

Prosthetic rehabilitation of a total rhinectomy patient resulting from squamous cell carcinoma of the nasal septum: A clinical report

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The clinical characteristics and prosthetic rehabilitation of a patient with squamous cell carcinoma of the nasal septum after combined radiation therapy and a total rhinectomy is presented. (J Prosthet Dent 2003;89:234-8.)

Cancer of the head and neck is a generic term applied to a group of malignant tumors that occur in the anatomic regions of the head and neck. Tumors found in the upper aerodigestive tract account for most of these head and neck cancers.¹ Higher incidences of these malignancies have been noted among elderly patients, with a prevalence 3 times higher in men than in women.^{2,3} In the United States, approximately 60,000 to 61,000 new head and neck cancers are reported annually with a 27% mortality rate.³ Early detection increases the chance of a cure; unfortunately, only about 35% of those diagnosed have curable diseases at the time of diagnosis.

Malignancies of the nasal septum are rare and account for only 9% of all cancers of the nasal cavity.⁴ As of the year 2000, there had been 300 reported cases of carcinomas of the nasal septum.⁵ Most of these tumors were squamous cell carcinoma.⁵⁻⁷ These tumors are considered deadly unless diagnosed and treated early.⁸

Molecular biology investigations^{5-7,9-11} have increased knowledge about squamous cell carcinomas of the head and neck. The mechanism of malignant transformation progresses in 2 stages: initiation and promotion. The process of initiation describes the onset of permanent cellular DNA damage. *Promotion* refers to environmental agents, such as tobacco,^{9,10} alcohol, and viruses that stimulate cellular proliferation or alter differentiation. These mechanisms may include dysregulation of the proliferating cell nuclear antigen, transforming growth factor, glycoprotein, loss of tumor suppressor activity at gene 9p21, amplification of the cyclin D1 gene, mutations of gene p53, and overexpression of gene bcl-2.

Treatment options for nasal septum carcinomas are the same as treatments of the other cancers of the head and neck, including surgery, radiation therapy, and chemotherapy. These treatments, used alone or in conjunction with one another, have been used to satisfactorily control or even cure the disease.^{4,8} However, delayed diagnosis, smoking, alcohol consumption, poor nutrition, and other unknown factors seemed to decrease the effectiveness of these treatments. In recent years, newer

treatment options such as cryotherapy, immunotherapy, cytotoxic treatment, photodynamic treatment, and hyperthermal treatment have been used in conjunction with conventional treatment methods for head and neck cancers.¹² Unfortunately, most of these treatment methods result in unwanted or incapacitating defects requiring immediate short- or long-term management and rehabilitation procedures.

Reconstruction of head and neck defects after surgical treatment can be accomplished either surgically or prosthetically.^{5-8,13} The site, size, etiology, severity, age, and patient's desire are used to determine the methods of reconstruction. Prosthetic rehabilitation has considerable advantages; for example, a prosthesis offers the clinician and the patient the means to observe the healing wound for recurrence of disease, esthetic superiority, technical simplicity, and inexpensive care. Most facial prostheses are retained with adhesives and mechanisms, including anatomic undercuts, eyeglasses, and magnets.¹⁴⁻¹⁸ In the last 2 decades, osseointegrated implants have been used for improving support and retention of the facial prostheses.¹⁹⁻²⁴ Recently developed surgical reconstruction techniques (microvascular surgery, free flap)²⁵⁻²⁷ have been presented as the new treatments of choice. However, radiation therapy, anatomic complexity, possibility of recurrence, appearance of the area to be rehabilitated, and complexity of the surgical procedure may exclude surgical reconstruction as an option as in the situation of a patient undergoing total rhinectomy.^{7,13}

For the purpose of prosthetic rehabilitation for facial defects, biomaterials such as polymethyl methacrylate, polyvinyl chloride, polyurethane, and silicone have been used. Silicone materials are the most widely used for facial prostheses because of their various superior features.¹⁸ Silicone preparations with different chemical and physical properties have provided the required versatility for industrial applications; however, these silicone materials fall short of an ideal maxillofacial prosthetic material because of their poor adheophilic property, polishing problems, low tear resistance, and microbial growth-promoting characteristics.^{18,28}

