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Review
Obturator prostheses for hemimaxillectomy patients

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SUMMARY Maxillary defects are created by surgical treatment of benign or malignant neoplasms, congenital malformation and by trauma. The size and location of the defects influence the degree of impairment and difficulty in prosthetic rehabilitation. Lack of support, retention, and stability are common prosthodontic treatment problems for patients who have had a maxillectomy. A prosthesis used to close a palatal defect in a dentate or edentulous mouth is referred to as an obturator. The obturator prosthesis is used to restore masticatory function and improve speech, deglutition and cosmetics for maxillary defect patients.

KEYWORDS: maxillary defect, support, retention, stability, obturator prosthesis

Introduction

Probably the most common of all intraoral defects are in the maxilla, in the form of an opening into the antrum and nasopharynx. Defects in the maxilla may be divided into these defects resulting from congenital malformations and the acquired defects resulting from surgery for oral neoplasms. This review considers the rehabilitation of acquired defects of the palate which are the result of trauma, disease, pathological changes, radiation burns, or surgical intervention. The opening produced may be quite small or it may include any portion of the hard and soft palate, the alveolar ridges, and the floor of the nasal cavity (Chalian *et al.*, 1971).

Post-surgical maxillary defects pre-dispose the patient to hypernasal speech, fluid leakage into the nasal cavity, and impaired masticator function.

In the total rehabilitation of the maxillectomy patient, the maxillofacial-prosthodontist has two primary objectives:

– to restore the functions of mastication, deglutition, and speech and

– to achieve normal oro-facial appearance (Beumer III *et al.*, 1979).

The prostheses needed to repair the defect is termed as a maxillary obturator. An obturator (Latin: obturare, to stop up) is a disc or plate, natural or artificial, which closes an opening or defect of the maxilla as a result of a cleft palate or partial or total removal of the maxilla for a tumour mass (Chalian *et al.*, 1971).

The goals of prosthetic rehabilitation for total and partial maxillectomy patients include separation of oral and nasal cavities to allow adequate deglutition and articulation, possible support of the orbital contents to prevent enophthalmos and diplopia, support of the soft tissue to restore the midfacial contour, and an acceptable aesthetic results (Wang, 1997).

Prosthodontic management of palatal defects has been employed for many years. The history of maxillary obturator prostheses is well documented. Ambroise Pare was the first to use artificial means to close a palatal defect as early as the 1500s. The early obturators were used to close congenital rather than acquired defects. Claude Martin described the use of a surgical obturator prosthesis in 1875. Fry described the use of impressions before surgery in 1927, and Steadman described the use of an acrylic resin prostheses lined with gutta-percha to hold a skin graft within a maxillectomy defect in 1956 (Desjardins, 1978; Huryn & Piro, 1989).

The indications for the use of an obturator:

An obturator may be used

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

– to serve as a temporary prosthesis during the period of surgical correction;
– to restore a patient's cosmetic appearance rapidly for social contacts;
– when surgical primary closure is contra-indicated;
– when the patient's age contraindicates surgery;
– when the size and extent of the deformity contra-indicates surgery;
– when the local avascular condition of the tissues contraindicates surgery;
– when the patient is susceptible to recurrence of the original lesion which produced the deformity (Nidiffer & Shipmon, 1957).

The obturator fulfils many functions:

– for feeding purposes
– it may be used to keep the wound or defective area clean, and may enhance the healing of traumatic or post-surgical defects;
– it may help to reshape and reconstruct the palatal contour and/or soft palate
– it improves speech or, in some instances makes speech possible
– in the important area of esthetics, the obturator can be used to correct lip and cheek contour
– it can benefit the morale of patients with maxillary defects
– when deglutition and mastication are impaired, it can be used to improve function
– it reduces the flow of exudates into the mouth
– the obturator may be used as a stent to hold dressings or packs post-surgically in maxillary resections. It reduces the possibility of post-operative haemorrhage, and maintains pressure either directly or indirectly on split-thickness skin grafts, thus causing close adaptation of the graft to the wound which prevents the formation of a haematoma and ultimate failure of the graft (Lang & Bruce, 1967; Chalian *et al*., 1971).

Obturators for acquired defects of palate

Almost all acquired palatal defects are precipitated by resection of neoplasms of the palate and paranasal sinuses. The extent of the resection is dependent on the size, location, and potential behaviour of the tumour (Curtis, 1967; Lang & Bruce, 1967).

