

The evaluation of the use of a delayed surgical obturator in dentate maxillectomy patients by considering days elapsed prior to commencement of postoperative oral feeding

Ki Tae Park, DDS, MS, PhD,^a and Ho Beom Kwon, DDS, MS, PhD^b

Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea

Statement of problem. As a prosthodontic treatment for a maxillectomy patient in the initial postoperative period, immediate surgical obturators during surgery have been advocated to restore and maintain the patient's oral function to a reasonable level. However, these may fit poorly because they are fabricated using preoperative casts.

Purpose. The purpose of this study was to determine the comparative usefulness of a delayed surgical obturator.

Material and methods. During the period from 2000 to 2004, 29 patients underwent prosthodontic treatment after maxillectomy. Twenty-three patients who were dentate postoperatively and were treated with polyvinyl acetal (Merocel) packing and a delayed surgical obturator were included in this study. Patients who were edentulous postoperatively, who were treated with an immediate surgical obturator or whose data were incomplete were excluded. The records of 23 patients were reviewed to determine the usefulness of using a delayed surgical obturator by counting days required to start postoperative oral feeding. The median of days elapsed prior to commencement of postoperative oral feeding was compared with data from a study by Lapointe et al (1996). In the Lapointe et al study, the median days elapsed prior to beginning a clear fluid diet was 2 in the group using immediate surgical obturators. The data were analyzed using the 1-sample Wilcoxon signed rank test ($\alpha=.05$).

Results. Days elapsed prior to commencement of postoperative oral feeding were less than those reported previously. Patients with Merocel packing began oral feeding, on average, 1.48 days after the maxillectomy. The median number of days elapsed prior to commencement of postoperative oral feeding was 1. This time was earlier than the 2 days for the Lapointe et al study ($P=.0074$). No major postoperative care complications occurred among the maxillectomy patients treated with a delayed surgical obturator.

Conclusion. Delayed surgical obturators were successful in terms of the postoperative care of dentate maxillectomy patients and did not increase patient discomfort during early rehabilitative management. (J Prosthet Dent 2006;96:449-53.)

CLINICAL IMPLICATIONS

When prosthetic management is performed after a maxillectomy, delayed surgical obturator placement may be considered a treatment option. Postoperative placement of a delayed surgical obturator allows patients to receive subsequent procedures without difficulty, as does an immediate surgical obturator during maxillectomy.

Maxillectomy is a treatment option for maxillary cancer that leaves the patient with a palatal defect, which may cause problems with swallowing, mastication, and speech. These functional problems and changes in appearance may result in psychological problems.^{1,2} To control these deficits after maxillectomy, prostheses have been used. A surgical obturator is the first prosthesis placed, and is used to minimize postoperative

complications.³ The object of surgical obturator placement is to restore and maintain oral function to a reasonable level during the postoperative period. Prostheses fulfilling this objective may be classified as immediate surgical obturators and delayed surgical obturators.⁴ Immediate surgical obturators, placed intraorally during maxillectomy, are recommended by several authors⁴⁻⁶ and have some advantages. They support soft tissues, minimize scar contracture and disfigurement, reproduce the anatomic integrity of the palate, improve postoperative oral hygiene, and protect surgical packing from food debris contamination.⁵ They allow the patient to resume a normal diet, protect the wound from trauma, and maintain pressure, either directly or indirectly, on split-thickness skin grafts.² In addition, they restore

Poster presented at the 52nd Annual Meeting of the American Academy of Maxillofacial Prosthetics, Ottawa, Canada, October, 2004.

^aChairman and Associate Professor, Department of Pediatric Dentistry.

^bAssistant Professor, Department of Prosthodontics.

speech to a normal level and obviate the use of nasal nutritional tubes. However, they have some disadvantages. First, because they are placed during surgery requiring fixation, prosthesis removal can be difficult after external surgical skin flap closure.⁷ Second, and perhaps most importantly, because immediate surgical obturators are prepared from casts made prior to maxillectomy, they fit only loosely into defects, allowing leakage into the nasal cavity.⁸ To resolve these problems the following have been suggested: adjustment of immediate surgical obturators during surgery,⁵ fabrication of a surgical obturator with an additional clasp that can be adapted to various situations,⁹ fabrication of several obturators per patient prior to surgery,¹⁰ and addition of a resilient denture lining material to immediate surgical obturators.¹¹ However, these methods can cause dust in operating rooms and require considerable additional time and effort.

