline
Class IV - Lateral bone graft and surgical reconstruction
Class V - Anterior bone graft and surgical reconstruction
Class VI - Anterior mandibular resection without surgical reconstruction

Treatment of mandibular defects
Surgical reconstruction using a bone graft is the best approach that a surgeon can take to correct defects of the mandible. The bone graft restores continuity to the mandible and provides a prosthesis-bearing area. However, surgical reconstruction may be contraindicated in patients receiving radiation therapy or in individuals with residual tumors.
If mandibular resection involves the lower border of the mandible, the remaining segments deviate toward the defect side, backward, and upward. Using intermaxillary fixation for 5-7 weeks following the resection can reduce the deviation. The placement of a resection guidance appliance can also help minimize the deviation. These appliances are temporary and are removed once acceptable occlusal relationship and proper proprioception are attained.

Surgical reconstruction of mandibular defects through myocutaneous, osteomyocutaneous, or microsurgical techniques is the treatment of choice for establishment of mandibular continuity. However, use of bone graft alone seldom provides an optimal base for removable prostheses. Optimal treatment involves placement of endosseous implants in the bone graft, which help to anchor removable or fixed prostheses. The implants also minimize bone resorption and add to patient comfort.

When surgical reconstruction is contraindicated because of the presence of residual tumors or the patient's poor physical condition, perform prosthetic rehabilitation of the partially edentulous mandible with a mandibular guidance prosthesis. Optimally, design of such prosthesis incorporates a rigid major connector and allows the device to obtain major support from adjacent soft tissue and teeth. In edentulous mandibulectomy, extending the denture into the soft tissue area on the resected side beyond the bony resection forms an outrigger that helps make the denture stable. On insertion of this denture, an occlusal ramp may be added to the palatal side of the maxillary teeth on the nonresected side. This ramp helps guide the mandible to the desired occlusion during closure. In both edentulous and dentulous patients, attempt to close the bite as far as possible in order to facilitate insertion of a food bolus and to minimize stress transmitted to the remaining ridges.

**Tongue Defects**

Tongue (glossal) defects can be partial or total. Factors influencing prosthetic prognosis of restoring the tongue include the presence or absence of teeth and the type of procedure that is combined with the glossectomy (eg, mandibulectomy, palatectomy, radiation therapy). Patients with partial glossectomy (ie, < 50% of tongue removed) suffer minimal functional impairment and require no prosthetic intervention. Removal of more than 50% of the tongue requires construction of a palatal or lingual augmentation prosthesis.

Total glossectomy causes a large oral cavity, loss of verbal communication, and pooling of saliva and liquid. Patients with a total glossectomy require a total tongue prosthesis. In dentulous patients, such a prosthesis can be attached to the mandibular teeth through a lower partial denture.\(^1\)

**Treatment of tongue defects**

In edentulous patients, tongue prosthesis can be retained to either a mandibular or maxillary denture. Common problems associated with tongue prosthesis include lack of salivary control and loss of ability to maneuver food from the buccal vestibule. Therefore, it is best to fabricate 2 prosthetic tongues, 1 for swallowing and 1 for speech.
A typical prosthetic tongue for speech is flat with wide anterior elevation, which aids in articulation of anterior lingual alveolar sounds (eg, /t/, /d/). The typical prosthetic tongue also has a posterior elevation, which aids in production of posterior lingual alveolar sounds (eg, /k/, /g/) and helps shape the oral cavity for improved vowel productions.

The tongue prosthesis for swallowing is made with a trough in its posterior slope to guide the food bolus into the oropharynx. A speech pathologist and, when necessary, a nutritionist should monitor all patients who have a glossectomy.

**Hard and Soft Palate Defects**

Hard and soft palate defects are best treated with obturator or speech aid regardless of the presence or absence of teeth. Saving as much of the maxillae as possible without compromising tumor resection is important. Retention of the premaxillae and/or key teeth (eg, cuspids, first molars) helps enhance prosthesis stability and support. Using a split-thickness skin graft to line the cheek flap enhances prosthesis tolerance. In addition, the mucodermal junction forms a lateral scar band, which helps retain and stabilize the prosthesis.

**Maxillectomy Rehabilitation**

In prosthetic rehabilitation of maxillectomy, the surgical obturator is placed immediately after maxillae resection. A wrought wire clasp, sutures, or screws attached to the remaining palatal bone can retain the obturator. The obturator helps maintain surgical packing, helps the patient speak and swallow, and adds to the patient's comfort and psychological stability.

