

## Provisional Prosthetic Nasal Rehabilitation following Total Rhinectomy Using a Silicone Based Prosthesis

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**Abstract:** Tumors of the nasal skin are common, and can usually be managed with local excision and reconstruction or radiotherapy. Extensive, neglected or recurrent nasal tumors may require rhinectomy for complete excision. Surgical reconstruction of the rhinectomy defect is challenging. Attempts at autologous reconstruction with regional flaps or free tissue transfer are frequently unsatisfactory, even in the hands of the most skilled surgeon. A good prosthesis is invariably better than the best reconstruction. The literature indicates that 3 to 5 months of postoperative healing may be required to allow for contraction and organization of the tissue bed before commencing fabrication of a definitive nasal prosthesis. This delay in rehabilitation can be a hardship for the patient and result in adverse psychological consequences. Early rehabilitation through the use of a temporary nasal prosthesis offers a means of overcoming these difficulties. The purpose of this article is to present a clinical report that describes the provisional prosthetic rehabilitation using a silicone based prosthesis of a patient who had undergone a total rhinectomy as a result of a neglected basal cell carcinoma of the nose to fulfill the esthetic requirements of the patient and allow him to practice his social activities confidently.

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### 1. Introduction

Malignancies of the midface result in cosmetic deformities that make maxillofacial prosthesis as an integral part of the treatment plan. Facial defects can be devastating in their impact on physical structure and function of the affected individual, leading to potential compromises in quality of life. (Negahdari, Pournasrollah et al. 2014)

Among facial defects, nasal defects produce severe cosmetic impairment, since the nose is a prominent feature of the human face (Breitbart and Holland 1988) which is involved in up to 25 per cent of head and neck skin malignancies. (Johnson 1993) The majority of cases can be adequately treated with either limited surgical excision and reconstruction or radiotherapy. However, some tumors behave in a more aggressive manner and may require extensive surgery, in the form of rhinectomy, for adequate treatment. (Chipp, Prinsloo et al. 2011)

Rhinectomy is an oncologically sound procedure for the management of high risk nasal malignancies. The quality of life after the rhinectomy is severely compromised if an efficient surgical reconstruction or a prosthetic device is not provided. (Brunski, Puleo et al. 2000).

Surgical reconstruction of the rhinectomy defect is challenging. Attempts at autologous reconstruction with regional flaps or free tissue transfer are frequently unsatisfactory, even in the hands of the most skilled surgeon. A good prosthesis is invariably better than the best reconstruction. The advantage of a

prosthesis is that it involves no surgical morbidity and allows easy monitoring of the surgical site for evidence of recurrent disease. (Stanley and Olsen 1988)

A temporary nasal prosthesis may be considered for those patients. Such prosthesis can be delivered as soon as 3 to 4 weeks after surgery providing the patient with an improved appearance. This can enable the patient to resume social interactions while permitting easy access to observe tissue bed changes during healing. The literature indicates that 3 to 5 months of post operative healing may be required to allow for contraction and organization of the tissue bed before commencing fabrication of a definitive nasal prosthesis. (Beumer J 1996)

The construction of the facial prostheses usually consists of 4 stages each equally important to the success of the rehabilitation effort and each requiring extraordinary attention to the details: moulage impression and working cast fabrication, sculpture and fabrication of the pattern, mold fabrication and processing of the prosthesis material with intrinsic and extrinsic coloration. (Taylor 2000)

This clinical case report describes the provisional prosthetic rehabilitation using a silicone based prosthesis of a patient who had undergone a total rhinectomy as a result of a neglected basal cell carcinoma of the nose to fulfill the esthetic requirements of the patient and allow him to practice his social activities confidently.

## 2. Clinical Report

A 64 year old male farmer with a history of neglected basal cell carcinoma of the nose which was surgically treated with a total rhinectomy referred to the maxillofacial prosthodontic clinic for the prosthetic rehabilitation.

Clinical examination revealed absence of the entire cartilage of the nose, ala, bridge of the nose and part of the nasal septum and nasal bone due to the surgery with excision of the left lower eyelid. A surgical scar at the upper boundary of the defect was noticed as a result of surgical reconstruction at this area. (Fig 1) The patient did not have a history of significant medical illness aside from the carcinoma. No follow-up radiation therapy or chemotherapy was given.



