Basic Principles of Obturator design for partially edentulous patients. Part I: Classification

What an obturator is???

Definition: Obturator is a prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate &/or contiguous alveolar structures. Prosthetic restoration of defect often includes use of a surgical obturator, interim obturator & definitive obturator. - GPT
Indications:

1. to act as a framework over which tissues may be shaped by the surgeon;

2. to serve as a temporary prosthesis during the period of surgical correction;

3. to restore a patient’s cosmetic appearance rapidly for social contacts;

4. to provide for an inability to meet the expenses of surgery;

5. when the patient’s age contraindicates surgery;

6. when the size and extent of the deformity contraindicates surgery;

7. when the local avascular condition of the tissues contraindicates surgery; and,

8. when the patient is susceptible to recurrence of the original lesion which produced the deformity.
USES OF OBTURATORS

- Provides a stable matrix for surgical packing
- Reduces oral contamination
- Speech is effective post-operatively
- Permits deglutition
- Reduces the psychological impact of surgery
- Reduce the period of hospitalization
1) Based on phase of treatment:-
   o Surgical obturators (immediate surgical obturators & delayed surgical obturators)
   o Interim obturators
   o Definitive obturators
2) Based on the material used:
   - Metal obturators
   - Resin obturators
   - Silicone obturators

3) Based on area of restoration:
   - Palatal obturator
   - Meatal obturators
Surgical obturator

- A temporary prosthesis used to restore the continuity of hard palate immediately after surgery or traumatic loss of a portion or all of the hard palate &/or contiguous alveolar structures like gingival tissue, teeth.-GPT

- It is of two types :-
  i. **Immediate surgical obturator** :- It is inserted at time of surgery.
  ii. **Delayed surgical obturator** :- It is inserted 7-10 after surgery
CLINICAL CONSIDERATIONS

- Surgical obturator is inserted on the day of surgery.

- A preliminary cast is obtained before surgery on which a mock surgery is performed.

- A clear acrylic plate is fabricated & inserted after surgery.

- If patient is dentulous, retention is obtained with simple clasps.
- If the patient is edentulous, the obturator is wired into alveolar ridge & zygomatic arch.

- The obturator is retained for 3-4 months post surgically.

- It is replaced with an interim or definitive obturator after complete healing of the surgical wound.
A prosthesis that is made several weeks or months following surgical resection of a portion of one or both maxillae. It frequently includes replacement of teeth in defect area. This prosthesis when used, replaces the surgical obturator that is placed immediately following the resection & may be subsequently replaced with a definitive obturator.-GPT
The defect is packed with gauze dipped in Vaseline to the level of the remaining tissue, then impression is taken with modified stock tray using elastic impression material.

The steps of construction are the same as in immediate obturator.
**Function:** helps in restoring

1. Speech.
2. Feeding.
3. Esthetics.
4. Prevent wound contamination.
A prosthesis that artificially replaces part or all of the maxilla & the associated teeth lost due to surgery or trauma:-GPT
Preparation of the mouth for obturator:

I. Extract hopeless teeth.

II. Periodontal therapy.

III. Restore carious teeth.
Definitive Obturators

Types of obturators:
1. Hollow bulb (*Closed*).
2. Roofless (*Open bulb*).
PALATAL OBTURATOR

- Closes or occludes opening caused by cleft or fistula
- Used to facilitate separation of oral & nasal cavities for speech, feeding, & swallowing & hypernasality
MEATAL OBTURATOR

- It is a special type of obturator that extends up to the nasal meatus.
- It establishes closure with nasal structures at a level posterior & superior to the posterior border of the hard palate.
- The closure is established against the conchae & roof of the nasal cavity.
- It separates oral & nasal cavities.
- Indicated in patients with extensive soft palate defects.
DISADVANTAGES OF MEATAL OBTURATORS

- Nasal air emission cannot be controlled because it is in an area where there is no muscle function.
- Nasal resonance will be altered.
Advantages of hollow bulb:

1. The weight of the prosthesis is reduced, making it more comfortable and efficient.
2. The lightness of the prosthesis changes one of the fundamental problems of retention and increases physiologic function.
3. The decrease in pressure to the surrounding tissues aids in deglutition and encourages the regeneration of tissue.
4. The light weight of the hollow bulb obturator does not add to the self-consciousness of wearing a denture.
5. The lightness of the prosthesis does not cause excessive atrophy and physiologic changes in muscle balance.
The need for the study of obturator design is evident because of:

- the increase in the number of partially edentulous patients undergoing partial resection of the maxilla,
- the increase in the life expectancy after surgery, creating a need for definitive restorations, and
- an ever-increasing percentage of younger patients in the maxillary resection patient population.
Classification
Class I

- The resection in this group is performed along the midline of the maxilla; the teeth are maintained on one side of the arch.