Prior to resection, the surgical obturator is fabricated from the impression made of the maxillary arch. This cast is modified according to the planned surgery. From the modified cast, the surgical obturator is waxed and processed in clear acrylic resin and inserted immediately after surgery. After 5-7 days, the surgical obturator and packing are removed, the defect area is cleaned with mineral oil, and the surgical obturator is adjusted and relined with tissue-conditioning material. The patient then returns weekly for adjustment and change of relining material. Finally, the relined surgical obturator is duplicated in heat-cured, clear, acrylic resin. This process results in a cleaner interim obturator.

Delay fabrication of the final obturator until the surgical site is stable and fully healed. This process usually takes at least 4 months. Extend the lateral wall of the definitive prosthesis as high as possible in order to engage the scar band. This extension helps in retention and stability of the prosthesis. Several authors have recommended different techniques for enhancing retention of the maxillary obturator, including fabrication of a hollow bulb obturator, making the bulb without a top, use of a 2-part obturator, or use of a sectional obturator with a magnet. Use of dental implants in the remaining maxillae and/or in the zygomatic bone also helps in retention and stability of the prosthesis. Consider patients for surgical reconstruction if they are unable to use a maxillary obturator or if they underwent bilateral subtotal maxillectomy.²,³
**Treatment of patients that had radiation therapy**

Patients, who undergo radiation therapy to the head and neck region, will experience several effects of radiation to the oral cavity. These effects include mucositis, loss of taste, xerostomia and trismus. Patients who have ill-fitting dentures are instructed not to wear their dentures during the course of radiation therapy. Fabrication of new denture should be delayed until the oral soft tissue has adequately healed. Healing could take 3-12 month before the new dentures could be fabricated. Soft tissues should be manipulated very gently when developing the denture border extension. In addition, interocclusal record should be done at a decreased vertical dimension. This decreased vertical dimension allows less transfer of load to the supporting tissues as well as, it will help in compensating for decreased opening ability that is due to trismus.

The use of dental implants has been studied by several authors. Some authors recommended the use if hyperbaric oxygen treatment (HBO) prior to implant placement. Others don't recommend the use of HBO. Literatures seem to find equal implant success and failure rates regardless of the use of HBO. Overall, implants in radiated patients experienced a very high success rate that is slightly less than the success achieved in patients that had no radiation. The benefits gained by the use of implants are great. This makes it highly recommended to use dental implants in radiated patients whenever it is possible.

**Treatment of soft palate defects**

Prosthetic treatment of soft palate defects varies based on the extent and site of the defect. The goal of treatment is to attain velopharyngeal closure during function, which allows normal speaking and swallowing and keeps the patient relatively comfortable.

In edentulous patients, after the conventional maxillary denture is fabricated, a wire is attached to the palatal end of the denture and extended to the defect area. An impression of the defect area is attained and duplicated in clear, cold, cured acrylic, thus, forming the speech bulb. The speech bulb can be attached to a removable partial denture framework in the same manner for dentulous patients (see the image below). Following fabrication, the prosthesis is positioned in the mouth and checked for overextension using pressure-indicating paste and tissue-conditioning material. Evaluate the patient for comfort, breathing, and swallowing ability. Water leakage should not occur during swallowing of fluids. Both plosive sounds (eg, /p/, /t/) and nasal sounds (eg, /m/, /n/, /ng/) should be produced easily.

**Extraoral Defects**

Restoration of facial defects can be accomplished either surgically, prosthetically, or by using a combination of both methods. The choice of method depends on many factors (eg, size and location of the defect, age of patient). Surgical reconstruction is indicated when the defect is small in size, involves mobile structures (eg, eyelid, lip), or occupies the cranial vault, especially if the margins of the defect are clear of cancer.
The prosthetic approach is superior to the surgical approach if the defect is large or the blood supply to the area is compromised (e.g., nasal septal defects, tracheoesophageal fistula, radiated bed). Superior color match and patient acceptance, especially in nasal or auricular prostheses, make prosthetic rehabilitation superior to the surgical approach, especially if the defect is large in size.

It is important to use prosthetic materials with certain properties in order to achieve clinical success and patient acceptance. These properties include color stability, ease of fabrication, dimensional stability, and edge strength. Flexibility, low thermal conductivity, biocompatibility, and surface texture are also important. Silicones are the most widely used materials for facial restorations in the United States. The type most commonly used, RTV Silicone MDX-4-4210, has surface texture and hardness within the range of human skin.

Methods for attaching and holding facial prostheses must be as invisible as possible to make them aesthetically pleasing. Using tissue undercuts or attaching the prosthesis to the patient’s eyeglasses or dentures can help mechanically retain the device. Medical-grade adhesives or tapes are also under study for this purpose; however, they collect dirt and are unhygienic.

Endosseous implants placed in surrounding facial bone to help anchor different facial prostheses have been widely used. Implants in the mastoid process retain auricular prostheses. Orbital rim implants may anchor orbital prostheses, and implants placed in malar bone and/or the anterior nasal spine can be used to secure nasal prostheses.

References