Fig 1. Facial disfigurement after rhinectomy

The defect was carefully evaluated to identify possible restorative limitations regarding retention and esthetics. The fabrication of a silicone nasal prosthesis retained with adhesive and assisted with engagement of the tissue undercuts was planned, and the expectation of this treatment was explained to the patient. The construction of the prosthesis was done according to the following stages:

### First Stage: Moulage Impression And Working Cast Fabrication

The patient was first mentally prepared for the impression procedure by a simplified description of the steps of the facial impression making to gain his confidence and cooperation.

The patient was placed in a semi-supine position for making impression of the affected area. Patients' eyebrows, moustache and eyelashes were protected by a light application of petroleum jelly. A ring of boxing wax was built around the defect area to prevent undesirable flow of the alginate material and to make it confined to the desired area.

The patient was allowed to breathe through 2 saliva evacuator tubes to ensure maintenance of adequate ventilation. Pieces of moist gauze were used to plug the internal part of the defect to prevent the flow of material into the undesired areas of the defect but leaving a bilateral lateral areas of undercut unplugged to be included in the impression and to be engaged later on by the silicone prosthesis to assist in its retention.

Facial Impression of the defect together with the adjacent tissues was made using irreversible hydrocolloid which was mixed with cold water to prolong the setting time and to gain adequate working time for registration of this relatively large defect.

Pieces of opened gauze squares were applied over the entire surface and imbedded into the alginate using light pressure to provide mechanical retention to the subsequent fast set plaster layer. The impression with its supported plaster layer was removed and poured immediately in Type III dental stone.

### Second Stage: Sculpture and Pattern Fabrication:

The margins of the prosthesis were detected and marked on the cast. The undesirable undercuts were blocked out by gypsum while the desirable undercuts were blocked out with clay to be easily removed before construction of the silicone prosthesis.

A piece of thin tin foil was adapted at the defect area to allow easy removal and the handling of the wax pattern in the try in stage.

A pyramid-shaped wax sculpturing blockout formed with baseplate wax was then built on the cast to a rough contour which was initially trimmed to configuration that close to the nose and then sculpted into the final form with incorporation of the skin texture. A previous photograph of the patient was used as a guide to carve the wax pattern. The final wax pattern was then tried on the patient face to verify fit and contour. (Fig 2)



Fig. 2: Try in of the wax pattern

Third Stage: Mold Fabrication:

The wax pattern was returned on the facial model and was sealed to the cast and the margins of wax prosthesis were kept thin to ensure marginal adaptation with patient's skin to create natural merged appearance as well as to avoid unnecessary trimming of the prosthesis.

Two pieces mold was fabricated by using the working cast as the tissue surface of the mold (drag portion), The second part (cope portion) of the mold was poured in Type III dental stone after building a boxing ring of 10 cm height of base plate wax and 3 cm around the wax pattern and applying a separating medium to the exposed stone surface of the cast rounding the wax pattern. (Fig 3.a)

As soon as the stone had set the drag portion and the cope portion were carefully separated. The softened wax pattern and the blockout clay were removed and the mold cavity was cleaned with hot water and detergent to be ready for the application of the room temperature cured silicone.

Fourth Stage: Processing of the Prosthesis Material with Intrinsic and Extrinsic Coloration:

Room-temperature vulcanizing (RTV) silicone rubber was used in for the construction of the prosthesis. The pigment was placed in a small quantity of silicone rubber and mixed until it is thoroughly incorporated. Different color pigments were added until the desired skin tone was attained. A care was taken to avoid contamination of the silicone while being packed into the mold.

After packing of the silicone in the mold cavity the two portions of the mold were reassembled and pressed gently under bench press until maximum mold closure was achieved with the excess silicone was expressed using light pressure. This complex was left under the bench press until the silicone was fully set. (Fig. 3.b) After that the two portions of the mold were carefully separated and the residual silicone flash was trimmed back to the margin with sharp scissors and cleaned with water and mild detergent.

Finally, the prosthesis was evaluated on the patient and some extrinsic water-resistant coloration was applied.

A medical grade silicone skin adhesive was used for retention of the prosthesis assisted by engagement of the anatomic undercuts. (Fig. 4).

The patient was instructed how to use and take care of the prosthesis, how to orient and place it, how to use the adhesives and how to maintain both tissue and prosthesis hygiene.



Fig. 3: Mold Fabrication and silicone packing a. Wax pattern on the working cast with boxing wax to pour the cope. b. Two portions of the mold kept together while silicone is set.



Fig. 4: Final Prosthesis: a. Lateral View. b. Anterior view.

