MODIFICATION OF CLASSIC RECONSTRUCTIVE TECHNIQUES AND EVALUATION OF NEW ESTHETIC METHODS IN TERMS OF THE EXPECTATIONS OF MODERN OTO-RHINO-LARYNGOLOGY AND HEAD-NECK SURGERY

PHD THESIS

GÁBOR VASS MD

Department of Oto-Rhino-Laryngology and Head-Neck Surgery
University of Szeged

University of Szeged, Faculty of Medicine
Doctoral School of Clinical Medicine
Ph.D. Program:
The role of tissue reconstruction in case of advanced and recurrent laryngo-pharyngeal tumors considering function-preservation and quality of life

Program Director: Prof. Dr. Lajos Kemeny D.Sc.
Supervisor: Dr. Laszlo Ivan Ph.D.

Szeged
2017

PUBLICATIONS RELATED TO THE PHD THESIS

I. László I, **Gábor V**, Zsolt B, László T, József J. **Synchronous myeloproliferative and inflammatory disease of the nasal cavity and paranasal sinuses: an interesting differential diagnostic problem.** Rhinology. 2009 Sep;47(3):323-6.
Impact Factor: 2.182

II. **Vass G**, Torkos A, Altmayer A, Czigner J, Jóri J, Rovó L, Iván L. **Epicutaneous patch test--a new diagnostic option to prevent the rejection of silicone-covered cochlear implants in children.** Int J Pediatr Otorhinolaryngol. 2013 Oct;77(10):1635-8. doi: 10.1016/j.ijporl.2013.06.023. Epub 2013 Aug 12.
Impact Factor:1.319

III. **Vass G**; Mohos G; Paczona R; Varga J; Iván L; Rovó L**. Ajtószárny lebenyek speciális felhasználási lehetőségei fej-nyaki tumoros beteganyagunkon.** Magyar Traumatológia, Ortopédia, Kézsebészet és Plasztikai Sebészet. - ISSN 1217-3231. - 2015. 58. évf. 4. sz., p. 257-265.

IV. **Vass G**, Bella Zs, Tóbiás Z, Nagy A, Iván L, Rovó L. **Esztétikai és funkcionális szempontból is kedvező sebészi alternatíva a maxilloethmoidális daganatok eltávolítására: a módosított „facial degloving" technika** Fül-Orr-Gégegyógyászat 2016. 62:(3) p. 118.

V. **Vass G**, Mohos G, Bere Z, Ivan L, Varga J, Piffko J, Rovo L. **Secondary correction of nasal deformities in cleft lip and palate patients: surgical technique and outcome evaluation.** Head Face Med. 2016 Dec 1;12(1):34.
Impact Factor: 0.916

ABBREVIATIONS

ACD	Allergic Contact Dermatitis
CI	Cochlear Implant
CLP	Cleft Lip and Palate
CT	Computer Tomography
ELISA	Enzyme-Linked Immunosorbent Assay
ELTMF	Extended Lower Trapezius Musculocutaneous Flap
EPT	Epicutaneous Patch Test
FNA	Fine Needle Aspiration
LDMF	Latissimus Dorsi Musculocutaneous Flap
MFD	Modified Facial Degloving
MRI	Magnetic Resonance Imaging
PET	Positron Emission Tomography
PM	Pectoralis Major
ROEQ	Rhinoplasty Outcome Evaluation Questionnaire
TNM	Tumor - Lymph Node - Metastasis
TOF	Turnover Flap
VAC	Vacuum Assisted Closure

LIST OF CONTENTS

1. INTRODUCTION

1.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

Benign and malignant tumors of the head and neck region imply a great surgical challenge in virtue of their localization, as operative scars are nearly always visible in these regions. Patients have to face not only the tumor itself, but the stigma caused by the surgeon's knife. Oncosurgical principles, however, should not be abandoned for aesthetics, because radicality and ablasticity are priority in case of malignant tumors. Continuous development of the surgical instruments and operative techniques have set the focus of surgical treatment on one hand onto microsurgery and free flap reconstruction also in the field of otorhinolaryngology and head-neck surgery nowadays. However, these operations are rather time-consuming, mean a great intra- and postoperative burden for the patient, and require highly specialized, skilled surgical team.

1.1.1. The Modified Facial Degloving technique

Endoscopic surgery has become the cutting-edge therapeutical approach nowadays, as it is minimal-invasive, scarless and can be carried out mostly on one-day-surgery basis. However, the endoscopic approach - especially in case of malignant sino-nasal tumors - has its limitations (orbital involvement, infiltration of the premaxillary soft tissues or skin, lateral extension/infiltration of the tumor in the internal carotid artery's region, etc.), not to mention the long learning curve of becoming an expert in endoscopic surgery, the time-consuming operations and high cost of the endoscopic sets with navigation system (1). In such cases, when microsurgical reconstruction or endoscopic surgery are inadequate or limited, or the personal and financial resources are insufficient, simpler reconstructive methods or classic external approaches may come forth, together with increasingly raised expectations of patients towards the head and neck surgeon to elaborate and apply new surgical methods with concealable or hidden scars.

Maxillo-ethmoidal malignant and aggressively growing benign tumors are removed routinely through the widely-used *Weber-Ferguson's* incision (2). This surgical approach provides a very good sight of the operative field but may cause postoperative aesthetic deformities (**Fig. 1**).

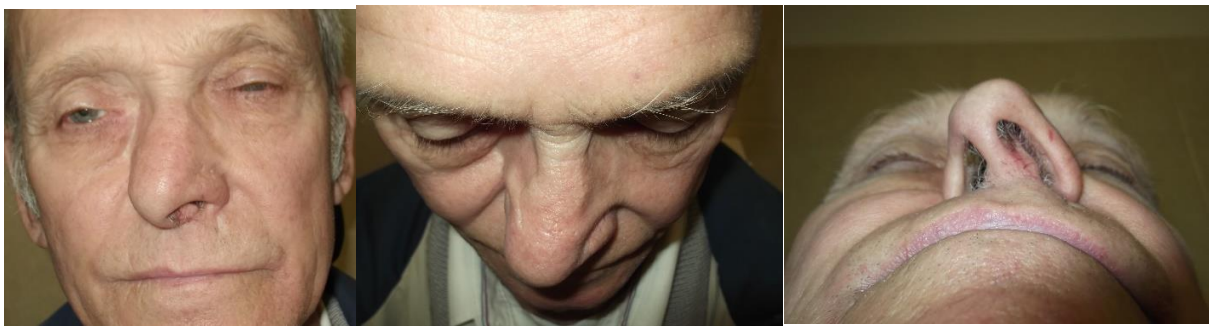

Figure 1: *Weber-Ferguson's* approach – late postoperative pictures

To avoid such complications, the need for a surgical technique with only hidden incisions started to evoke, that gives the same visibility and reach of the tumor (**Fig. 2**).

Figure 2: Modified Facial Degloving technique – late postoperative pictures

The main problem of such an approach is how to remove the soft tissues of the midface and the nose to be able to reach the whole maxillary and paranasal sinus region. With the classic, open approach through the *Weber-Fergusson's* incision this exploration is reached by cutting the skin and all soft tissues of the upper lip and along the paranasal line thus the soft tissues can me mobilized. *Conley and Price* suggested hidden, sublabial and intercartilaginous incisions; by this so called facial degloving technique the soft tissues of the midface could be elevated (3). We have modified this approach (Modified Facial Degloving – MFD) and we have been using it for 5 years routinely at our Department in cases of benign and malignant sino-nasal tumors both.

1.1.2. Application of alternative reconstructive surgical methods in special cases of head-neck cancer

From the surgeon's point of view, the spreading of oncotherapy against his first treatment choice of oncosurgery is another problem, as wound healing disorders may rise after radio-chemotherapy, and additional reconstructive operations could become necessary. Tissue environment alterations due to oncotherapy and/or multiple scars caused by previous operations require elaboration of alternative tissue restoration methods, which are uniquely planned for each case and are often redesigns of a previously used and published flap technique. Turnover Flaps (TOF) are flaps, that are turned by 180 degrees into the defect over their fulcrum, which provides their blood supply. Flaps containing skin and subcutaneous fat have random blood supply, while pedicled TOFs have muscle and fascia components. Comprehensive usage of these flaps have been published in the international literature (4-7). Most frequent application of these flaps are: defects of the lower limbs and hands, sacral sores, myelomeningocele, chest wall defect, tracheostomy, fistulas of the pharynx and oral cavity and nasal defects (8-11).

In reconstruction of defects of the skin and underlying soft tissue of the neck it is the surgeon's main objective to achieve proper long-term coverage of the exposed vital organs with well-vascularised tissue harvested from a distant donor site (12, 13). A precise evaluation of the extent of the defect, the patient's physiological data, and the area to be covered will guide the surgeon in choosing the best option (12, 14, 15). The extended lower trapezius musculocutaneous flap (ELTMF) and latissimus dorsi musculocutaneous flaps (LDMF) are the two available muscle compartments that can be transferred on a reliable vascular pedicle to the dorsal, suprascapular, and neck regions. The selection of flap depends on a thorough understanding of their anatomy, their way rotation, and an analysis of the size, extension, and site of the defect (12, 14).

1.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTION

Cochlear Implant (CI) revolutionized hearing restoration in patients with bilateral, severe or profound sensorineural hearing loss. A CI's function is to substitute the inner ear, to code and to transfer the sound stimuli to the acoustic nerve. The receiver-stimulator unit is implanted under the scalp and the electrode array is installed into the cochlea during a surgical procedure (16). In the past decades, the increasing number of cochlear implantations worldwide, also in Hungary, has led to an elevated number of possible reoperations due to certain complications (17, 18). One of these complications might be the skin necrosis above the transmitter coil and the concomitant exposure of the receiver-stimulator unit – this is a major complication of the operation (19-21). In some of our cases, the skin necrosis occurred repeatedly notwithstanding the various surgical solutions to re-cover the implant. As all implants have been operated by the same team with standard methods, and no infective or histopathological anomaly has been revealed in our patients with implant rejection, and furthermore all of our adopted reconstructive methods, that have been published previously as definitive surgical solutions, we started to seek for non-surgical cause. According to literature data the silicone housing of any implanted medical device may pay a role in this rejection process via immune system modulation, by inducing foreign-body type and local and systemic nonspecific (nonallergic) inflammatory reactions (22). However, evidence for true allergic reactions to silicone-coated medical devices has also been reported in some cases (22). In general, we can state, that any kind of silicone implant may induce the production of auto-antibodies in genetically susceptible patients causing immune system disorders (23). This draw our attention towards the possibility of individual silicone hypersensitivity against the covering of the CI, because all four patients with skin necrosis had the same silicone-covered device implanted. In the dermatology-allergology practice routinely used, non-invasive Epicutaneous Patch Testing (EPT) seemed to be a proper method to reveal the possibility of individual silicone hypersensitivity.