Delayed surgical obturators are prostheses that are placed 6 to 10 days postsurgically.⁴ They are usually fabricated from a postoperative cast and, therefore, are generally more accurate than immediate surgical obturators in terms of fit. If a patient is able to maintain a reasonable level of speech and the ability to swallow until prostheses are placed, delayed surgical obturators offer an alternative to immediate surgical obturators. Before placement of a delayed surgical obturator, defects are maintained with packing materials. Various materials have been used for this purpose, including gauze,⁷ tissue conditioning material,¹²⁻¹⁵ silicone,¹⁶ acrylic resin,¹⁷ gutta percha,¹⁸ modeling plastic impression compound,⁴ and cotton wool.⁶ Some of these materials may deteriorate rapidly intraorally, may be difficult to manipulate, and may have possible adverse effects on tissue surfaces,⁴ although most of them work well.

Several authors report on the use of surgical obturators.^{1,2,4,5,7} However, evaluations of these prostheses have rarely been performed. Lapointe et al⁶ compared immediate placement of an obturator prosthesis with delayed placement by counting postoperative days required to start a fluid diet. The authors concluded that the patients had a more rapid return to normal function with immediate surgical obturators. The use of days required to start oral postoperative feeding as a measure is meaningful, because it may be related to level of recovery. The purpose of the present study was to determine the comparative usefulness of delayed surgical obturators in terms of the recovery of food swallowing ability after maxillectomy.

MATERIAL AND METHODS

The records of all maxillectomy patients treated between 2000 and 2004 at the Samsung Medical Center, Seoul, were retrospectively reviewed for assessment of delayed surgical obturator use. From March 2000 to

December 2004, 29 patients underwent prosthodontic treatment after maxillectomy at the Samsung Medical Center. Three patients who became edentulous after surgery, 2 patients treated with immediate surgical obturators, and 1 patient whose data was insufficient were excluded from the study. Twenty-three patients who were dentate after the maxillectomy and were treated with a delayed surgical obturator postoperatively were included.

Data on patient age, gender, diagnosis, and tumor location were collected from charts. Data on flap design, skin graft, days elapsed before the start of postoperative oral feeding, and days elapsed before insertion of delayed surgical obturators and interim obturators were also collected. To determine the comparative usefulness of delayed surgical obturators, the number of days elapsed prior to commencement of postoperative oral feeding was compared with the results of a study by Lapointe et al.⁶ In that study, the median of days elapsed to start a clear fluid diet in the group using immediate surgical obturators was 2. Complications during procedures were recorded. The protocols and procedures of the study were reviewed and approved by the Institutional Review Board at Samsung Medical Center.

The fabrication of delayed surgical obturators

Patients who presented to the Department of Otorhinolaryngology for maxillary tumors were referred to the Department of Prosthodontics for examination and preparation for prosthetic treatment. Preoperative dental evaluations were performed, and impressions were made using irreversible hydrocolloid (Cavex Impressional; Cavex Holland BV, Haarlem, The Netherlands) for diagnostic casts. Resective surgeries were performed at the Department of Otorhinolaryngology at the Samsung Medical Center. During the surgical procedure, a surgical packing material (Merocel; Medtronic Xomed, Jacksonville, Fla) was placed into surgical defects and secured with silk sutures.¹⁹⁻²¹ Approximately 2 days postoperatively, irreversible hydrocolloid (Cavex Impressional; Cavex Holland BV) impressions were made with stock impression trays (Osung Industrial, Kimpo, Korea) to fabricate delayed surgical obturators. Surgical areas remained packed with surgical packing material. Casts were poured using dental stone (Hi-koseton; Maruishi Gypsum Co, Osaka, Japan) and the delayed surgical obturator was fabricated using acrylic resin (Ortho-Jet; Lang Dental Mfg Co, Wheeling, Ill). For prosthesis retention, 0.036-inch stainless steel (Remanium; Dentaaurum, Pforzheim, Germany) C clasps or labial bow wire clasps were used. Artificial teeth were not added. Because defect sites were not included in the impression due to the presence of the surgical packing, in some situations anticipated defects were arbitrarily formed on casts to form obturator extension portions. Upon removal of the surgical packing from