Prosthodontic therapy for patients with acquired surgical defects of maxilla can be divided into three phases of treatment with each phase having different objectives (Beumer III *et al*., 1979; Wiens, 1990).

The surgical obturator

It is a base plate type appliance which is constructed from the pre-operative impression cast and inserted at the time of resection of the maxilla in the operating room.

The advantages of surgical obturation are as follows:
– The surgical obturator provides a matrix on which the surgical packing can be placed. The obturator maintains the packing in the proper relationship thus ensuring close adaptation of the skin graft to the raw surface of the cheek flap when grafting is used.
– The obturator reduces oral contamination of the wound during the immediate post-surgical period and may thus reduce the incidence of local infection.
– The obturator enables the patient to speak more effectively by reproducing normal palatal contours and by covering the defect.
– The obturator permits deglutition, thus the nasogastric tube may be removed at an earlier date.
– The obturator lessens the psychological impact of surgery by making the post-operative course easier to tolerate. The patient is reassured that rehabilitation has begun.
– The obturator may reduce the period of hospitalization.
– If desired, artificial anterior teeth may be added for aesthetics, so that when the patient recovers from the operation, the teeth and facial appearance are psychologically comfortable. The mental well-being of the patient is boosted considerably. (Lang & Bruce, 1967; Kipfmueller & Lang, 1972; Carl, 1976; Parel & Drane, 1976; Birnbach, 1978; Huryn & Piro, 1989).

There are several principles relative to the design of surgical obturators (Beumer III *et al*., 1979)
– The obturator should terminate short of the skin graft-mucosal junction.
– The obturator should be kept simple, lightweight and inexpensive.
– The obturator for dentate patients may be perforated at the interproximal extensions with a small dental bur to allow the obturator to be wired to the teeth at the time of surgery.
– Normal palatal contours should be reproduced to facilitate post-operative speech and deglutition.
– Posterior occlusion should not be established on the defect side until the surgical wound is well organized.
– In some patients, the existing complete or partial prosthesis may be adapted for use as an immediate surgical obturator. In edentulous patients, the existing

prosthesis should be inspected carefully to ensure that it will adequately obturate the surgical defect. Often it is necessary to extend the prosthesis with autopolymerizing acrylic resin to cover the margin of resection on the soft palate. After the prosthesis is adjusted, it is relined with an intermediate reline material. It is wired or pinned to the alveolar ridge or zygomatic arches and/or anterior nasal spine and sometimes circumzygomatic and frontal wiring is employed to support the affected side. Clear resin is suggested so that the extensions and possible pressure areas can be more easily visualized at surgery.

In dentate patients, retention may be obtained by wiring the prostheses to existing teeth. Retention from conventional clasp retainers may not be sufficient. The surgical obturator must not be removed for 7–10 days post-surgically (Beumer III *et al.*, 1979).

The temporary obturator

The temporary obturator is constructed from the post-surgical impression cast which has a false palate and false ridge and generally has no teeth. The closed bulb extending into the defect area is hollow. The patient is usually seen every 2 weeks because of the rapid soft tissue changes that occur within the defect during organization and healing of the wound. The new lining material is placed or changed. It is best to remove all of the old interim lining material because of porosity, leading to bacterial contamination and precipitation of undesirable odours and mucosal irritations.

A definitive obturator is not indicated until the surgical site is healed and dimensionally stable and the patient is prepared physically and emotionally for the restorative care that may be necessary.

There are several reasons for constructing a new obturator. First, the periodic addition of interim lining material increases the bulk and weight of the obturator and this temporary material may become rough and unhygienic. Secondly, if teeth are included in the resection, the addition of anterior denture teeth to the obturator can be of great psychological benefit to the patient. Thirdly, if retention and stability are inadequate, occlusal contact on the defect side may result in improvement of these aspects (Beumer III *et al.*, 1979).

The definitive obturator

Approximately 6 months after surgery consideration may be given to the construction of a definitive obturator prostheses. It is constructed from the post-surgical maxillary cast. This obturator has a false palate, false ridge, teeth and closed bulb which is hollow. Often the temporary obturator will need to function comfortably for as long as 6 months. The timing will vary depending on the size of the defect, the progress of healing the prognosis for tumor control, the effectiveness of the present obturator, and the presence or absence of teeth. Changes associated with healing and remodeling will continue to occur in the border areas of the defect for at least 1 year. Dimensional changes are primarily related to the peripheral soft tissues rather than to bony support areas (Zarb, 1967; Chalian *et al.*, 1971; Beumer III *et al.*, 1979).