1.3. SECONDARY CORRECTION OF NASAL DEFORMITIES IN CLEFT LIP AND PALATE PATIENTS: SURGICAL TECHNIQUE AND OUTCOME EVALUATION

Cleft lip and palate (CLP) deformities are among the most common congenital malformations (24). In Hungary the incidence of combined oro-facial clefts is 2 in 1000 live births (25). Although CLP together occur more commonly in males, isolated cleft palate is more common in females (24, 25). Surgical correction of CLP should be performed before the first year of age, usually between 3-6 months-of-age, prior to speech development (24, 25). The aim of the operation is to reunite all tissue layers of the lip, to reposition the nasal septum and to separate the oral and nasal cavities; and restore the valve function of the soft palate. This functional repair helps also with the preservation of facial growth and the development of proper dentition (24, 25). If this adequate primary surgical correction of CLP fails, the consequentially developing nasal deformity associated with CLP is one of the most challenging reconstructive problems in rhinoplasty. The characteristic CLP nose represents a stigma for the patient. This results from a combination of altered anatomy, surgical scarring from previous reconstructive operations and includes deformities of the septum, nasal pyramid, malformation of the nasal tip and malposition of alar cartilages. The indication for surgery is on one hand the difficult nasal breathing and altered nasal function (tendency for chronic rhinosinusitis) and on the other hand the aesthetic look of the nose, both of which may affect the patient's quality of life negatively and can cause heavy psycho-social burden for them. Accompanying nasal deformities are mainly characterized by a shortened columella, a depressed nasal tip, bilateral dislocation of the alar cartilage, eversion of the alar bases and nasal obstruction (26-28). Although numerous secondary rhinoplasty methods have been described in the literature for the lengthening of the columella, or for grafting techniques, no standardized technique exists. Statistical analysis or comparison of the surgical methods and their results are hardly comparable this way.

2. AIMS OF THE THESIS

2.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

To work-out and demonstrate a novel surgical method, which gives the opportunity to resect malignant sino-nasal tumors according to the oncosurgical principles without visible skin scars and aesthetic deformities. Furthermore, to present the alternative, modified application of two well-known and previously published flaps (TOF, ELTMF) for the reconstruction of special tissue defects in the head and neck region after malignant tumor resection and oncotherapy.

2.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTION OPTION

To establish a diagnostic method, which could shift the focus from reconstruction towards prevention in CI with complications. As three of the four implantees with implant rejection have had a positive skin reaction with the EPT for the silicone sample and the repeated, different reconstructive operations have been unsuccessful, possible individual silicone hypersensitivity has arisen. This, in our opinion, plays a very important role in the process of wound healing disorder and the rejection of the implant, because no other cause could have been proved by histopathology, bacteriology or methodology analysis. EPT, as a non-invasive method, might be useful in childhood before the planned cochlear implantation to reveal optional silicone allergy. Thus rejection tendency, skin necrosis above the implant and stressful reconstructive surgeries with stigmatizing scars on the scalp could be avoided.

2.3. SECONDARY CORRECTION OF NASAL DEFORMITIES IN CLEFT LIP AND PALATE PATIENTS: SURGICAL TECHNIQUE AND OUTCOME EVALUATION

To standardize the surgical method according to the experience gained during the secondary rhinoplasty operations of CLP patients at our University, and to evaluate our results by the adaptation of a previously published patient satisfaction questionnaire (ROEQ – Rhinoplasty Outcome Evaluation Questionnaire).

3. METHODS AND SUBJECTS

3.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

3.1.1. The Modified Facial Degloving technique

In case of head and neck tumors, especially in sino-nasal localization, radiological imaging is inevitable for the evaluation of the tumor's extent, the infiltration of bony structures or soft tissues and the presence of metastatic lymph nodes. Beside the clinical picture, these images help to predestinate the chosen surgical method, which is mainly the endoscopic approach for benign lesions (chronic rhinosinusitis, nasal polys or papilloma) and early-stage malignant tumors of the maxillo-ethmoidal region (1). Considering malignant tumors, endoscopic surgery has its well-defined limitations, when an open approach becomes necessary (1). Open surgery is advised for benign lesions with complications (e.g. frontal sinusitis with intracranial spreading), for malignant tumors and other indications such as mucormycosis, foreign body in the sinuses or certain maxillary fractures (29-32). First line imaging method for the above listed cases is the Computer Tomography (CT), which gives a proper status of the bony structures and the extent of the disease; however, its specificity is rather low: inflammation and tumor can hardly be distinguished. In order to differentiate between a malignant tumor and chronic inflammation, as we have published before, Magnetic Resonance (MR) examination should be performed (neoplastic tissues often have higher proton density and relaxation time than the healthy tissues), i.e. on T2 flares the chronic inflammation is hyperdense, while the tumor remains hypodense.

Twenty-three consecutive patients have been operated with this technique at our Department between 2012-2016. Patients had a mean age of 44,4 years (varying between 19 and 67 years); gender ratio was 14 (61%) female and 9 (39%) male. All patients had been diagnosed with histologically proven malignant sino-nasal tumors and had preoperative CT/MRI imaging. Inclusion criteria for surgery have been: limitations of endoscopic surgery (orbital involvement, infiltration of the premaxillary soft tissues or skin, lateral extension/infiltration of the tumor in the internal carotid artery's region, etc.), tumor TNM stage (T2-T4a, tumor mass reduction in cases of T4b before oncotherapy) and informed

consent from the patients for the MFD surgery. Exclusion criteria: contraindication for general anesthesia.

MFD technique: Always under general anesthesia, the base of our approach is a wide sublabial incision between the two premolar teeth. The incision line is then following the anterior and minimally the superior margin of the septal cartilage (much like the transfixion incision) and the inferior, horizontal border of the piriform aperture (incision of the nasal mucosa) unilaterally or bilaterally, depending on the localization of the tumor. Superiorly from this latter incision, the lateral bony rim of the piriform aperture with the covering mucosa and also all soft tissues remain intact. To provide the widest exploration, in our modification with the help of rhinoplasty osteotomes we prepare an osteoplastic flap: starting from the lowest and most lateral angle of the piriform aperture, where the previous horizontal mucosal incision stopped, a horizontal osteotomy is done towards the side, followed by a vertical one till the infraorbital rim and an oblique one backwards and upwards till the nasal pyramid parallel with the contour of the infraorbital rim (**Fig. 3a, 3b**).

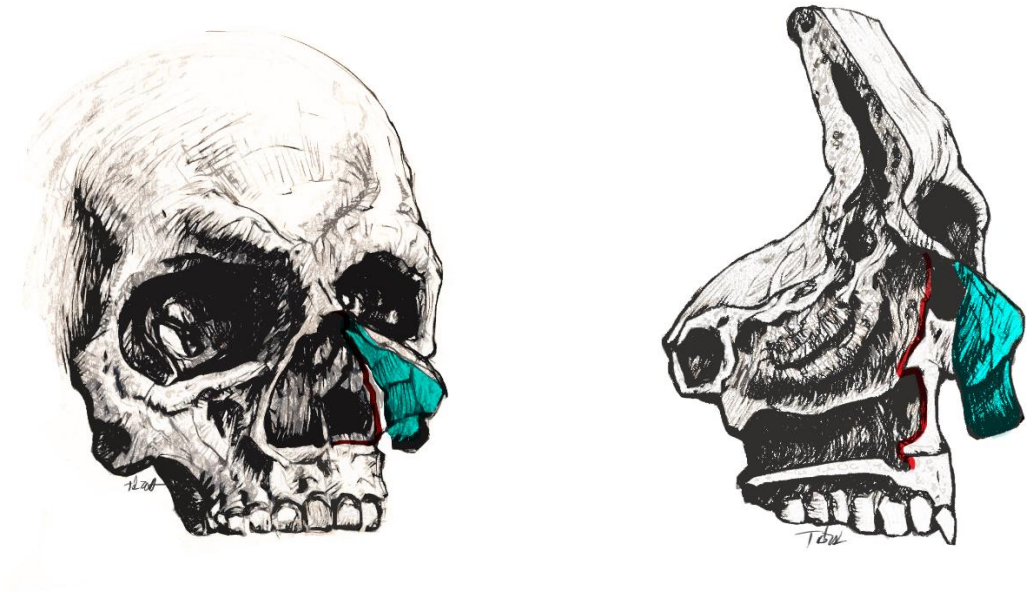

Figure 3a (frontal-oblique view) **and 3b** (medial-oblique view): Red line: incision lines of the MFD technique used by the authors; the osteoplastic flap is colored green (own illustration).