- This is the most frequent maxillary defect, and most patients fall into this category.
The defect in this group is unilateral, retaining the anterior teeth on the contralateral side.

The recommended design is similar to the design of a Class II Kennedy removable partial denture, in which indirect retention minimizes the possibility of dislodgement of the prosthesis under gravity.

The central incisor and sometimes all the anterior teeth to the canine or premolar are saved.
The palatal defect occurs in the central portion of the hard palate and may involve part of the soft palate.

The surgery does not involve the remaining teeth.

The design for these patients is simple, and retention, stabilization, and reciprocation can be effectively planned.
The defect crosses the midline and involves both sides of the maxillae.

There are few teeth remaining which lie in a straight line, which may create a unique design problem similar to the unilateral design of conventional removable partial dentures.
The surgical defect in this situation is bilateral and lies posterior to the remaining abutment teeth.

Labial stabilization may be needed, and splinting of remaining abutments is advisable.
It is rare to have an acquired maxillary defect anterior to the remaining abutment teeth.

This occurs mostly in trauma or in congenital defects rather than as a planned surgical intervention.

In this class, cross-arch stabilization is derived through a system of cross-arch bars which will provide wide distribution of support and retention from separated abutment teeth.
General principles for the design of obturator

1. The need for a rigid major connector;
2. Guide planes and other and other components that facilitate stability and bracing;
3. A design that maximizes support;
4. Rests that place supporting forces along the long axis of the abutment tooth;
5. Direct retainers that are passive at rest and provide adequate resistance to dislodgment without overloading the abutment teeth; and
6. Control of the occlusal plane that opposes the defect, especially when it involves natural teeth.

The class I category represents the classic maxillary resection defect where the hard palate, alveolar, ridge, and dentition are removed to the midline.

This unilateral defect is the one most commonly seen in the maxillofacial rehabilitative practice.

SUPPORT: it is provided and shared by the remaining natural teeth, the palate, and any structures in the defect that may be contacted for this purpose.
A metal framework with a linear design at the try-in stage for a Class I maxillary defect. Note that retention and bracing are diagonally opposed.

Goal is that functional load is distributed as equally as possible to each of these structures via rigid major connector.

A broad square or ovoid palatal form aids by providing a greater tissue bearing surface to resist upward forces (such as may be supplied by an occlusal load) and a greater potential for tripodization to improve leverage.

A tapering arch is less of an aid.
Rests are placed on the most anterior abutment (closest to the defect) and the mesio-occlusal surface of the most distal abutment tooth when alignment and occlusion will permit.

The mesio-occlusal posterior rest, most often located between adjacent posterior teeth, is accompanied by a rest on the disto-occlusal surface of the more anterior adjacent tooth.

This additional rest will prevent wedging and separation of the two adjacent teeth and will decrease the possibility of periodontal damage from food impaction.
Guide planes will assist in the precise placement of the prosthesis once the teeth have been contacted.

They will also ensure more predictable retention and add a greater degree of stability to the prosthesis.

Guide planes on the anterior abutment should be kept to a minimum vertical height (1 to 2 mm) to limit torque on the abutment teeth and should be physiologically adjusted.

This is important since movement can be expected during function because of the extensive lever arm provided by the defect and the dual nature of the support system.
An indirect retainer is usually located perpendicular to the fulcrum line (which connects the most anterior and most posterior rests) and as far forward as possible.

This is usually a canine or first premolar.

Indirect retainers allow maximum use of leverage to resist movement of the prosthesis in a downward direction by the pull of gravity acting on the defect side.
Retention is supplied by direct retainer designs that allow maximum protection of the abutment teeth during functional movements.

On the anterior abutment, a 19- or 20-gauge wrought wire clasp of the “I-bar” design is often used to engage a 0.25 mm undercut on the midlabial surface of this abutment.

Additional protection is afforded to this tooth by splinting it to one or two adjacent teeth with full crowns when possible or acid-etch composite resin techniques when crowns are not possible.
The posterior retainer is most often a cast circumferential clasp using 0.25 mm undercut on the buccal surface.
Class I: Linear arch form

- The linear design is used for the class I defect when there are no anterior teeth present or when one does not desire to use the anterior teeth.