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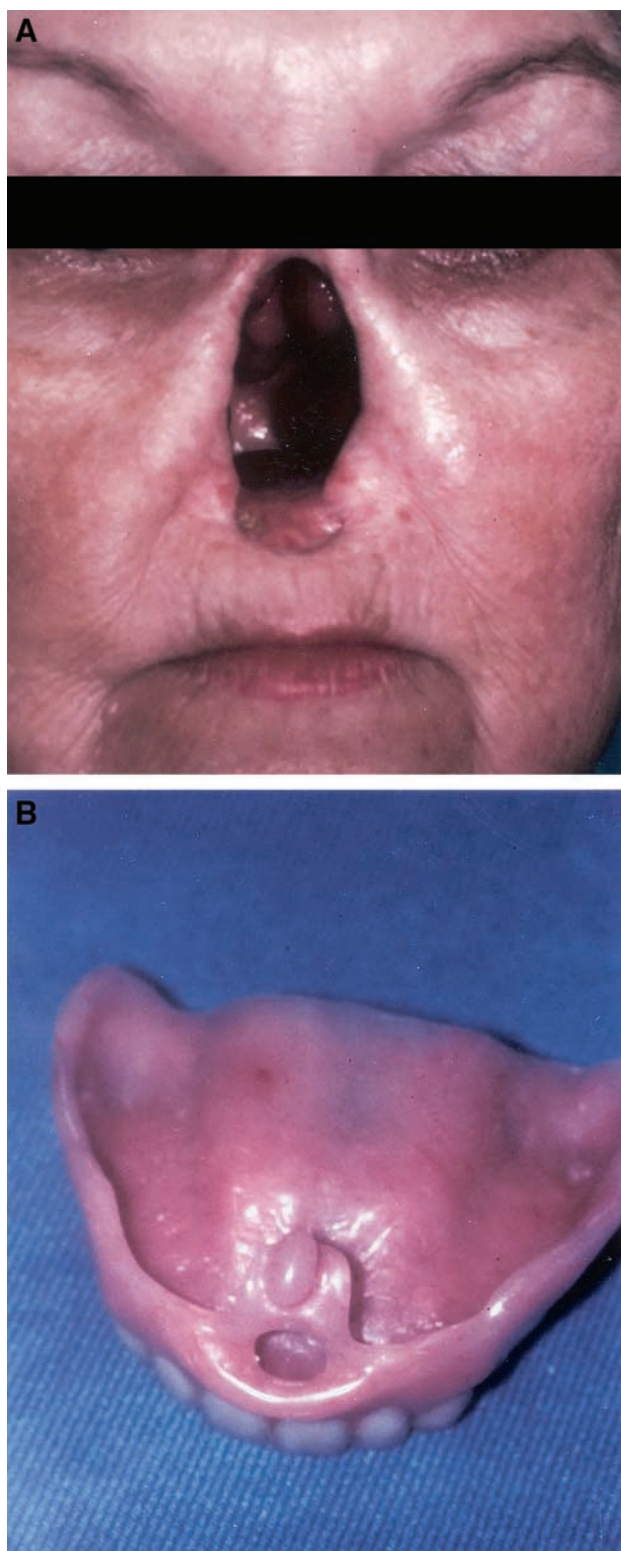


Fig. 1. A, Patient's face with defect after total rhinectomy. B, Maxillary denture with modified button (atrix) extended to nasal cavity.

Methods of overcoming these weak properties and taking advantage of the superior features of the silicone materials have been introduced. For example, the pro-



Fig. 2. Perforated die stone cast.

cess of using a prefabricated urethane sheet as a lining for the tissue surface of the silicone materials has been evaluated.²⁸ The urethane sheet has a high tear resistance and is clear, smooth, easily cleanable, and compatible with many available adhesives. In addition, the urethane material can be satisfactorily bonded to metals and silicone materials, producing a superior prosthesis. Such a prosthesis could be called a “composite prosthesis.” This clinical report describes the prosthetic rehabilitation of a patient with nasal septum squamous cell carcinoma after radiation therapy and a total rhinectomy.

CLINICAL REPORT

A 56-year-old white woman with a 5-year history of treatment for infection and allergic rhinitis noted, over a 2-month period, some swelling and partial obstruction of her nares. She had a history of smoking 1 or more packs of cigarettes a day for many years. She reported no weight loss, difficulty swallowing, headaches, or seizures.