Table I. Patient clinical data

Patient	Age (y)	Gender	Diagnosis	Location
1	49	M	Mucoepidermoid carcinoma	Left maxillary sinus
2	53	F	Osteosarcoma	Left maxilla
3	47	M	Squamous cell carcinoma	Right maxilla
4	59	M	Squamous cell carcinoma	Left maxillary sinus
5	28	F	Osteoblastoma	Right maxillary sinus
6	36	F	Mucoepidermoid carcinoma	Left maxilla
7	43	F	Myoepithelioma	Hard palate
8	72	F	Squamous cell carcinoma	Right maxillary sinus
9	56	M	Squamous cell carcinoma	Left maxillary sinus
10	56	M	Adenoid cystic carcinoma	Left maxillary sinus
11	67	M	Mucoepidermoid carcinoma	Right maxillary sinus
12	67	F	Squamous cell carcinoma	Left maxillary sinus
13	62	M	Squamous cell carcinoma	Left maxillary sinus
14	46	M	Squamous cell carcinoma	Left maxillary sinus
15	61	M	Squamous cell carcinoma	Right maxillary sinus
16	47	F	Adenoid cystic carcinoma	Hard palate
17	46	F	Squamous cell carcinoma	Left maxillary sinus
18	49	M	Squamous cell carcinoma	Left maxillary sinus
19	32	M	Mucoepidermoid carcinoma	Nasopharynx
20	60	M	Squamous cell carcinoma	Left maxillary sinus
21	56	M	Inverted papilloma	Left maxillary sinus
22	58	M	Squamous cell carcinoma	Right maxillary sinus
23	59	F	Adenoid cystic carcinoma	Right maxillary sinus
Average	52.57			

the defect, the delayed surgical obturator was placed. Tissue-conditioner material (COE-Comfort; GC America, Alsip, Ill) was added to extension portions when prostheses were fitted. This procedure was repeated until a sufficient amount of tissue-conditioner material had been added to obtain a complete defect seal. Patients were discharged from the hospital when they were able to manage daily life. Periodic recall examinations were performed, and at approximately 6 weeks postoperatively, interim obturators were fabricated, artificial teeth (Endura; Shofu Inc, Kyoto, Japan) were added to interim prostheses, and an attempt was made to develop occlusion on the side of the defect. All of the clinical procedures were performed by 1 prosthodontist, and 1 dental technician performed all of the laboratory procedures. Data were analyzed by the 1-sample Wilcoxon signed rank test ($\alpha=.05$), which was performed using statistical software (SAS 9.1; SAS Institute Inc, Cary, NC).

RESULTS

The clinical data of the 23 patients that underwent maxillectomy are presented in Table I. Patient age ranged from 32 to 72 years, with an average age of 52.57 years. Fourteen patients were men and 9 were women. The causes of maxillectomy included 12 squamous cell carcinomas, 4 mucoepidermoid carcinomas, 3 adenoid cystic carcinomas, and 1 each of osteosarcoma, osteoblastoma, myoepithelioma, and inverted

papilloma. Maxillectomy and prosthesis data are summarized in Table II. A Weber-Fergusson flap was used in 21 patients and a split-thickness skin graft in 20. Impression making was performed for all patients prior to surgery. Impressions were made approximately 2 days postoperatively to fabricate surgical obturators. Oral feeding was commenced at an average of 1.48 days postoperatively. The median of days elapsed before the start of oral feeding was 1. In the Lapointe et al⁶ study, the median was 2. The comparison demonstrated a statistically significant difference ($P=.0074$). Delayed surgical obturators were placed in defects after an average of 7.04 days, and interim obturators were inserted after an average of 46.18 days. There were complications during postoperative care, although they were not severe. In Patient 1, it was not possible to make an impression for a delayed surgical obturator, and in Patient 9, a piece of the surgical packing was dislodged from the defect during the postoperative impression procedure for the delayed surgical obturator.

DISCUSSION

When a delayed surgical obturator is used, the separation between nasal and oral cavities is accomplished by the use of surgical packing. Thus, the packing material is of considerable surgical importance in this procedure. Packing material secures grafts by applying a constant pressure. Defect packing material provides splinting