- The remaining posterior teeth are usually in a relatively straight line.

- **SUPPORT:** In the linear design, support is provided by the remaining posterior teeth and the palatal tissues.

- The palate becomes more important in the linear design because the use of leverage to resist vertical dislodging forces is decreased.

- **RETENTION:** Retention is usually provided by the combined use of buccal premolar retention and lingual molar retention.
Class II

- Class II includes arches in which the premaxilla and the premaxillary dentition on the contralateral side is maintained.

- A single, unilateral defect is located posterior to the remaining teeth.

- This arch is similar to a Kennedy class II in that a bilateral, tripodal design can always be used.

- **Support**: it is provided by rests (located on the abutment nearest to the defect and farthest from the defect) as well as the palate.
CLASS II

design: tripodal

S: SUPPORT
R: RETENTION
B: BRACING
G: GUIDING PLANE
Ib: INDIRECT RETENTION
Support and stability are maximized by generating the largest tripodal design possible and again will be aided by a square or ovoid palatal form.

Double rests are used between adjacent posterior teeth.

Guide-plane location and size is similar to the class I situation with full use of the palatal surfaces of the posterior teeth.

An indirect retainer located opposite the fulcrum line and as far forward as possible usually is located on the canine or first premolar and completes the tripodal design.
• RETENTION: The abutment tooth located closest to the defect is critical for retention and should be engaged with a direct retainer design that resists downward displacement but tends to rotate, disengage, or flex when upward forces are applied.

• A cast circumferential clasp or an I-bar clasp is frequently used in a 0.25 mm undercut when the retentive terminus can be located on the fulcrum line.

• A 19-gauge wrought wire clasp in a 0.5 mm or, less mesiofacial undercut is also a frequent choice.

• Additional protection can be provided for this tooth by splinting it to the one or two teeth adjacent to it.
The posterior retainer is most frequently a cast circumferential clasp using a 0.25 mm distobuccal undercut.

The placement of posterior clasp assemblies facing in both an anterior and posterior direction will aid in retaining both the anterior and posterior portions of the prosthesis.

The canine is frequently the location of the indirect retainer and also serves as an additional (but optimum retentive site), engaged with a 19-gauge wrought wire if a 0.25 mm undercut.

The canine is important in receiving occlusally directed forces and will receive severe forces for which an additional clasp is required on the canine, it should be a more flexible clasp in less than the normal amount undercut or a less flexible clasp on the height of contour that frictional retention will be supplied.
Class III involves a midline defect of the hard palate and may include a variable portion of the soft palate as well.

The dentition is usually preserved, making this obturator prosthesis design simple and effective.

**SUPPORT:** Support is supplied by the remaining natural teeth via widely separated and bilaterally located rests.

The canines and molars are usually selected to generate the largest quadrilateral shape possible while avoiding alignment and occlusion and hygiene problems, and providing good esthetics.
Little or no support is expected from the palate or the defect.

Bilateral symmetry of the major connector design and avoidance of the rugae area is desirable when possible.

Guide planes are usually short because they are located on the palatal surfaces of the posterior teeth.

The proximal surfaces may be liberally used if edentulous spaces are present.

Very little movement of the prosthesis should occur in function; therefore, these guide planes may be long and physiologic adjustment should not be necessary.

Indirect retention is not required because each terminus is supported by a direct retainer; therefore, rotation around a common fulcrum should not occur.
A Class III obturator prosthesis in place.
**RETENTION:** Retention is often provided with cast retainers using 0.25 mm undercuts on the facial surfaces of the teeth.

These may be circumferential retainers, I-bars, or modified T-bars, depending on the location of the retentive sites, the esthetic requirements, and the presence of tissue undercuts.

Combination-type retainers can be used to an esthetic advantage because they can engage a deeper undercut (0.5 mm) and may thus be placed in a less conspicuous region.
Class IV situations involve the surgical removal of the entire premaxillae, leaving a bilateral defect anteriorly and a lateral defect posteriorly.

There are often a few remaining posterior teeth located in a relatively straight line, creating a unilateral linear design problem where leverage cannot be used to an effective degree.

**SUPPORT:** Support is usually provided by rests located centrally on all of the remaining teeth. Channel rests or multiple mesio-occlusal and disto-occlusal results are often designed.
The defect should also be engaged to use, as much as possible, any sites within the defect that may be contacted.