The bone incisions are finished with a medial or medio-lateral oblique osteotomy of the nasal bone depending on the height of the tumor localization. This osteotomy is carried

out through a narrow tunnel prepared by a sharp *Cottle* elevator in the supraseptal-subperiosteal plane - just like in closed technique rhinoplasty - above and medial from the nasal cartilages; thus no incision in the nasal vestibule or in the region of the nasal cartilages is needed. The lateral nasal wall is then separated - like in *Denker's* operation - and later on resected together with the tumor mass. This way the cartilaginous framework, the nasal bone and the anterior bony wall of the maxillary sinus could be elevated together with the soft tissues of the nose and the midface. In the classic approach the nasal skin is reached and lifted through the intercartilaginous incisions used in rhinoplasty (31-34). In our modification so as to be more simple, and not to disrupt the integrity of the cartilage framework of the nose thus minimizing the postoperative and aesthetic complications, the soft tissues above the bony nasal pyramid and the anterior wall of the maxillary sinus are not dissected at all, but these are elevated and mobilized together with the nasal bone and the anterior bony wall of the maxillary sinus after performing the above detailed osteotomies. This approach makes it possible to perform endonasal resection and to explore the whole nasal and paranasal region according to the localization and extent of the tumor. If necessary, the effect of radicality can be controlled with 30-45-70 degree rigid endoscopes; furthermore, endoscopes can be used intraoperatively to dissect and coagulate the sphenopalatine and ethmoid arteries in order to have a better intraoperative bleeding control (30). The nasal septum can be incised parallel with the palate at the level of the nasal floor, and a swinging-door technique can be used to gain more space for tumor resection, or the septum can be partially resected in case of tumorous infiltration. As the final step of operation the osteoplastic flap and the soft tissues are repositioned; care is taken to have the nasolacrimal duct open freely into the nasal cavity (35). If partial resection of the infraorbital rim, or the anterior bony wall of the maxillary sinus or the nasal bone is necessary due to tumorous infiltration, reconstruction with rib cartilage or mini-plate osteosynthesis can be an option (29). Because the integrity of attached tissues is intact within the osteoplastic flap, usually there is no need for fixation of the elevated and repositioned bones. The sublabial incision is sutured with absorbable stitches. The operative common nasal-paranasal cavity is filled with tamponage so as the nasal vestibule; no sutures are applied in this region. We routinely use iodoform gauze as packing for 3-5 days, which in our opinion has two important advantages: firstly, the used material is antiseptic, and could be left within the surgical cavity for several days, which minimizes crust formation. Secondly it

provides a continuous compression for the clipped vessels and mucosa, thus providing bleeding control during the early and mid-term postoperative days. Our patients generally complain about only minimal postoperative pain; they have no discomfort related to the tamponage. Of course other methods, packing materials and shorter tamponage intervals are also available, depending on the individual case and the extent of the surgical resection.

We illustrate the main points of our technique and its advantages versus the endoscopic approach below in different tumor localizations and types.

In case of a basal cell adenocarcinoma of the mesostructure and the orbit (37-year-old female) due to the limitations of endoscopic surgery (i.e. orbital involvement) we decided on the MFD approach, during which we carried out medial maxilla resection, removed all turbinates and the entire ethmoid region, the medial orbital wall, the medial segment of *Tenon's* capsule within the orbit and also the inferior wall of the frontal sinus, which had not been infiltrated yet, but we wanted to gain a better endoscopic visibility of the affected regions and their surroundings during the control examinations (**Fig. 4a**). The osteoplastic flap was repositioned (**Fig. 4b**), the sublabial incision was sutured with absorbable thread; the surgical cavity was filled with tamponage for four days. Radical tumor resection was achieved with excellent cosmetic results; no complications were observed. She has been tumor-free for one and a half years.

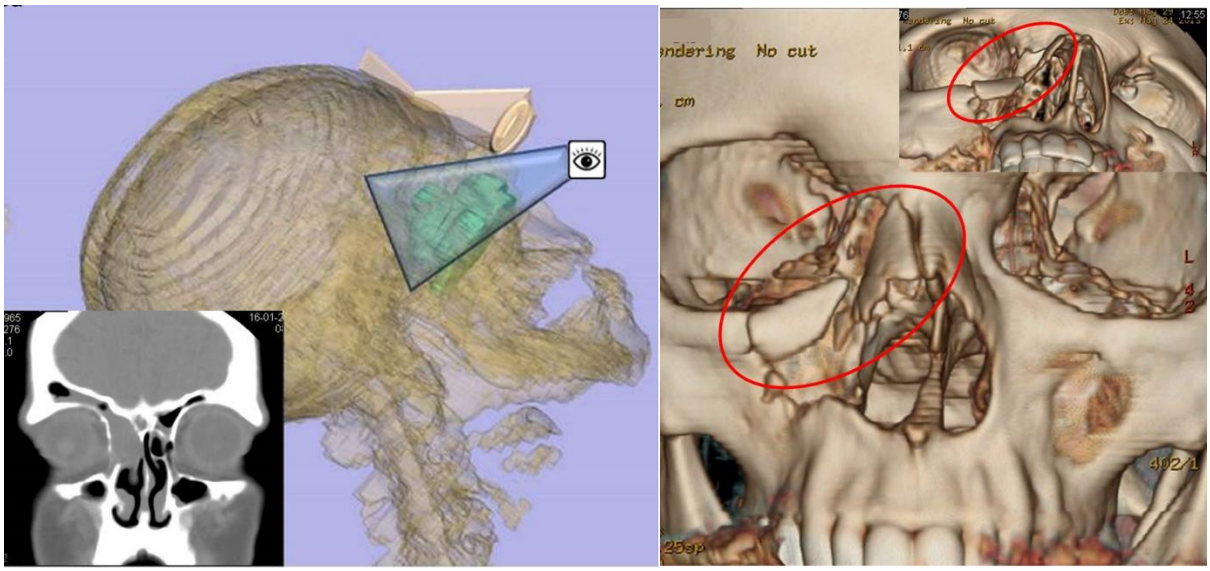

Figure 4a: preoperative CT and 3D reconstruction (blue triangle shows the field of view during operation, the tumor mass is colored green), **Figure 4b**: postoperative 3D CT reconstruction with bone window, red oval line shows the repositioned osteoplastic flap.

In case of a basaloid squamous cell carcinoma of the meso- and suprastructure (23-year-old female) the tumor originated from the left nasal cavity, it destroyed the medial wall of the maxillary sinus, the ethmoid cells and infiltrated also the frontal sinus, which latter meant a limitation for ablative endoscopic resection (**Fig. 5a**). The epipharynx and the orbit were intact according to the CT scan. Based on the age and gender of the patient and the invasion of the whole frontal sinus, we decided on the MFD approach instead of open surgery or endoscopic resection. During the operation in general anesthesia we removed the remaining medial, and partially the anterior wall of the left maxillary sinus, all of the turbinates and partially the left nasal bone. By putting the patient into Trendelenburg's position, we were able to reach the frontal sinus as well, since its frontal and lateral recess were also infiltrated, so the tumor mass could be completely and radically removed (**Fig. 5b**). The total gross resection was controlled in this case even with a 30-degree rigid endoscope in the created common operative cavity. The sublabial incision was sutured with absorbable thread; the surgical cavity was filled with tamponage for seven days. Radical tumor resection was achieved with acceptable cosmetic results; no complications were observed. She has been tumor-free for two years.

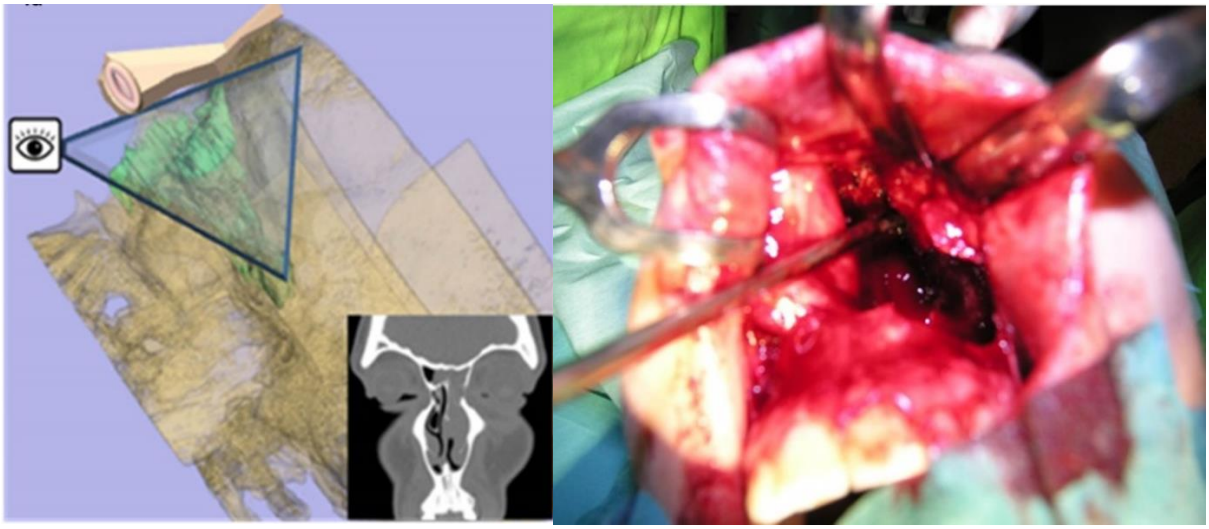

Figure 5a: preoperative CT and 3D reconstruction (blue triangle shows the field of view during operation, the tumor mass is colored green), **Figure 5b**: intraoperative picture, surgical approach (the end of the metal suction tube is on the upper wall of the frontal sinus).

In case of a Stage B olfactory neuroblastoma of the suprastructure (19-year-old female) we decided on the MFD approach, as our endoscopic technique in this field, with this

kind of tumor was still in the beginning phase of the learning curve. **Fig. 6a** is our schematic illustration of the surgical approach, while **Fig. 6b** shows the intra-operative situation. The medial wall of the maxillary sinus, all the turbinates and the whole ethmoid region was resected up to the cribriform plate, which we found intact. In order to have a full endoscopic overview during control examinations of the whole maxillo-ethmoidal region, both the frontal and the sphenoid sinuses were opened; however, no abnormalities were found in them. The sublabial incision was sutured with absorbable thread; the surgical cavity was filled with tamponage for five days. Radical tumor resection was achieved with excellent cosmetic results; no complications were observed. Postoperative full dose radiotherapy was administered; she has been tumor-free for one year.