#### 4. Discussions

Basal cell carcinoma is the most common skin malignancy, accounting for up to 80% of all cancers arising from the epidermis. (Rubin, Chen et al. 2005) Most basal cell carcinoma (BCC) grow slowly, have a non-aggressive course, and can be fairly easily managed. However, long standing or neglected BCCs can present a therapeutic challenge, especially in terms of functional and cosmetic reconstruction. (Baxter, Patel et al. 2012) Basal cell carcinoma of the nasal area has a high cure rate of more than 95% but a delay in seeking treatment can allow the cancer to enlarge, causing possible disability. (Glass, Fenske et al. 1996) In the present case the basal cell carcinoma was misdiagnosed and neglected which necessitate total rhinectomy for complete excision.

Rhinectomy is an operation which carries significant aesthetic, psychological and social implications, but which is an oncologically sound procedure for the management of high risk lesions. Prosthetic rehabilitation is the most common post-

operative option, and provides a safe and aesthetically pleasing outcome. Prosthetic rehabilitation can be an excellent alternative to surgery, particularly in those patients unsuitable for major reconstruction. (Chipp, Prinsloo et al. 2011)

The treatment objectives for such patients are to reconstruct the lost tissues as soon as possible after surgery to maintain appearance, morale and self-confidence of the patient and improve social relations among the public and their families. (Negahdari, Pournasrollah et al. 2014)

The literature indicates that 3 to 5 months of postoperative healing may be required to allow for contraction and organization of the tissue bed before commencing fabrication of a definitive nasal prosthesis. This delay in rehabilitation can be a hardship for the patient and result in adverse psychologic consequences. Early rehabilitation through the use of a temporary nasal prosthesis offers a means of overcoming these difficulties (Toljanic, Lee et al. 1999) so it was planned to provide the present case with a provisional nasal prosthesis as early as possible.

The silicones are the most widely used material for maxillofacial prostheses because of advantages like light weight, softness, life-like appearance, translucency, possibility of intrinsic and extrinsic coloration, dimensional stability, flexibility, natural skin like texture, and no allergic responses. (Beumer J 1996; Brooks, Carr et al. 2004; Rodrigues, Shenoy et al. 2005)

Silicone elastomers are classified into heat vulcanized silicones or room-temperature vulcanized silicones. RTV (room-temperature vulcanized) silicones became popular not only because of their good physical properties but also because they are easily processed. The physical properties of RTV silicones are good, processing and colorization are easy, and they provide opportunities to use gypsum muffs. Physical and mechanic properties of these materials are still being improved. They corrode fast but not to such a degree that would impede their use for maxillofacial prostheses. (Polyzois 1999)

Most facial prostheses like nasal prostheses are retained with adhesives and mechanisms including anatomic undercuts, eyeglasses attachments, attachment to maxillary obturators, magnets, and prosthetic connections to osseointegrated implants. Each of these methods has its own advantages and disadvantages. (Beumer J 1996; Nishimura, Roumanas et al. 1996; Jain, Maru et al. 2011)

For the present case, a silicone material with intrinsic coloring was used and in order to achieve a natural appearance, further extrinsic coloring was applied. The margin of the prosthesis was planned to end on normal skin to allow the adhesive to work

efficiently but also the margins were kept thin and merged with the facial aging lines of the patient to be unobservable and to create natural merged appearance. Soft flexible silicone projections were gently engaged minor tissue undercuts to enhance retention and stability.

Pigments used with silicone rubber are nearly always inorganic compounds such as metallic oxides. (Taylor 2000; Lemon, Kiat-amnuay et al. 2005) Determining the concentration of pigments needed to obtain the desired color is primarily a trial-and-error procedure.

The facial prosthesis described in this article which was fabricated from RTV silicone provided economic rehabilitation to the patient and have the advantages of non-invasive technique, tissue tolerant, aesthetic, low weight, comfortable to use, and easy to fabricate and clean. No evidence of inflammation or irritation has been found on follow up for 4 months.

#### 4. Conclusion

This case report describes a time saving and cost effective prosthetic rehabilitation of a patient with total rhinectomy with a provisional nasal prosthesis made up of a room temperature curing silicone elastomer, which is retained by medical grade biocompatible adhesive with engaging minor tissue undercuts to enhance retention and stability using a simple and effective 4 stages technique of facial prosthesis construction; moulage impression and working cast fabrication, sculpture and fabrication of the pattern, mold fabrication and processing of the prosthesis material with intrinsic and extrinsic coloration.

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