To reduce and improve adhesion and retention, a hollow obturator bulb is required for cleft palate prostheses and for dentures following maxillectomies (Buckner, 1974).

General considerations concerning bulb design

– A bulb is not necessary with a central palatal defect of small to average size where healthy ridges exist.
– It is not necessary in the surgical or immediate temporary obturator.
– It should be hollow to aid speech resonance, to reduce the weight on the unsupported side, possibly to provide facial aesthetics and to act as a foundation for a combination of extraoral prostheses in communication with the intraoral extension.
– It should not cause the eye to move during mastication.
– It should be one piece, if possible, to provide better colour matching and maximal patient acceptance.
– It should always be closed superiorly. There are advantages and disadvantages to both forms (open and closed) of obturators. If the obturator is left open, nasal secretions accumulate leading to odour and added weight. If secretions do tend to accumulate, a small diagonal opening may be made between the inferior-lateral floor of the obturator through to the cheek surface for drainage. The other disadvantages of an open type hollow obturator include difficulty in polishing and cleaning the internal surface, from saliva, mucous crusts, food accumulation (unhygienic, foul smelling), and the inability to obtain support from the superior aspect in the defect area.
– It should not be so large as to interfere with insertion if the mouth opening is restricted (Chalian *et al.*, 1971; Beumer III *et al.*, 1979).

The advantages of a hollow bulb obturator

– The weight of the obturator is reduced, making it more comfortable and efficient.
– The lightness of the obturator improves one of the fundamental problems of retention and increases physiological function so that teeth and supporting tissues are not stressed unnecessarily.
– The decrease, in pressure to the surrounding tissues aids in deglutition and encourages the regeneration of tissue.
– The light weight of the hollow bulb obturator reduces the self-consciousness of wearing a denture.
– The lightness of the obturator does not cause excessive atrophy and physiological changes in muscle balance (Nidiffer & Shipmon, 1957; Brown, 1970; Parel & Drane, 1975; Beumer III *et al.*, 1979; Shimodaira *et al.*, 1998).

Numerous articles appear in the literature describing techniques for the fabrication of hollow obturators to decrease the weight of the prostheses and to make comfortable and well-tolareted prostheses (Payne & Welton, 1965; Ampil *et al.*, 1967; Brown, 1969; Chalian & Barnett, 1972; Buckner, 1974; Benington & Clifford, 1982; Orr, 1986; Benington, 1989; Wu & Schaaf, 1989; Schmaman & Carr, 1992; Didier *et al.*, 1993; Wang & Hirsch, 1997; McAndrew *et al.*, 1998).

The construction of the definitive obturator will vary with the type of resection and the presence or absence of teeth. If the obturator is not properly designed and constructed, the stress on the remaining hard and soft tissues may be pathological and may lead to premature loss of abutment teeth and chronic irritation of soft tissues.

Movement of the obturator prostheses

The obturator may be displaced superiorly with the stress of mastication and will tend to drop without occlusal contact. The degree of movement will vary with the number and position of teeth that are available for retention, the size and configuration of the defect, the amount and contour of the remaining palatal shelf, height of the residual alveolar ridge, the size, contour, and lining mucosa of the defect and the availability of undercuts. Lack of retention, stability and support are common prosthodontic treatment problems for patients who have had a maxillectomy.

Retention

Retention is the resistance to vertical displacement of the prostheses.

Residual maxillary retention

The structures in the remaining maxilla amenable to providing obturator retention are limited to the remaining natural teeth and the borders of the defect.

Teeth

The teeth are the greatest asset for providing retention of the obturator prosthesis. The amount of stress generated by the movement of the obturator may be very great. The number, position, and periodontal status of the remaining teeth are the most critical factors in evaluating the amount of stress that remaining teeth may be able to absorb. Obturator abutments adjacent to distal extension maxillary resection sites are subject to excessive rotational forces. Fixed splinting of some or all of the remaining teeth may be indicated to provide dissipation of the stresses directed to primary abutment teeth.