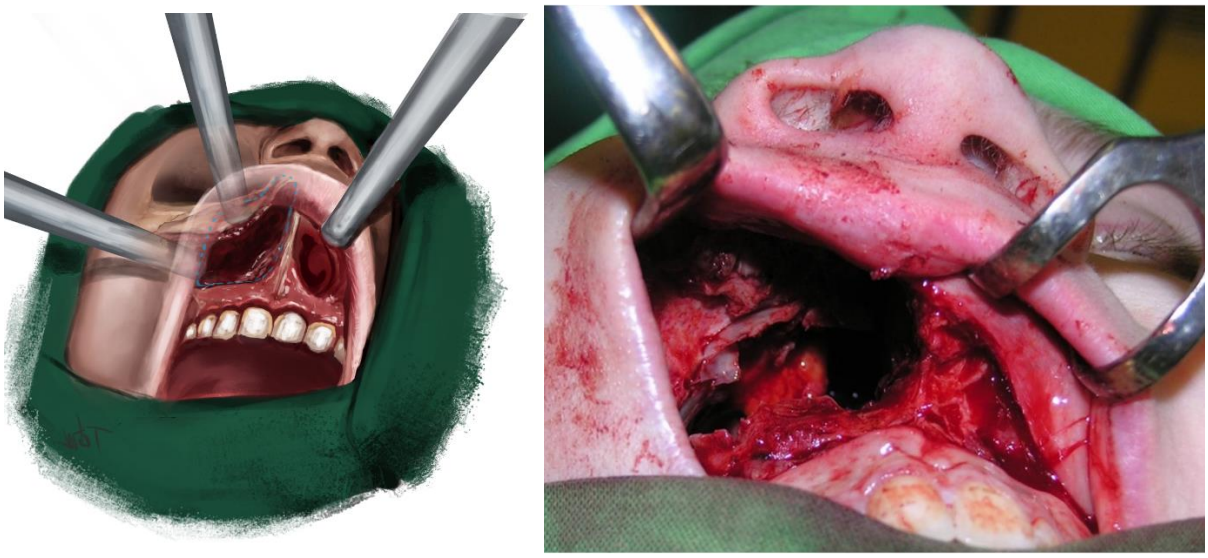

Figure 6a: our own illustration shows the operative approach – the elevated osteoplastic flap on the right side (the incision lines are blue dotted) **Figure 6b**: intraoperative picture, (elevated osteoplastic flap on the right side).

Our results were evaluated by Acoustic Rhinometry (Acoustic Rhinometer A1-209, GM Instruments LTD, Ashgrove, UK) without decongestion to prove that the operative technique does not result in narrowing of the nasal cavity and does not cause loss of nasal breathing function.

3.1.2. Application of alternative reconstructive surgical methods in special cases of head-neck cancer

3.1.2.1.Turnover flap

Patient 1*:* On a 51-yar-old woman total laryngectomy with neck dissection has been performed because of residual tumor of the hypopharynx following initial definitive-dose radiotherapy. Due to the poor wound healing caused by the previous irradiation and bacterial infection despite the parenteral application of wide-spectrum antibiotics in the postoperative period have led to the development of a pharyngo-cutaneous fistula. Long-term antiseptic-regenerative conservative treatment of the fistula did not give permanent solution. Parenteral proton pump inhibitor was not part of the protocol then; the novel Vacuum Assisted Closure (VAC) is not available at our Department. Several skin flaps and musculocutaneous flaps (pectoralis major and latissimus dorsi) have been used to close the fistula, however only size reduction of the fistula has been achieved (**Fig. 7a**). These well-vascularized, stable musculocutaneous flaps have been used at out Department routinely and successfully for decades in the reconstruction of head and neck tumors. In our opinion in this certain case the previous radiotherapy and recurrent, multiresistant bacterial infections were the causes of flap failure. A TOF has been used as a last chance solution to close the fistula. The flap was elevated from the relatively richer vascularized remnant of the previous musculocutaneous flap along the side of the fistula (**Fig. 7b**).

Figure 7a: preoperative picture (F: fistula, T: tracheostomy), **Figure 7b**: operative plan for the preparation of the TOF.

Patient 2*:* An 83-year-old male patient was diagnosed with a malignant tumor (adenoid cystic carcinoma) of the left submandibular gland, and metastatic lymph nodes on the neck. Radical resection of the tumor mass was carried out together with radical neck dissection. In the postoperative period excessive arterial bleeding occurred and acute exploration was necessary. Despite the parenteral antibiotic treatment oro-cutaneous fistula developed and also the mandible become partially denuded (**Fig. 8a**). Conservative treatment was not an option because of the size of the fistula, direct wound closure was unsuccessful. Due to the patient's age and comorbidities (chronic ischemic heart disease, diabetes mellitus) we chose the least stressful surgical solution: the defect was closed with a triangle-shaped TOF, the cortical lamina of the exposed mandible was resected (**Fig. 8b**).

Figure 8a: preoperative picture (M: mandible, F: fistula), **Figure 8b**: preparation and positioning of the TOF into the defect.

Patient 3*:* On a 63-year old male patient amputation of the left side of the nose was performed due to spinocellular carcinoma, surgical resection was complete according to histopathology findings (**Fig. 9a**). After 6 months of tumor-free status, a three-staged reconstructive operation was carried out. Firstly, the inner lining of the nose was reconstructed with two TOFs, then the cartilaginous framework has been rebuilt and finally the defect was closed with a forehead flap (**Fig. 9b**).

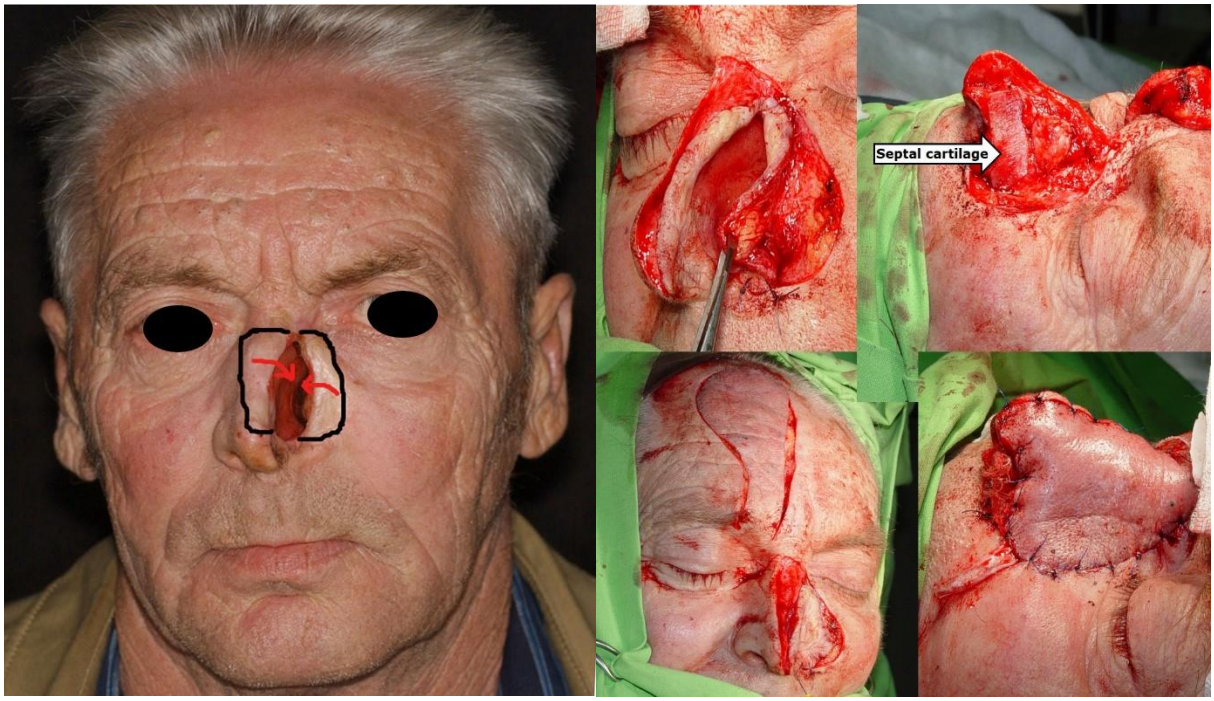

Figure 9a: operative plan for the use of TOFs as the inner lining of the nose, **Figure 9b**: steps of surgery (nasal mucosa replacement, rebuilding of the cartilaginous framework and forehead flap preparation)

TOFs have the following advances for the replacement of the missing nasal mucosa: it is a stable, well-vascularized, thin flap, onto which cartilage graft can be placed immediately. Skin turned over into the nose replaces the mucosa perfectly; it prevents crust formation and supports nasal breathing function as well. For the reconstruction of the cartilaginous framework septal and concha cartilages were used; from the former dorsal and columella grafts, from the latter alar grafts were fabricated, and in one case rib cartilage was used for grafting. External coverage of the nose was provided by a forehead flap pedicled on the supratrochlear artery.

TOFs from the facial skin have been used for the reconstruction of the inner lining of the nose in six consecutive patients, after partial or total amputation of the nose because of malignant skin tumors (**Table 1**).

Extensive nasal defects			
Gender	*Age (years)*	*Localization and extent of the defect*	*Histopathology*
female	85	total right cartilaginous nose	cc. basocellulare
female	72	total alar and tip region on the left side	cc. basocellulare
female	57	nasal tip, columella, anterior part of septum	cc. planocellulare
female	79	total right cartilaginous nose	cc. planocellulare
male	63	total left cartilaginous nose	cc. planocellulare
male	58	total cartilaginous nose and partial septum	cc. basocellulare

Table 1: Summary of our patients with nasal skin tumor, who have been operated with TOFs (2005-2015.)

3.1.2.2.Extended Lower Trapezius Musculocutaneous Flap (ELTMF)

A 49-year-old patient was admitted to our head and neck surgery department in 2003 with a squamous cell carcinoma of the right tonsillar region and the soft palate (T2N0M0). We performed a transoral carbon dioxide laser excision of the tumor, and histopathological examination showed tumor-free resection margins. He was given postoperative radiotherapy (total dose 66 Gy). Four years after the operation a late metastasis was found in the right submandibular region and verified by fine needle aspiration (FNA). He was treated by modified radical neck dissection and given four cycles of postoperative chemotherapy.

