Several uses of skin grafts inside mucosa-lined cavities have been described. Free grafts, pedicled flaps, or free vascularized composite grafts have been used for many years in the reconstruction of the oral cavity or the pharynx usually after extensive tissue ablation due to malignant diseases.

In the nasal cavity, in particular, skin grafts have been also used for several years to replace nasal mucosa for various reasons. Pedicled skin flaps to reconstruct nasal defects were described as early as the Italian Renaissance [1] and are under constant use and development in our days [2] after removal of nasal tissues usually to treat malignant diseases. Other uses include repair of oronasal fistula [3] and treatment of hereditary hemorrhagic telangiectasia (HHT) by replacing septal mucosa [4].

Based on the concept of the treatment of HHT by septal dermoplasty we designed and presented another use of skin grafts inside the nasal cavity for the treatment of severe polyposis [5]. If this method proves effective, it may become one of the most common indications for skin grafting mucosa-lined cavities.

Material and methods

Since January 2012 we have used this novel dermoplasty technique in fifteen patients. Patients’ age ranged from 23 to 60 years old and among them were four women and eleven men. All patients reported a history of multiple operations in the past for the removal of nasal polyps.
yps. After being informed about the details of the technique, they proceeded with the operation.

Our technique is based on the removal of the mucosa of the middle meatus which is the main area that polyps grow. To prevent the mucosa from growing back, we cover the denuded area with a split-thickness skin graft. The operation begins as a conventional functional endoscopic sinus surgery (fess). Polyps are removed, the ethmoid cells are opened and the ostia of the maxillary, the sphenoid, and the frontal sinuses are broadened.

In order to increase the chances for the skin graft to survive, we must accordingly prepare the bed to receive it. The first condition to be met is the complete removal of the nasal mucosa of the middle meatus. We cannot expect the skin graft to survive above intact mucosa. On the other hand, we do recognize that complete removal of the mucosa is difficult to achieve. There are areas where this effort may prove not only futile but dangerous as well. One such example is the area of the frontal ethmoidal artery especially when it is supported by a mesentery.

The mucosa of the lamina papyracea and the fovea ethmoidalis is rather easy to remove. We use a variety of fine endoscopic instruments including the round knife used in the surgery of the ear (Fig. 1). The mucosa is easily elevated having as substrate the fine bone of the orbit and the skull base. Still, small remnants of mucosa may be left behind.

The mucosa of the lateral surface of the middle and upper concha — if still present because of the previous operations — is more difficult to remove because the bony substrate is uneven and cancellous. For this area we make use of the microdebrider (Fig. 2) trying to remove the mucosal surface and providing the graft with a raw surface to vascularize.

Another prerequisite for the skin graft to survive is to provide the circumstances for major adherence of the graft with the bed. In order to achieve this condition, we must remove all bony ethmoidal septa including the frontal wall of the sphenoid sinus. This way we render the bed even and we are avoiding the tent effect. The removal of the bony septa is accomplished by making use of the 15° curved diamond bur (Fig. 3). The removal of bony septa also helps in the removal of small mucosa remnants.

After preparing the bed it is the time to receive the graft. The donor site is the patient’s thigh, preferably the inner surface. To receive the graft we make use of an electric dermatome (Fig. 4). The desired thickness of the

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**Figure 1.** Elevating the mucosa from the lamina papyracea making use of the round knife.

**Figure 2.** The use of the microdebrider to traumatize the mucosa of the lateral surface of the middle concha.

**Figure 3.** The use of 15° curved diamond bur for the atraumatic bony septa removal.

**Figure 4.** The use of an electric dermatome to receive the graft.
graft has been estimated to be 0.15 mm. This estimate results considering that the graft must contain a portion of the dermis, being also thin enough for the narrow space of the middle meatus. Also, as a general axiom, the thinnest the graft the easier is to survive.

For the graft to survive we must ensure the major adherence with the bed. In order to prevent air or blood clots to accumulate between the graft and the bed we perform multiple cuts on the surface of the graft (Fig. 5). These cuts may serve a dual purpose as they may facilitate small remnants of mucosa to grow to the free surface of the graft finding their way out to the nasal cavity.

The surface and the contour of the graft needed have already been estimated preoperatively from the study of the computed tomography (CT) taking multiple measurements in the sagittal and the coronal plane (Fig. 6). The wound of the leg is dressed and normally it will be inspected after twenty days or more.

After completing trimming of the graft, it is wrapped around a sterile paper and is inserted into the nasal cavity. At its final position, the graft is unwrapped by making use of the Freer elevator and the round knife. During this manipulation, suction is completely avoided. No packing of any kind — absorbable or not — is used (Fig. 7).

The procedure lasts about four hours and is performed under general anesthesia. The patient stays overnight and leaves the hospital the next day.

**Results**

Until today, we have applied this novel method of dermoplasty in fifteen patients. The first two cases were considered a failure as a result of inadequate surgical technique. By gaining experience and improving surgical details we count thirteen consecutive successful cases. In the last thirteen patients the graft take was successful which in turn led to better control of the polyps and improved patency of the upper airway system.

The successful graft take can be confirmed in two ways: the first is by direct inspection inserting the endoscope into the middle meatus (Fig. 8) during the first postoperative examination. The second way is indirect — in cases the middle meatus is not accessible — by the foul odor produced by the keratin debris produced by the graft again starting about one month postoperatively. This bad odor is well documented from the use of skin grafts for the treatment of HHT [6] and subsides during the following months.

The longest follow up period is four years and a half. The mean follow up period is sixteen months. None of the patients developed polyps in the area covered by the skin graft. Polyps still grow in other areas of the nasal mucosa but exhibit a more benign course and respond easily to topical application of drops containing tobramycin/dexamethasone. To maintain patency of the nasal cavities we have agreed to instruct our patients to use these drops for one week every three months.

The skin graft may have a dual effect inside the nasal cavity: the early effect is the suspension of polyp growth in the area covered by the graft. A late effect which is still under investigation is the development of squamous metaplasia in polyps growing postoperatively (Fig 9) in certain patients while no foci of metaplasia were detected preoperatively.

**Discussion**

Autologous skin transfer is an old and safe technique with fine results when done «lege artis» which means according to the laws of the medical art. In our case of the use of dermoplasty to replace the mucosa of the nasal vault it seems that we have certain conditions in favor.
One major advantage is that the nasal cavity provides an almost closed and secure space with no motility and reduced harmful factors e.g. the passage of air. Another advantage is the rich vascularity of the recipient site which will guarantee the process of angiogenesis to feed the graft in its new position. Finally, the fact that the graft needed must be of split-thickness is also advantageous.

If a minimum of the surgical protocol is practised with proper preparation of the recipient site and proper trimming of the graft then success is unanimous leading to graft survival in its new position.

The high rate of success in skin transferring also ensured the success in controlling polyp growth. Polyps grow no more in the area covered by the graft. In the rest of the nasal mucosa polyps may recur but display a more benign course easily responding to topical therapy even in cases with co-morbidities present that lead to severe polyposis [7]. Our current instruction to our patients is to use eye-drops containing tobramycin/dexamethasone intranasally for one week every three months.

Conclusion

Dermoplasty for nasal polyps is a new indication for the use of split-thickness skin graft inside the nasal cavity. It is a time honored procedure with a high rate of successful graft take and promising results in the control of intractable nasal polyposis. If we establish the efficacy of the technique, it may become one of the most common indications for skin transferring inside mucosa-lined cavities.

REFERENCES