When the remaining teeth are located unilaterally, the intracoronal retainer might provide some benefit in minimizing the amount of vertical movement of prostheses within the defect. Moreover, if the defect is small and the remaining teeth stable, intracoronal retainers might be considered. If the defect is large and some or all of the remaining teeth are weak, extracoronal retainers should be used. If the remaining teeth are not parallel with the walls of the defect, and if the palatal surfaces of the teeth are not adequate, guiding planes may be provided to resist vertical displacement of the obturator and disengagement of the retentive clasp arms (Beumer III *et al.*, 1979).

Alveolar ridge

The retentive capabilities of the edentulous residual maxillary segment must be evaluated by the same factors that contribute to acceptable retention of a conventional complete denture, i.e. utilization of the physical properties of adhesion, cohesion, atmospheric pressure and interfacial surface tension.

Ridge size and shape influence retention to a limited extent. A large ridge with a broad ridge crest is more

retentive than is a small or tapering ridge crest. The palatal contour influences the ability to increase or decrease the interfacial surface tension. The broad, flat palate is more retentive than the high tapering palate. The square arch form is more conducive to retention than the tapering or ovoid arch form. Tapering arch forms provide less palatal shelf area and therefore support is compromised (Beumer III *et al*., 1979).

Within the defect retention

If the obturator extension itself could minimize the vertical displacement of the prosthesis, less stress would be generated to the residual maxillary structures.

There are five intrinsic areas within and around the defect that may provide retention to the obturator itself: the residual soft palate, the residual hard palate, the anterior nasal aperture, the lateral scar band and the height of the lateral wall (Beumer III *et al*., 1979).

Residual soft palate: The residual soft palate provides a posterior palatal seal which will minimize the passage of food and liquids above the obturator prosthesis. Extension of the obturator prosthesis onto the nasopharyngeal side of the soft palate will help in this purpose and will also provide retention.

Residual hard palate: Depending on the location of the line of palatal resection, there will be varied degrees of undercut along this line into the nasal or paranasal cavity. The objective of prosthesis extension is to provide resistance to vertical and horizontal displacement. The extension should not contact the septum or the turbinates.

Anterior nasal aperture: The anterior nasal aperture may be entered unilaterally or bilaterally, depending on the extent of the defect to or beyond the midline and upon the presence or absence of the nasal septum.

Lateral scar band: A scar band results after surgical resection at about the level of the mucobuccal fold. Because of its lack of bone support, the lateral scar band also tends to stretch with continued use. This stretching may necessitate sequential additions to the prosthesis which may be limited by cosmetic requirements and prosthesis size and weight.

Height of lateral wall: In addition to the physical engagement of the four structures mentioned, the lateral wall of the defect can be utilized for indirect retention. A high lateral wall of an obturator will undergo less vertical displacement with a given defect wall flexure than will a shorter prosthesis lateral wall.

One way of overcoming retention problem is to obtain accurate reproduction of undercut areas. Benington and Clifford (1982) described the injection impression technique. The technique provided increased mechanical retention of prostheses for defects of the palate by engaging undercuts around the borders of the defect with a flexible material. The impression was made by injecting an elastic impression material with a syringe through a hole-prepared in the palate of the impression tray.

Stability

Stability is the resistance to prosthesis displacement by functional forces. Movement of the prosthesis within the horizontal plane can be anteroposterior, mediolateral, rotational, or a combination of any or all of these directions. As with retention and support specific areas of the residual maxilla, as well as the defect itself, must be considered in minimizing the extent of these potential movements (Desjardins, 1978; Beumer III *et al*., 1979).

Residual maxilla stability

If sound natural teeth remain, the bracing components of the prosthesis framework can be used to minimize movement in all three directions. In edentulous patients, maximal extension of the prosthesis is imperative. Maximal extension into the mucobuccal fold, and especially the distobuccal extension as the buccal flange approaches the hamular notch, is important in minimizing movement within the horizontal plane.

Stability within the defect

Maximal extension of the prosthesis in all lateral directions must be provided. Special emphasis must be placed on maximal contact with the medial line of resection, the anterior and lateral walls of the defect, the pterygoid plates, and the residual soft palate. Contact of the obturator portion of the prosthesis with these structures minimizes anteroposterior, mediolateral and rotational movement of the prostheses.