During the next two years we removed solitary metastases that were verified by both Positron Emission Tomography (PET) scanning and FNA in two occasions from the deep compartments of the neck. Histopathological examination showed free margins for each specimen. He was also given irradiation (32 Gy) and cetuximab postoperatively. Despite the complex surgical and oncological treatment, the tumor spread aggressively and in November 2009 another late metastasis appeared below the mastoid region and infiltrated the skin, the subcutaneous tissue, the deep neck muscles, and the carotid artery itself. We resected it as radically as we could by excising even the X cranial nerve and the external branch of the carotid artery. Histopathological examination showed tumor-free margins and scar tissue. The large and deep tissue defect (5 x 12 x 3 cm) needed extensive coverage, so we decided to use a LDMF from the same side, which could fill the neck defect properly. Postoperatively we noticed that the musculocutaneous flap was slowly becoming necrotic. Our musculocutaneous

flap had failed, so we had to recover the same defect (**Fig. 10a**). Our second choice was the ELTMF, which is also safe, well-vascularized by the dorsal scapular artery, and voluminous enough to be an alternative flap to cover a dorsocervical defect.

We marked the trapezius and the rhomboid muscles, and the contour of the scapula on the skin. Next to the medial-superior edge of the scapula we marked the rotation point where the supplying vessels enter at the muscle. Finally, above the end of the trapezius muscle we marked a skin island equivalent in size to the defect (5 x 12 cm) (**Fig. 10b**).

Figure 10a: Large neck defect (5 x 12 x 3 cm) remaining after necrosis of the LDMF. **Figure 10b**: Operative planning – the black arrow shows the rotation point of the flap and the white arrow shows the skin island.

The island flap was excised and its muscle pedicle dissected up to the rotation point at the medial-superior edge of the scapula. The supplying vessels were identified on the lower surface of the pedicle. We debrided the recipient site, freed the carotid artery of scar tissue, and removed the remnants of the LDMF pedicle. The tunnel of the pedicle was drained. The ELTMF was rotated laterally into the defect, and the donor site was closed free of tension after mobilization of the wound edges (**Fig. 11**).

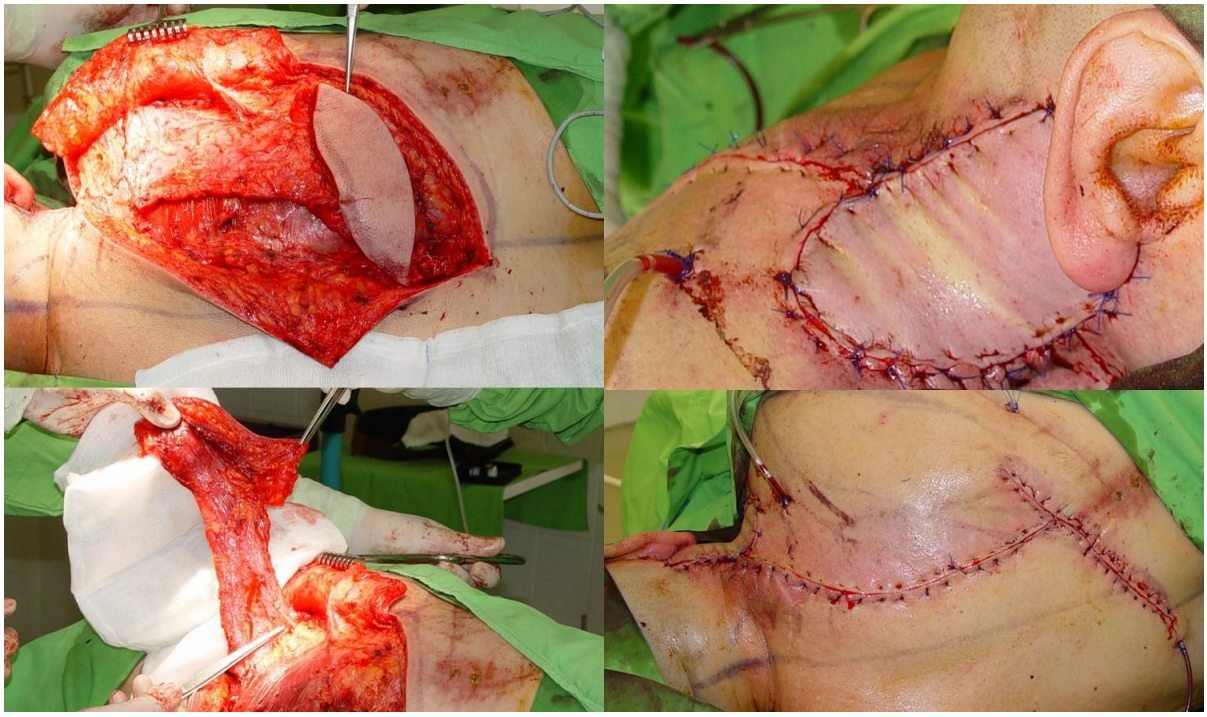

Figure 11: Preparation of the musculocutaneous flap with the skin island. The forceps on the lower-left picture is pointing on to the supplying DSA branch. Viable skin island sutured into the defect (upper-right). Primary closure of the donor site (lower-right).

3.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTION

EPT according to our method was applied with different silicone samples provided by the implant manufacturer, Cochlear AG, Basel. The test was applied at the Dermatology and Allergology Department of our University, and the reading was done by a skilled dermatologist so as to correctly identify the positive allergic versus irritant reaction. The silicone samples were attached onto the back of the child for 48 h, the results were read after 20 min, 48 and 72h.

Patient 1: a three-year-old girl was implanted in March 1999 on the left ear due to bilateral deafness, she received a Nucleus 24M device (silicone coverage). Antibiotic prophylaxis was administered perioperatively. During the postoperative weeks granulation developed in the incision line several times, which was removed by debridement. In November 1999 skin necrosis of 2 cm - 3 cm in extension developed above the receiver-stimulator unit of the implant (**Fig. 12a**). The defect was covered with a parieto-occipitally

pedicled skin flap following necrectomy. The postoperative period and wound healing was undisturbed. Four months later repeated skin necrosis evolved in the same location, surprisingly on the intact skin and not in the scar line. An occipitally pedicled skin flap was used to cover the implant and we placed a Liodura sheet onto the receiver-stimulator unit in order to avoid direct contact of the implant with the subcutaneous tissue. The donor site of the flap was covered with split-thickness skin graft from the gluteal region. Wound healing was normal again. Six months later the skin necrosis developed again above the implant body, so we decided to remove the implant. In 2006 we performed a right-sided implantation, the Med-El Pulsar implant (ceramic coverage) showed no signs of rejection. A remarkable fact is that during the aesthetic correction of the alopecia in the area of the split-thickness skin graft we used a croissant-shaped silicone tissue expander, one end of which also extruded because of skin necrosis during the fill-up period. However, by removing the expander we were already able to achieve an acceptable cosmetic result by removing the scary skin and wound healing was undisturbed (**Fig. 12b**). According to the above mentioned details we presumed silicone allergy and carried out a dermatological-allergological examination. EPT was applied and we observed positive skin reactions with the silicone samples.

Figure 12a: large skin necrosis developed above the receiver-stimulator unit of the implant. **Figure 12b**: occipitally pedicled rotation skin flap gained by tissue expander to cover the skin defect after the removal of previous scars

Patient 2: a four-year-old boy's right-sided cochlear implantation was performed in June 2003, he received a Nucleus 24M device. Five months after the operation we detected granulation and early-stage tissue necrosis in the incision line. The implant functioned properly. Necrectomy, antiseptic-regenerative conservative treatment and antibiotic treatment

were administered. Following temporary improvement, discharge and the progressive rejection of the implant was observed, thus the implant was removed in February 2004, the electrode was left in its place to preserve the cochleostoma. The defect was closed with parietally and temporally pedicled rotation skin flaps, wound healing was undisturbed. EPT showed positive reaction. Cochlear implantation on the opposite side was done in February 2006, we used a Med-El Pulsar implant. Wound healing was normal, the device remained fully functional.

Patient 3: a 4-year-old, mentally retarded girl was operated on in February 2006 due to bilateral, profound sensorineural hearing loss. Perioperative antibiotic treatment was administered. The implant was a Nucleus 24R type device. Two years after the surgery a skin necrosis evolved above the rim of the receiver-stimulator coil, which was covered with a perichondrium sheet harvested from the ear and a parietally pedicled rotation skin flap. Six months following surgery granulation and skin necrosis developed in the location of the previous defect. In November 2008 we elevated occipitally pedicled skin flaps to cover the defect paying close attention to place the incision lines and scars as far as possible from the implant while maintaining the blood supply of the flap (**Fig. 13**). The postoperative period and wound healing was undisturbed. Half year after we observed the recurrence of the skin defect with suppuration and granulation, so the implant had to be removed in June 2009. Re-implantation is planned later on with a Med-El implant. EPT was positive.

Figure 13: skin necrosis evolved above the rim of the receiver-stimulator coil and its surgical solution.

Patient 4: a five-year-old boy was implanted on the left ear in January 2001 because of bilateral profound sensorineural hearing loss and disturbed speech development. Nucleus 24M type device was implanted. Six months following the operation we saw suppuration, abscess formation and insufficiency of the anchoring sutures. Antibiotic treatment, necrectomy and re-suturing resulted in total recovery. One month later wound insufficiency,

granulation, rejection of the implant occurred and the device was removed. Skin testing with the silicone samples was negative in this case. Re-implantation was cancelled for the parent's explicit request.

3.3. Secondary correction of nasal deformities in cleft lip and palate patients: surgical technique and outcome evaluation

Between 2012 and 2014 twelve consecutive patients with combined CLP deformities underwent nasal reconstructive surgery performed by the same operative team in cooperation with other departments of our University. Every patient had already undergone dental and maxillo-facial rehabilitation (orthodontia, oro-nasal fistula closure, bimaxillary orthognathic surgery, etc.), no further surgical intervention was planned in connection with their congenital malformation. Ten patients had unilateral and two patients had bilateral CLP deformity. They included four males and eight females, their ages varied from 17 to 26 with a mean age of 21 years. There were no exclusion criteria and only two inclusion criteria were set: patients had to have CLP and had to be older than 16. All patients signed the informed consent documents of the operation. As all surgical methods have already been published in the literature; our innovation was to combine the different techniques into a standard surgical protocol, thus no ethical approval was necessary.