Table II. Surgical and prosthetic treatment data

Patient	Weber-Fergusson flap	Split-thickness skin graft	Days elapsed before start of oral feeding after operation	Days elapsed before insertion of delayed surgical obturator after operation	Days elapsed before insertion of interim obturator after operation
1	Yes	Yes	1	6	35
2	Yes	Yes	2	7	78
3	Yes	Yes	2	6	86
4	Yes	Yes	2	8	34
5	Yes	Yes	1	8	38
6	Yes	Yes	1	7	46
7	No	No	1	14	No interim obturator
8	Yes	Yes	1	6	47
9	Yes	Yes	2	7	28
10	Yes	Yes	1	8	32
11	Yes	Yes	3	6	43
12	Yes	Yes	2	6	38
13	Yes	Yes	1	7	45
14	Yes	Yes	1	6	74
15	Yes	Yes	1	7	82
16	No	No	2	5	43
17	Yes	Yes	1	7	53
18	Yes	Yes	1	7	39
19	Yes	No	3	8	16
20	Yes	Yes	1	6	56
21	Yes	Yes	1	6	43
22	Yes	Yes	2	7	29
23	Yes	Yes	1	7	31
Average			1.48	7.04	46.18

and stenting, which reduces the shearing forces that can dislodge a graft. Packing materials absorb secretions from the operative site, and prevent the graft from being touched until it has adhered to the surgical site. In the present study, Merocel was used as a packing material. Merocel is a synthetic hydroxylated polyvinyl-acetal and was initially designed for postoperative packing.²¹ It is a compressed, dehydrated sponge, which expands on contact with water to become sponge-like in consistency, and adopts its preset shape.¹⁹ Merocel can absorb much more fluid than conventional dressings and applies pressure due to its elastic properties.¹⁹ However, some authors indicate that Merocel has been shown to be associated with more bleeding and pain on removal when compared to other packing materials in endonasal surgical procedures.²⁰ Like the other packing materials, Merocel has advantages and disadvantages. Merocel was used in this study because it was simple to use, provided adequate pressure to grafts, and did not interfere with subsequent prosthetic treatment.

Because there was no control group in this study, the results were compared with results of a previous study. Lapointe et al⁶ compared immediate placement of an obturator with delayed placement in maxillectomy patients. In the Lapointe et al study, patients fitted with an immediate obturator progressed better and returned to normal functioning more rapidly. Thus, the authors

concluded that the use of an immediate prosthesis for maxillectomy patients is beneficial. However, postoperative oral feeding in the present study began earlier than in the Lapointe et al study. The protocol involving the use of Merocel packing and a delayed surgical obturator allowed a rapid return of swallowing function. In the authors' opinion, the Merocel packing provides enough separation between the nasal and oral cavity for the patients to begin swallowing. However, with this protocol, integrity of the palatal anatomy is not reproduced, and it is disadvantageous in terms of postoperative oral hygiene care. In the present study, the surgeons who performed the maxillectomy usually determined the time when the patients began oral feeding. Due to the preferences of the surgeons and the differences in hospital environments, direct comparison with the Lapointe et al⁶ study is not possible.

The delayed surgical obturators used in this study were more accurate than those made immediately after surgery. Although the internal aspect of the defect was not recorded because of the Merocel packing, the exact location and outline of the defect could be identified. When impressions are made for delayed surgical obturators, careful procedures must be followed, because patients may have facial incisions, and healing at this stage is incomplete. Thus, there are risks of tearing incisions and traumatizing operative sites,¹ and risks of

dislodging surgical packing when impressions are removed. In the present study, no facial incision tearing incidents occurred among the 23 patients. However, the Merocel packing of Patient 9 was dislodged during the impression-making procedure. Three pieces of Merocel packing were placed during the surgical operation in this patient. One piece moved during the impression procedure. However, this incident caused no adverse effect in terms of objective signs. More than 3 pieces of Merocel packing are usually used per maxillectomy. Therefore, the dislodgement of 1 or 2 pieces is not usually problematic.

The remaining anatomical structures on which delayed surgical obturators depend for support are often coated with dried blood, mucus, and material alba. It may, therefore, not be possible to obtain an accurate impression, and in such situations, preoperative impressions can be used to fabricate obturator prostheses.¹

In the present study, postoperative impressions were successfully obtained in 22 of 23 patients. Patient 1 was nervous after surgery, and his ability to open his mouth was too limited to make an impression. Therefore, a preoperative cast was used to fabricate the delayed prosthesis.

At an average of 46.18 days postoperatively, interim obturators were placed. During the intervening period delayed surgical obturators were used, and during this period patients found it difficult to adapt to the changed oral condition. Converting the immediate or delayed obturator to an interim earlier may help this problem. However, all patients maintained reasonable oral function throughout this period. Counting days elapsed prior to commencement of postoperative oral feeding is one of the methods to evaluate the management of the maxillectomy patient. To evaluate patient recovery to normal function, further studies on speech, oral hygiene, deglutition, and psychological status are needed.