Occlusion

The most important aspect of stability is occlusion. Maximal distribution of the occlusal force in centric and

eccentric jaw positions is imperative to minimize the movement of the prostheses and the resultant forces on individual structures. Stress created by lateral forces is minimized by the correct selection of an occlusal scheme, elimination of premature occlusal contacts, and wide distribution of stabilizing components (Aramany, 1978a,b).

Acrylic resin teeth with a reduced occlusal contact area may be indicated. Altering the cusp angle of posterior teeth may influence the stability of the prosthesis placed on an edentulous resected maxilla. It may be necessary to accept an occlusion that is not bilaterally balanced in eccentric occluding positions for an edentulous maxilla or mandible. In edentulous patients, non-anatomic posterior teeth are preferred. The teeth are set in centric relation and adjusted to eliminate lateral deflective occlusal contact (Academy of Denture Prosthetics, 1989).

Obturator size and extension

The obturator must contact the medial line of resection and may engage the residual bony palate from the anterior mucobuccal fold to the soft palate. An extension may be provided into the anterior nasal aperture. The height of the medial surface may be limited by the turbinates, which should not be in contact with the prosthesis. The medial surface of the obturator should not be high enough to obstruct nasal breathing. Contact with the nasal septum may be necessary for support in defects which pass the midline. The medial surface should not be as high as the lateral surface, and the anterior aspect should be higher than the posterior aspect in order to encourage mucous drainage in a medial and posterior direction into the nasopharynx. The anterior and lateral surfaces should extend superiorly as much as possible to enhance retention by minimizing vertical displacement. The anterior and lateral surfaces of the prosthesis provide the support for the facial muscles.

Support

Support is the resistance to movement of a prosthesis towards the tissue. The support available from the residual maxilla and from within the defect must be considered (Beumer III *et al.*, 1979; Jacob and Yen, 1991).

Residual maxilla

In the residual maxilla, the primary areas available for support are the residual sound teeth, the alveolar ridge, and the residual hard palate.

Teeth

Only sound teeth should be selected to provide support in the remaining segment for a large prosthesis.

Alveolar ridge

The height and contour of the residual alveolar ridge and the depth of the sulci are important for support in both the edentulous and the dentulous patient. The large, broad ridge or the ridge with a square or ovoid tendency usually provide better support than the small, narrow ridge with a tapering contour. In patients with a retained pre-maxillary segment or a tuberosity, the arch form is improved and the support for the prosthesis is increased considerably.

Residual hard palate

The residual hard palate is an important structure for support of an obturator prosthesis. The broad, flat palate is more conducive to support than the high tapering palate.

Within the defect

Positive support within the defect to prevent rotation of the obturator into it must be considered. This support can be achieved by contact of the prostheses with any anatomic structures that provide a firm base. The exact structure depends on the size and extension of the defect. In the acquired maxillary defects, the floor of the orbit, the bony structures of the pterygoid plate and the anterior surface of the temporal bone near the infratemporal fossa are considered for positive support. The nasal septum may be used if the defect extends beyond the midline.

Tissue changes

Dimensional changes will continue to occur for at least a year secondary to scar contracture and further organization of the wound. The prosthesis may be

rebased to compensate for these changes. Changes in the tissues supporting a maxillofacial prosthesis may be more rapid than in those supporting a more conventional prosthesis. Therefore, the occlusion and base adaptation must be re-evaluated frequently and corrected by selective grinding of the occlusion or refitting the base of the prosthesis (Academy of Denture Prosthetics, 1989).

Partial denture design

Many authors (Curtis, 1967; Desjardins, 1978; Gay & King, 1980; Parr *et al.*, 1989) have discussed obturator framework design for acquired maxillary defects, but now a simplified approach to the planning of resective surgery and a guide for the design of the maxillary obturator prostheses have been presented. According to Parr *et al.* (1989), the Aramany classification system of post-surgical maxillary defects is a useful tool for teaching and developing framework designs for obturator prostheses and for enhancing communication among prosthodontists. The abutment teeth and periodontium should be restored and healtly before commencing the rehabilitation.

The classification is divided into six different groups based on the relationship of the defect area to the remaining abutment teeth (Aramany, 1978a,b).

In class 1 design, the resection 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.

In class 2 design, the defect is unilateral, retaining the anterior teeth on the contralateral side. The central incisor and sometimes all the anterior teeth to the canine or pre-molar are saved.

In class 3 design, the palatal defect occurs in the central portion of the hard palate and may involve part of the soft palate.