After analyzing the pathological anatomy of the nose the following surgical steps were used generally: philtrum surgery, septal surgery, alar and nasal tip surgery and nasal pyramid reposition. Surgery was always carried out under general anesthesia via an open rhinoplasty approach. The columellar skin was in each case lengthened via a V-Y plasty of the philtrum area. During the septal surgery part an interalar approach was used, followed by subperichondral and subperiosteal tunneling. The deviated cartilaginous and bony parts were resected, the remaining septal plates were then positioned back to the midline and, if available, septal cartilage was harvested for grafting. If any severe deviation of the septal dorsum was visible, dorsal grafts were used unilaterally or bilaterally on one hand to straighten it, on the other hand to adjust the height of the dorsum. The anterior septal base was then sutured to the anterior nasal spine, or if this was dislocated, to the midline (27, 36).

Autologous nasal septum cartilage grafts and, if necessary, autologous cartilage from the concha, were used to rebuild the nasal framework in the second step. The lower lateral

cartilage on the cleft side was positioned into a more medial and prominent position and the two medial crural cartilages were sutured together with the columella strut to set the tip projection. If the lateral crus was buckled, strengthening was done with an onlay conchal graft. Occasionally a shield graft was used to define the nasal tip. (**Fig. 14**) (27, 28, 36).

Figure 14: nasal grafting with septal cartilage; columella strut graft on the left and dorsal graft on the right picture (A: alar cartilage, CS: columella strut, D: dorsal graft, S: nasal septum).

Bony pyramid surgery, if rarely necessary, consisted of hump resection, medial and lateral osteotomies and repositioning of the nasal bone (27).

All 12 patients received both columella and dorsal grafts, harvested 11 times from the nasal septum and once from the ears; shield graft or tip graft was used in three patients fabricated from septal cartilage and an onlay alar graft, harvested from the concha, was necessary in one case.

To measure the patient satisfaction, we adapted the ROEQ, which was first described by *Alsarraf et al* to measure facial aesthetic surgery outcome (37). The questionnaire was modified by *Arima et al* for patients having rhinoplasty (38). Our adapted ROEQ asks the same four questions before and after surgery, the patient has to score each question with 0-4 points, where 0 represents the least satisfaction and 4 represents the highest one:

1. How much do you like the appearance of your nose?
2. How much can you breathe through your nose?
3. How much do you think your friends and those close to you like your nose?
4. Do you think the appearance of your nose limits your social or professional activities?

Scores for each individual question were compared using a t-test (IBM SPSS Statistics ver20), p was considered significant at 0.005.

4. RESULTS

4.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

4.1.1. The Modified Facial Degloving technique

23 consecutive patients have been operated with our MFD approach between 2012-2016. Important patient data have been summarized in **Table 2**.

Name	Age	Gender	Tumor histology	Tumor stage
1	67	female	sarcoma	T3
2	42	male	squamous cell carcinoma	T2
3	33	female	squamous cell carcinoma	T4a
4	23	female	basaloid cell carcinoma	T2
5	51	male	malignant melanoma	T2
6	54	male	squamous cell carcinoma	T3
7	19	female	olfactory neuroblastoma	Stage B
8	28	male	adenocarcinoma	T3
9	45	female	squamous cell carcinoma	T4a
10	39	female	verrucous carcinoma	T2
11	30	female	adenocarcinoma	T2
12	44	female	squamous cell carcinoma	T3
13	56	male	verrucous carcinoma	T2
14	65	male	basaloid cell carcinoma	T2
15	34	female	hemangiopericytoma	Grade II
16	60	male	squamous cell carcinoma	T4a
17	37	female	adenocarcinoma	T3
18	48	female	verrucous carcinoma	T4a
19	37	female	squamous cell carcinoma	T3
20	62	male	malignant melanoma	T2
21	48	male	squamous cell carcinoma	T4b
22	42	female	squamous cell carcinoma	T3
23	57	female	squamous cell carcinoma	T2

Table 2: Summarized data of the total 23 consecutive patients operated with the MFD approach between 2012 and 2016.

Table 3 represents the results of postoperative bilateral comparative Acoustic Rhinometry.

	Patient 1		Patient 2		Patient 3	
Volume (cm^3)	left nasal cavity	right nasal cavity	left nasal cavity	right nasal cavity	left nasal cavity	right nasal cavity
external nasal valve	1.45	**1.70**	**1.00**	1.10	0.33	**1.45**
internal nasal valve	2.71	**5.11**	**4.47**	2.65	0.49	**2.75**
Totals	4.16	**6.81**	**5.47**	3.75	0.82	**4,20**

Table 3: Acoustic Rhinometry results (values of the operated side are bolded; larger number represents the enlargement of the nasal cavity volume due to surgical resection), *external nasal valve*: inferior lateral cartilage; *internal nasal valve*: inferior nasal concha head's mucosa.

In order to visualize the mimic function of the face, photo documentation was done postoperatively (**Fig. 15**).

Figure 15: intact mimic movements of the patients without any skin scars or asymmetry. The second patient in the middle-lower photo have had the nasal bone deformity reconstructed with rib cartilage.

4.1.2. APPLICATION OF ALTERNATIVE RECONSTRUCTIVE SURGICAL METHODS IN SPECIAL CASES OF HEAD-NECK CANCER

4.1.2.1.Turnover flap

In the past 10 years (2005-2015) 106 total laryngectomies with partial resection of the pharynx have been performed at our department on patients with T3-T4 stage hypopharyngeal and laryngeal cancer. Among them 23 (21,7%) pharyngo-cutaneous fistula cases were observed. In 12 patients (52,2%) the fistula healed completely for conservative treatment, for 11 patients (47,8%) surgery became necessary as the conservative treatment was unsuccessful. With the eleven revision operations 7 patients (63,6%) were cured completely by multilayer reconstruction of the fistula, or by pectoralis major (PM) flap reconstruction. In

4 cases (36,4%) however, all the above listed methods failed, thus we decided on the application of the simple TOF as the final solution to close the fistula. Three of these patients received initial chemo-radiotherapy, one patient had postoperative oncotherapy. Oro-cutaneous fistula developed in one case, without preliminary oncological treatment.

In the first presented case after the application of the TOF the defect was covered with a split thickness skin graft. Complete healing has been achieved, with normal swallowing function (**Fig. 16**).

Figure 16: two months' postoperative picture

In the second presented case after the preparation of the TOF the defect was covered with an occipitally pedicled rotation flap and by mobilizing the surrounding skin of the neck (**Fig. 17a**). Wound healing was undisturbed, the anatomical and physiological function of the pharynx has been restored completely (**Fig. 17b**).

Figure 17a: total closure of the defect by neck flaps, **Figure 17b**: complete healing after ten days.

In the second stage of nasal reconstruction surgery three weeks after the first operation the flap was elevated, tapered and in the last stage the pedicle was transected on the 6th postoperative week. With this three-stage reconstructive method good functional and esthetic results could be achieved in case of large nasal defects (**Fig. 18**).

Figure 18: complete recovery, postoperative pictures 6 months after the reconstructive surgery.

4.1.2.2.Extended lower trapezius musculocutaneous flap

With the novel application of the ELTMF the umpteen reconstructive operation was successful, the flap remained viable, and the wounds healed primarily (**Fig. 19**).

Figure 19: Five weeks after the operation, the skin island is vital and wound healing undisturbed.

4.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTIVE OPTION

CI operations have been performed since 1995 at our Department. Until 31 December 2010 we carried out a total number of 223 CI surgeries, in detail 169 child and 54 adult implantations. In 4 pediatric cases (2,37 % of child implantations, 1,79 % of all CI operations) we faced skin necrosis above the receiver-stimulator unit and the concomitant exposure of the implant. The epicutaneous patch test proved to be positive in 3 cases (75%) and negative in one case (25%).

4.3. SECONDARY CORRECTION OF NASAL DEFORMITIES IN CLEFT LIP AND PALATE PATIENTS: SURGICAL TECHNIQUE AND OUTCOME EVALUATION

With the above detailed standardized surgical steps adequate aesthetic and functional results were achieved in all patients as shown in the results of the questionnaire and by the follow-up examinations of the patients **(Figure 20,21)**.

Figure 20: surgical results; lengthened columella, elevated nasal tip and set tip projection, adjusted dorsal height and symmetry given for the nostrils.

Figure 21: surgical results; lengthened columella, elevated nasal tip and set tip projection and symmetry given for the nostrils.

Table 4 shows the four questions of the ROEQ and the statistical data.

	preoperative		postoperative	
	mean±SD	median	mean±SD	median
How much do you like the appearance of your nose?	0.6±0.6	1	**3.5±0.5**	4
How much can you breathe through your nose?	2.1±0.9	2	**3.7±0.5**	4
How much do you think your friends and those close to you like your nose?	2.8±0.8	3	**3.8±0.4**	4
Do you think the appearance of your nose limits your social or professional activities?	2.8±1.0	3	**3.9±0.3**	4
Total Score	7.8±0.8		**15.0±1.0**	

Table 4: Results of the questionnaire: The four questions asked are listed in the first column, patients had to score each question with 0-4 points, where 0 was the least and 4 was the most value; the total score was 16 points. The other two columns show the answer scores of each question pre- and postoperatively, in detail the mean±SD and the median (most frequently given score) values. The last row summarizes the total score of the questionnaire given by the twelve patients. There is a significant improvement between the pre- and postoperative mean values for each individual question (p=0,005).

All patients were most satisfied with the postoperative appearance of their nose. The opinion of others about the appearance of the patient's nose after surgery also improved. However, the least difference between the pre- and postoperative scores was with the last question, which could mean that the nasal deformity of these patients does not suppose an important limitation in Hungary for social and professional activities in these CLP patients (**Fig. 22**).