CONCLUSION

In the present study, delayed surgical obturators were successfully used without increasing patient discomfort. The surgical packing and delayed surgical obturator used may play a role and can be considered as an alternative to immediate surgical obturator during the initial healing period after maxillectomy.

REFERENCES

- Desjardins RP. Early rehabilitative management of the maxillectomy patient. *J Prosthet Dent* 1977;38:311-8.

- Lang BR, Bruce RA. Presurgical maxillectomy prosthesis. *J Prosthet Dent* 1967;17:613-9.
- Ackerman AJ. The prosthetic management of oral and facial defects following cancer surgery. *J Prosthet Dent* 1955;5:413-38.
- Beumer J, Curtis TA, Marunick MT. Maxillofacial rehabilitation: prosthodontic and surgical considerations. St. Louis: Elsevier; 1996. p. 225-47.
- Huryn JM, Piro JD. The maxillary immediate surgical obturator prosthesis. *J Prosthet Dent* 1989;61:343-7.
- Lapointe HJ, Lampe HB, Taylor SM. Comparison of maxillectomy patients with immediate versus delayed obturator prosthesis placement. *J Otolaryngol* 1996;25:308-12.
- Birnbach S. Immediate surgical sectional stent prosthesis for maxillary resection. *J Prosthet Dent* 1978;39:447-50.
- Keyf F. Obturator prostheses for hemimaxillectomy patients. *J Oral Rehabil* 2001;28:821-9.
- Penn M, Grossmann Y, Shifman A. A preplanned surgical obturator prosthesis for alternative resection lines in the anterior region. *J Prosthet Dent* 2003;90:510-3.
- Arcuri MR, Taylor TD. Clinical maxillofacial prosthetics. Chicago: Quintessence; 2000. p. 103-16.
- Zarb GA. The maxillary resection and its prosthetic replacement. *J Prosthet Dent* 1967;18:268-81.
- Carl W. Preoperative and immediate postoperative obturators. *J Prosthet Dent* 1976;36:298-305.
- Caputo TL, Ryan JE. An easy, fast technique for making immediate surgical obturators. *J Prosthet Dent* 1989;61:473-5.
- Jacob RF, Martin JW, King GE. Modification of surgical obturators to interim prostheses. *J Prosthet Dent* 1985;54:93-5.
- Stark BS. Transitional prosthesis for dentulous hemimaxillectomy patients. *J Prosthet Dent* 1972;27:73-5.
- Ampil JP, Ellinger CW, Rahn AO. A temporary prosthesis for an edentulous patient following a maxillary resection. *J Prosthet Dent* 1967;17:88-91.
- Shifman A. A technique for the fabrication of the open obturator. *J Prosthet Dent* 1983;50:384-5.
- Cunningham R. A laboratory technique for the production of immediate surgical appliances and 'one stage' obturators for the hemi-maxillectomy patient. *Br J Oral Maxillofac Surg* 1990;28:59-61.
- Lapid O, Lapid-Gortzak R, Kreiger Y. Merocel use as an adjunct for tie-over dressing. *Plast Reconstr Surg* 2001;107:884-5.
- Chevillard C, Rugina M, Bonfils P, Bougara A, Castillo L, Crampette L, et al. Evaluation of calcium alginate nasal packing (Algosteril) versus Polyvinyl acetal (Merocel) for nasal packing after inferior turbinate resection. *Rhinology* 2006;44:58-61.
- Pringle MB, Beasley P, Brightwell AP. The use of Merocel nasal packs in the treatment of epistaxis. *J Laryngol Otol* 1996;110:543-6.

Reprint requests to:

DR HO BEOM KWON
DEPARTMENT OF PROSTHODONTICS, SAMSUNG MEDICAL CENTER
SUNGKYUNKWAN UNIVERSITY SCHOOL OF MEDICINE
50 ILWON-DONG GANGNAM-GU
SEOUL, KOREA
FAX: 82-2-3410-0038
E-MAIL: kwon@smc.samsung.co.kr

0022-3913/\$32.00

Copyright © 2006 by The Editorial Council of *The Journal of Prosthetic Dentistry*.

doi:10.1016/j.prosdent.2006.09.019