In class 4 design, the defect crosses the midline and involves both sides of the maxilla.

In class 5 design, the anterior teeth are preserved and the posterior teeth, hard palate and portions of the soft palate are resected.

In class 6 design, anterior palatal defects, the least frequently occurring class, occurs mostly in trauma or in congenital defects rather than as a planned surgical intervention.

The basic principles of removable partial denture designing should be reviewed when designing a framework for an obturator. Major connectors should be rigid, occlusal rests should direct occlusal forces along the long axis of the teeth, guide planes should be designed to facilitate stability and bracing, retention should be within the physiological limits of the periodontal ligament and maximum support should be gained from the residual soft tissues.

The number and location of occlusal and incisal rests is determined by the number, position and health of the remaining teeth as well as by the size and location of the defect. Multiple occlusal rests are suggested to improve stability and support for the obturator prostheses and to minimize the movement of the prosthesis towards the tissue. Occlusal rests should be located as close to the defect as possible and adjacent to edentulous areas. They should be well-rounded so as to permit some prosthesis movement without placing excessive stress on the teeth (Desjardins, 1978; Gay & King, 1980; Martin & King, 1984; Parr *et al.*, 1989).

Obturators, made by the usual techniques (using a plaster/pumice washout technique), may be too heavy or the procedure time consuming. Techniques for making an emergency type of obturator for patients with acquired palatal defects have been described. A temporary emergency type of obturators can be made in one patient visit, if necessary. Rapid construction may be essential for some patients (Beder, 1968; Matalon & LaFuente, 1976; Birnbach, 1978; Caputo & Ryan, 1989; Kaplan, 1992).

Techniques have been described for fabricating a denture with a hollow obturator bulb (Nidiffer & Shipmon, 1957; Payne & Welton, 1965; Brown, 1969; Aras & Cötert, 1989; Benington, 1989; Birnbach & Barnhard, 1989; Knudson *et al.*, 1989; Haider & Lewis, 1994; Wang & Hirsch, 1997; McAndrew *et al.*, 1998).

Many materials have been used to make immediate and intermediate obturator prostheses (Fischman, 1989; Paprocki *et al.*, 1990). Acrylic resin is the most commonly used material for obturators but it does not fulfill all of the requirements. A new thermoplastic material, Polysar, is described to create a hollow obturator extension for immediate and intermediate light-weight obturators (Riley, 1968; Didier *et al.*, 1993).

The use of flexible silicone material has been proposed to provide better retention and less irritation than hard acrylic resin. Other advantages of silicone obturators are lightness of weight and ease of insertion and removal of the prostheses (Shimodaira *et al.*, 1994).

An obturator prosthesis with a swing-lock retentive design system is suggested to provide retention and stability because of the continuous splinting of the remaining teeth during function and a passive multiple retentive-clasp system during relaxation (Javid & Dadmanesh, 1976; Parr & Gardner, 1995).

Many reports have discussed implants to support facial prostheses, and implant supported prostheses have been used and reported for patients with partial and total maxillectomies. Many factors such as radiation status of the available bony site, surgical procedures, the age of the patients may influence implant prognosis and design of the obturator components. Osseointegrated implants are used in both the defect and non-defect sides of the maxilla. Location of an implant within the defect reduces movement of the prosthesis, encourages axial loading of the implant, provides better support and retention for the prosthesis and prevents rotation (Anderson, 1990; Gary *et al*., 1992; Arcuri *et al*., 1993; Niimi *et al*., 1993; Roumanas *et al*., 1997).

Small, powerful cobalt-samarium magnets have been prescribed for the retention of large maxillofacial prostheses. The prosthesis is composed of several sections that are retained together by magnets when in place in the defect. Each section has a different path of insertion, which provides the assembled prosthesis with resistance to displacement (Boucher & Heupel, 1966; Nadeau, 1968; Parel & Drane, 1976; Devlin & Barker, 1992; Lavelle *et al*., 1993; Dumbrigue & Fyler, 1997; Shimodaira *et al*., 1998).

Though it is difficult to improve the quality of life for hemimaxillectomy patients compared with patients with conventional prostheses, this can be achieved with skill, knowledge and experience of specialists. The problem experienced by hemimaxillectomy patients are reduced if a team approach is adopted and specialists are careful to apply skill and experience at all stages and keep the patient under regular review.

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