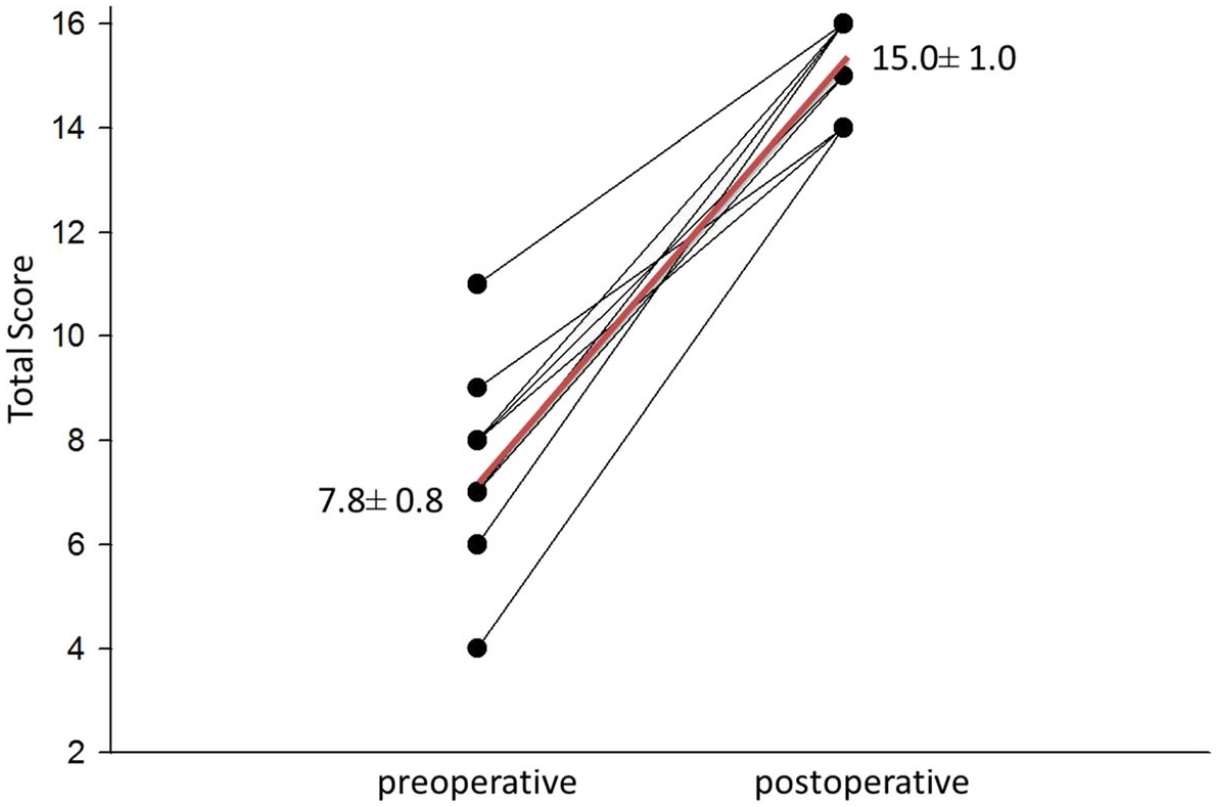

Figure 22: Pre- and postoperative changes in Total Score (total points given by each patient for all questions). Each dot represents the total given score of one patient for the all of the four questions, (less than twelve dots and lines result from overlapping scores, i.e. the same score was given by more than one patient for the same question; maximum points: 16). The red line shows the tendency of increase. Average mean±SD is also presented.

5. DISCUSSION

5.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

5.1.1. The Modified Facial Degloving technique

Lizars was the first to perform a maxillary resection, since then the surgical technique has developed significantly (33, 34). The still widely-used open approach was first described by *Fergusson* (2). The importance of functional and aesthetic integrity of the face was already emphasized by *Casson et al* in 1974, however in 1979 *Conley and Price* were the ones who used and published the facial degloving technique based on the elevation of the soft tissues of the midface in the surgical treatment of sino-nasal malignant tumors (31-34). In the decades passed since then several modifications of the method have been described, highlighting the favorable exploration of the surgical field and the good cosmetic result provided by the method (39, 40).

At our Department we have been using the method routinely since 2010 for malignant and benign sino-nasal tumors. None of the possible side effects of the method have been observed (temporary infraorbital anesthesia, nasal deformity, nasal valve stenosis and epiphora requiring cannulation of the nasolacrimal duct) (35, 40). However, among the patients operated with *Weber-Ferguson's* technique all side effects occurred. Some of our patients complained about dryness of the nasal mucosa, crusting and recurrent nasal bleeding; however, all of these could be easily treated locally.

Almost all benign (e.g. inverted papilloma, pituitary adenoma) and some selected cases of malignant tumors of the maxillo-ethmoidal region and even the skull base are treated mainly endoscopically at our University in accordance with the international recommendations and tendencies (1). However, the proper and adequate use of the endoscopic approach in our opinion requires well trained experts with a lot of surgical experience in this field and special set of expensive instruments, both of which is not available everywhere by all means. Furthermore, the endoscopic approach also has some limitations, which are highlighted by expert authors in cornerstone papers of the literature (1).

These limitations are: orbital infiltration, total maxillectomy, skin excision, involvement of anterior/lateral wall of frontal sinus, dura or brain involvement, insertional beak on the anterior maxillary wall, infratemporal fossa invasion, tumor lateral to internal carotid artery, internal carotid artery or cavernous sinus invasion, etc.

We think our MFD technique represents a simple, relatively easy and ablative alternative in between the two endpoints of surgical therapy for maxillo-ethmoidal lesions, the minimally-invasive endoscopic approach and the open, distorting surgeries. Our method can be easily combined with endoscopic surgery, and can even substitute it when any of the above listed limitations are present; the postoperative results of the two approaches are absolutely comparable. Moreover, if necessary, conversion to/combination with open surgeries is also possible, even intraoperatively.

As it has been published before, there is no significant difference in the recurrence of inverted papilloma between patients operated via the open approach (lateral rhinotomy with *Weber-Fergusson's* incision) or with the facial degloving technique (40). The same perception was true for our patients according to our previous experience, however, nowadays we would exclusively choose the scarless approach for this benign lesion - which still carries the potential of malignant transformation - if the endoscopic technique fails for any reason.

In the demonstrated cases we have chosen the facial degloving versus the endoscopic technique because of the involvement of the orbit in the first patient and invasion of the frontal sinus in the second patient. Although there are recent publications showing that endoscopic management of olfactory neuroblastoma provides higher overall and disease-free survival rates compared with external approaches (41), mastering such endoscopic technique requires long learning curves. We have been pursuing hard to reach and further extend our limitations in endoscopic surgery, for our thirdly presented young female patient the facial degloving approach meant a safer procedure with the same excellent cosmetic results. Avoiding an external approach was essential in each case.

In order to prove that the nasal breathing function is not affected by the method itself and the postoperative scar formation, we carried out acoustic rhinometry minimum one year after the operation on the basis of literature data (42). The results, presented in **Table 3** show that no narrowing of the nasal cavity is observed, neither in the external, nor in the internal

nasal valve area in comparison with the contralateral side. Statistical analysis was not performed due to the small number of patients.

Postoperative photo documentation of the face mimic shows no dysfunction on the operated side; however, in our second patient the left lamina of the nasal bone was also resected because of tumorous infiltration, so slight rotation of the nasal pyramid to the operated left side is visible. Without any skin and underlying soft tissue scars secondary correction with rib cartilage graft of this deformity was carried out with acceptable aesthetic result **(Figure 15)**.

5.1.2. Application of alternative reconstructive surgical methods in special cases of head-neck cancer

5.1.2.1.Turnover flap

The incidence of oro-cutaneous and pharyngo-cutaneous fistulas with or without preliminary radiotherapy is between 2-66%, with an average of 10-15% in most publications (43). Although fistulas may close spontaneously occasionally, after long lasting conservative treatment that help granulation and epithelization, this means a very sustained healing time and depletive psycho-social burden (e.g. nasogastric feeding tube or percutaneous gastrostomy). Direct relation between the preoperative radiotherapy and the development of fistulas have been proved by several publications (8, 43); furthermore, age, nutritive status, wound superinfection and tumor stage are additive predisposing factors (43). Despite the relatively high frequency of fistula occurrence, its surgical treatment is a difficult and challenging issue.

In head and neck tumor patients, who have disturbed wound healing (oro-cutaneous or pharyngo-cutaneous fistula, skin necrosis, etc.), the affected skin and soft tissue area is usually damaged by irradiation, scabby and has deteriorated circulation. In the literature several methods have been described for the surgical treatment of fistulas: from fasciocutaneous island flaps through local and distant skin- and musculocutaneous flaps up to free microvascular flaps (4, 6, 8, 43). In spite of all these methods, the recurrence of the

fistula is rather high, in case of PM musculocutaneous flaps it can be 35% – which may suspect even local tumor recurrence (43).

According to our experience and observations detailed above, we tried to find the safest and simplest reconstructive method without much operative burden for these five patients with pharyngo- and oro-cutaneous fistula, which proved to be the TOF.

In 1987 *Spear et al* were the first to describe the nasolabial TOF for alar reconstruction. Since then several modifications of the method have been described depending on the size and localization of the defect (44-46).

Surgical reconstruction of the defects of the cartilaginous framework and the perialar region of the nose after radical resection of malignant tumors is a highly challenging issue for the head and neck surgeon. Not only because of the complex spatial structure of the nose, but also the consideration of the aesthetic subunits of it, without which the combined reconstruction of function and appearance could not be fully performed. In order to be able to achieve the latter, reconstruction of all tissue layers of the nose is inevitable (45).

For our patients we have used turnover skin flaps mainly from the nasolabial region to substitute the nasal mucosa, the inner lining of the nose. We have found our method adequate for functional reconstruction, as it replaces the mucosa perfectly, it is thin, incorporates perfectly into the nasal cavity and prevents stenosis and crusting. The rich vascular supply of the flaps provides good nutritive medium for immediate implantation of cartilage grafts. Nasal skin has always been reconstructed with pedicled forehead flap.