A biopsy revealed a well-differentiated squamous cell carcinoma involving the anterior portion of the nasal septum. The patient received Co 60 radiation and a booster dose to the primary site with an electron beam. After radiation therapy, the patient complained of difficulty breathing through her nose. A mass obstruction in her nose was noted; subsequently, in August 1999, the patient underwent a total rhinectomy followed by radiation therapy. Surgical reconstruction was not recommended at the time due to the need for continued observation. The patient was referred to the clinic for possible prosthetic restoration of the nasal defect.

The patient reported with post-total rhinectomy (Fig. 1, A). There was no skin graft lining over the defect. The patient was completely edentulous with

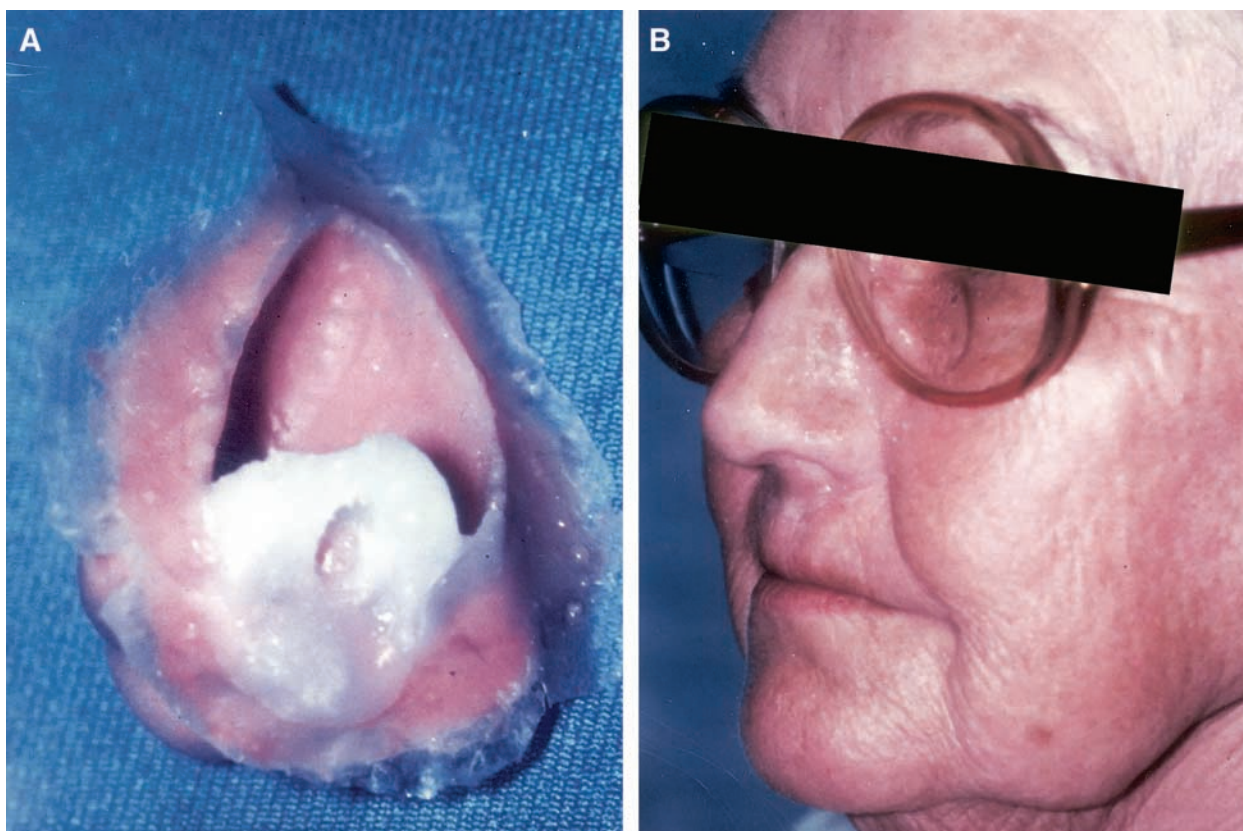


Fig. 3. **A**, Tissue-side view of finished nose prosthesis shows type A silicone (white color) replica (matrix) for engagement of modified part (patrx) of maxillary denture. **B**, Patient with finished nose prosthesis in place.

healthy oral tissues and wore maxillary and mandibular dentures. Examination of both dentures in position revealed an acceptable vertical dimension of occlusion. The posterior teeth were in contact in centric relation, and there was no interference in eccentric movements. The mandibular denture showed excellent stability and retention, but the maxillary denture showed compromised retention due to the existing maxillary defect. Use of root form osseointegrated implants for retention of the nose prosthesis was considered; however, after discussing potential problems with this treatment modality^{21,24} (the patient was in the recurrent observation period), she rejected further surgery. The fabrication of a nasal prosthesis with modification of the maxillary denture was planned, and the expectation of this treatment was explained to the patient.