These are the midline of the palatal incision, when palatal mucosa has been preserved to cover this region, the floor of the orbit, the bony pterygoid plates, and the anterior surface of the temporal bone.

**RETENTION:** a mixture of buccal retention on the premolars and palatal retention on the molars is used in a fashion similar to the class I linear design.

This leads often to the same problems discussed in class II situations when a combination of buccal and palatal retention is used: loss of bracing and stabilization, increased rotation, and the creation of small irritating spaces in the major conector design.
The tissue surface of an obturator prosthesis constructed for a patient with a Class IV maxillary defect.
Retentive sites should be located on the facial surfaces of the remaining teeth and the lateral wall of the surgical defect via the superiolateral extension of the obturator section in the engagement of the lateral scar band.
This situation involves a bilateral posterior surgical defect located posterior to the remaining teeth.

Many or all of the teeth are present anterior to the defect.

Labial stabilization and the use of splinting, especially of the terminal abutments, is desirable.

**SUPPORT:** Support is provided by rests located on the mesioocclusal surface of the most posterior abutment. These rests define the fulcrum line around which most of the expected movement will occur.
If adjacent posterior teeth are involved, double rests are used.

Stabilization and bracing is provided by broad palatal coverage and contact with the palatal surfaces of the remaining teeth.

Indirect retention is provided by rests located as far forward of the fulcrum line as possible.

This usually places them on the central incisors, which often presents an occlusal problem that may require minor occlusal equilibration.

The location of the indirect retainer essentially converts the design to an efficient large tripod that uses leverage to resist downward displacement of the prosthesis.

Positive rest seats are a critical necessity to eliminate the strong labial force generated by the downward movement of the prosthesis,
A porcelain-fused-to-gold splint is used on the six anterior teeth and a hinge-gate obturator prosthesis is used to restore a Class V defect.
**Retention:** The I-bar retainer is ideally suited for this situation.

Located in a 0.25 mm midbuccal undercut very close to the fulcrum line, it provides for resistance to dislodgment and rotates in function.

When the remaining soft palate is scarred and relatively immobile it can also be used to provide added retention for the posterior portion of the prosthesis.

A swing-lock type of prosthesis is a design possibility in this situation, especially if the patient can tolerate splinting of all of the remaining teeth.
The class VI defect is a rare surgical creation. Most often it results from a congenital anomaly or trauma such as an automobile accident or a self-inflicted wound that removes the entire premaxillae (and may include a portion of one or both of the maxillae), leaving a single bilateral defect located anterior to the remaining teeth.

Surgical defects of this nature are usually small. Nonsurgical defects are usually large and difficult to manage.

**SUPPORT:** Support is provided by rests located on the disto-occlusal surfaces of the most anterior abutment teeth.

Double rests are used when adjacent posterior teeth are involved. Greater stability is provided by placing additional rests as far posteriorly as possible.
The most posterior rests, similar to the Kennedy class IV situation, may be considered indirect retainers, resisting the vertical downward displacement of the anterior segment of the prosthesis.

In extremely large class VI situations, indirect retention may not be possible.

The remaining natural teeth provide all of the support, with little support derived from the defect.

Guide planes are usually located on the proximal surfaces adjacent to the defect and should be kept to minimal length (1 to 2 mm) to avoid trauma to the abutment teeth during expected movements of the prosthesis.

Splinting with a cross-arch tissue bar is also a possibility.
Protection of the tooth next to the defect is attained by resection of the maxilla ‘away from the remaining tooth. Arrows point to the alveolar ridge next to the maxillary central incisor.
**RETENTION**: Retention is most often provided simply with cast retainers using 0.25 mm of facial undercut.

The I-bar located on the anterior abutment in a midfacial undercut close to the fulcrum line can function effectively.

Combination retainers may also be used on the anterior abutments for esthetic reasons or when protection of the anterior abutments is a consideration.

Effective accessory retention can also be achieved by extending the prosthesis anteriorly into the nasal aperture.

Cosmetic support of the nose and upper lip is also possible when adequate retention is present.
The Aramany classification system of postsurgical maxillary defects is a useful tool for teaching and developing framework designs for obturator prostheses.

In all situations, a quadrilateral or tripodal design is favored over a linear design because this allows a more favorable application of leverage design for the support, stabilization, and retention of the prosthesis.