PROCEDURE

A mechanical retentive mechanism (a modified button shape of an auto-polymerizing denture base resin extending from the maxillary denture to the nasal cavity) was designed and fabricated (Fig. 1, B). With the modified maxillary denture and definitive mandibular denture in place, an impression of the defect was made with irreversible hydrocolloid (Jel-

trate Plus; LD Caulk Div Dentsply International Inc, Milford, Del.) supported with polyester fiber (Factor II Inc, Lakeside, Az.) and a thin layer of dental stone (Jade Stone; Whip Mix Corp, Louisville, Ky.). To facilitate the adaptation of a polyurethane sheet, a perforated cast was made as described by Udagama²⁸ (Fig. 2). To fabricate a hollow prosthesis^{29,30} that would reduce the weight of the nose prosthesis and make a space for breathing, a hole was made through the defect area and a clay-core of the nose prosthesis was made on the cast. The prosthesis was sculpted with generic pink base-plate wax over the core. On completion and verification of the wax prosthesis via a trial insertion procedure, the core was replaced with a vacuum mixed dental stone. The wax sculpture was flaked on the cast with the room temperature vulcanization silicone material (Dow Corning Corp, Midland, Mich.), and the wax was eliminated. A lining polyurethane sheet (0.004-inch thick; Factor II Inc) was prepared and adapted on the perforated master cast.²⁸ A mold was prepared, packed, and processed in the following manner: (1) a silicone separating agent (Dow Corning Corp) was applied over the mold surface, (2) a fresh thin layer of Type A adhesive (Dow Corning Corp) was applied on the primed lining ure-

thane sheet, and (3) the mold was packed under pressure (1500 psi) with silicone elastomer MDX-4210 (Dow Corning Corp) mixed with intrinsic colors (Factor II Inc) and type A silicone material (Dow Corning Corp). The material was polymerized in water at 165° F for 9 hours. The prosthesis was recovered after polymerization and rinsed with water to eliminate the residues, and flash was removed with a pair of surgical scissors (Schilling Forge Co, Syracuse, N.Y.). The prosthesis was evaluated on the patient.

To engage the nose prosthesis to the mechanical extension (patrix) on the maxillary denture (Fig. 1, B), a replica (matrix) on the tissue side of the nose prosthesis was fabricated. To accomplish this, Type A adhesive silicone material was applied to the acrylic button after the maxillary denture was properly placed. The nose prosthesis was then positioned. Caution was taken to ensure that the amount of silicone Type A adhesive material was adequate to fill in the space between the button on the maxillary denture and the inner surface of the nose prosthesis. The patrix and matrix were separated after the material had set (15 minutes). The resulting mechanism (Fig. 3, A) provided additional retention for both nose prosthesis and the maxillary denture.

The nose prosthesis was delivered (Fig. 3, B) and retained on the face by a medical adhesive (Secure; Factor II Inc) and the fabricated attachment. The patient was instructed on home care and prosthesis maintenance. To sanitize the wound, the patient was instructed to gently remove any exudate with a wet cotton tip with 1% hydrogen peroxide, and to clean the tissue side of the prosthesis with water once a day. In addition, the application of the medical adhesive and the placement of the prosthesis were demonstrated. The patient was then scheduled for the first adjustment (3 days after delivery). At the first adjustment appointment, the treatment included observation of the surgical wound to ensure the health of the tissues and report any abnormality to the surgeon, adjustment of the prosthesis to resolve the pressure areas on the tissues, and emphasis of hygiene regarding prosthesis maintenance and home care. After the first adjustment, the patient was placed on a 3-month recall for evaluation.

SUMMARY

Squamous cell carcinomas of the nasal septum are rare. Their symptoms are not different from other common rhinologic symptoms. The lesions require combined radiation therapy and aggressive excision of all or part of the nose. Immediate surgical reconstruction is very complex for the total rhinectomy, because close inspection of the lesion is required. This clinical report describes treatment using a urethane lined prosthesis with a mechanical retention design for a patient who

received a combined total rhinectomy and irradiation therapy.

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