5.1.2.2. Extended lower trapezius musculocutaneous flap

In 1979, *Demergasso and Piazza* described the trapezius musculocutaneous flap, in which the transverse cervical artery and paraspinous attachment of the trapezius were left intact (47). In 1980, *Baek et al.* first described the ELTMF for reconstructing cutaneous defects or for subcutaneous augmentation of the face (48). In 2000, *Tan and Tan* reported the vascular anatomy and clinical use of the ELTMF based solely on the dorsal scapular arterial system (49). In 2004, *Ugurlu et al*. proposed the use of the extended vertical trapezius musculocutaneous flap based solely on the transverse cervical artery in a salvage procedure for failed previous flaps and recurrent tumors (50).

The superior trapezius flap is based on the occipital artery and its paraspinous perforators, while the lateral and lower island trapezius musculocutaneous flaps are based on the branches of the transverse cervical artery (12, 49, 51). The use of the lower trapezius musculocutaneous flap is contraindicated in cases where there is suspicion of trauma to the descending branch of the transverse cervical artery (12, 52). *Tan and Tan* incorporated an extension of the flap that runs obliquely from the tip of the scapula towards the mid-axillary line (49). Their technique was based on the vascular supply from the dorsal scapular artery, which originates either directly from the subclavian artery as an independent branch, or from the trunk of the transverse cervical artery (12, 49, 51, 52).

In comparison with the LDMF, we can say that the latissimus dorsi muscle offers a limited axis of rotation because of the axillary origin of its pedicle and the frequent need for a split thickness skin graft at the donor site because of the difficulty to achieve a tension-free closure of the wound during the management of extensive defects (12, 14, 15, 52, 53).

The ELTMF flap has several advantages: the donor site can usually be closed easily, resulting in a tension-free but rather long scar; the flap fills the defect created by the neck dissection and covers the vessels of the neck, preventing damage to the vessels; and the long, thin musculocutaneous pedicle allows for easy transfer of the island flap, which can even be tunneled into a defect if necessary (12, 15, 50, 52, 53)

With our first solution, the LDMF, we found that the problem was the tunneling of the flap. However, the supplying vessels of the trapezius muscle and the muscle itself remained intact, and we were able to use this flap for the secondary reconstruction (12, 50).

5.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTION OPTION

CI nowadays has become a safe and widely used surgical method for the treatment of either prelingual or postlingual deafness. The intervention, like every other operation, may have complications. According to *Cohen and Hoffman* the so called major complications of CI surgery are the following: dislocation of the electrode array, permanent facial nerve palsy, cerebrospinal fluid leak and damage of the device (17, 19-21). The most frequent minor

complications are temporary facial nerve palsy, disturbed wound healing and transient dizziness (17, 18, 20, 21, 54).

The incidence of skin necrosis following CI surgery, which is one of the possible complications as presented by the authors, varies between 0-5.4% in the international literature after *Cohen and Hoffman* (19).

The treatment of skin necrosis depends mainly on the extent of the defect. In case of small, superficial lesions, necrectomy, skin regeneration therapy, usage of e.g. Epigard™ or Allevyn™ might be satisfactory. Choosing the appropriate surgical method in case of larger defects is sometimes difficult. One option is to relocate the implant to a "safer" location in the surrounding of the original operation site, however this is technically difficult and results is new scars and areas of alopecia (55-58). Local rotation flaps, which also produce scars, are the most reasonable choice, if the skin incision line avoids the implant location. Occipital flaps have the best vascularization and their other advantage is their proximity to the defect and that the scar lines can be easily disguised by a longer hair style (55, 56, 58, 59). A special entity is the Superficial Temporal Fascia Flap, which receives its blood supply from the fascia of the temporal muscle, so a well vascularized layer is placed between the skin and the implant. This way the danger of repeated skin necrosis decreases (56, 57). Following several correction surgery and the formation of multiplex scars the use of a tissue expander may be required in order to gain more skin, like in our first case, and to allow the removal of the majority of scars and covering of the defect with hairy skin.

Possible causes of skin necrosis can be the inadequately planned and placed incision line, over-narrowing of the flap, displacement of the implant, latent autoimmune diseases (vasculitis e.g.) (18, 19, 54). In our opinion other factors, like surgical incision lines and technique, too strong magnets, infection and individual silicone allergy may also play a role in the pathogenesis. We discuss these as follows:

In all of our four cases Nucleus 24 type, silicone covered implant was used for the first implantation. The surgical intervention was carried out by the same, highly trained and experienced person with the same technique; this excludes the causative role of the surgeon in connection with the skin necrosis.

The magnet is located in the transmitter coil and its strength is adjustable – four levels of strength is available. In children we use the magnet strength 1 or 2. However the skin

defect never occurred under the magnet, where the skin is between the transmitter and the receiver units, rather by the edge of the receiver-stimulator part which is covered with silicone.

As we always met the patients after the development of the skin defect, only tissue samples of necrectomy were histologically examined. Fibrosis, granulocytes and reparative signs were mentioned in histopathology data.

Wound cultures were always negative, no bacterial infection was proved. Also perioperative and postoperative parenteral antibiotic treatment is administered routinely in all of our CI patients.

Therefore, we thought that individual silicone hypersensitivity can be in the background of the skin flap necrosis in most of the cases. Several publications dealt with silicone allergy, they mostly examined the blood level of auto-antibodies against collagen type I and II by the Enzyme-Linked Immunosorbent Assay (ELISA) method in patients with silicone breast implants and they compared the results with the level of the same auto-antibodies in patients suffering from autoimmune connective tissue diseases and healthy control patients. However, no significant relationship was observed (60). In general, we can state, that any kind of silicone implant may induce the production of auto-antibodies in genetically susceptible patients causing immune system disorders (23).

Epicutaneous Patch Testing (EPT) is the gold standard method for the diagnosis of allergic contact dermatitis (ACD). The use of patch testing to diagnose ACD was first developed by *Jadassohn* in 1895 (61). *Sulzberger* brought the technique to the United States in the 1930s (61). Over the past 40 years, the pathophysiological understanding of ACD and the technique of patch testing have been expanded and redefined. Since in all of our four cases a Nucleus type, silicone-covered implant was used, the possibility of individual silicone allergy was obvious; our goal was to prove the possibility of silicone allergy with the epicutaneous patch test (**Fig. 23**). During the test small amounts of suspected allergens are placed on cups or disks and taped to the patient's back. The site of each patch is marked on the skin with a pen for later identification. The patches remain in place for about 48 hours, and then the results are read by a dermatologist-allergologist expert on removal and 24 hours later. The presence of redness, swelling, blisters, or other skin abnormalities at a test site indicate that may be allergic to the tested substance.

Figure 23: EPT with two positive skin reactions (redness, slight swelling on the skin)

The method is safe, non-invasive, it can be applied even in early years of age. The ideal patch test should give no false-positive or false-negative reactions. However, a false-positive reaction is an irritant reaction with the same morphology as an allergic patch test reaction, a false negative reaction can be due to test substance being insufficient, test panels removed too soon, reading taken too early. The true rate of clinically relevant hypersensitivity in positive patch test reactions remains for a great part unknown. There is always the risk of over- or underestimating the significance of positive patch test reactions. In our cases it does not prove the allergy to silicone, however the positive result of the test, the ACD, may raise the suspicion of immune reaction to silicone, resulting in disturbed wound healing and skin necrosis.

Our experimental study shows that skin necrosis above the CI, which is a rare, major complication of CI surgery, can be caused by individual hypersensitivity to silicone. In such patients, skin replacement or transplantation is not a definitive solution, as the newly placed skin may also necrotise due to the allergic reaction to silicone. Even if certain materials (e.g. perichondrium, Liodura) are placed between the implant and the skin, as we applied such in our cases, necrosis is possible. In our opinion, if hypersensitivity to silicone emerges, re-implantation with a different CI device is the definitive solution. With ceramic-housed implants we did not see any complications, not even skin necrosis during a 2-5 years follow-up period.

5.3. SECONDARY CORRECTION OF NASAL DEFORMITIES IN CLEFT LIP AND PALATE PATIENTS: SURGICAL TECHNIQUE AND OUTCOME EVALUATION

If the child receives the adequate functional surgery before the first year of age, usually there is no need for secondary rhinoplasty. In every other case secondary septo-rhinoplasty is advised optimally after the adolescence, not before the age of sixteen (26).

Unilateral or bilateral clefts should be distinguished generally. The difference between the nasal deformities associated with unilateral versus bilateral clefts and our surgical solution is presented in **Table 5**.

unilateral cleft	**bilateral cleft**	**surgical solutions** unilateral / bilateral
perpendicular plate deviates towards the cleft side	shortened columella	resection of the deviated bony septum/ columellar skin gained by V-Y plasty
nasal spine deviates towards the non-cleft side	lack of septal cartilage in the anterior columellar region	not corrected/ columella strut graft is used
bony pyramid deviates towards the non-cleft side	downward rotation of the nasal tip	bony pyramid replacement vis medial and lateral osteotomies/ tip projection provided by the columella strut
lateral displacement of the alar base at the cleft side	bifidity of the nasal tip	lower lateral cartilage replacement/ tip refinement with sutures and/or shield/tip grafting
downward displacement of the alar cartilage at the cleft side	buckling of the lateral crura on both sides	in both cases alar cartilage replacement and the two medial crural cartilages sutured together with the columella strut
asymmetry/bifidity of the dome area	usually no severe septal deviation	in both cases tip refinement with sutures and/or grafting
down position of the medial crus at the cleft side	downward rotation of the alar cartilage	in both cases tip projection provided by the columella strut

Table 5: Nasal deformities associated with unilateral and bilateral clefts and our surgical solutions

6. CONCLUSIONS

6.1. ALTERNATIVE SURGICAL METHODS FOR MALIGNANT TUMORS OF THE HEAD AND NECK

In our opinion the MFD technique might be a useful alternative or supplementary of the widely used minimally invasive endoscopic approaches in sino-nasal surgery (30, 62). Moreover, it might help the less skilled surgeons in the acquisition of the endoscopic techniques for resecting tumors of the maxillo-ethmoidal region. By combining the two methods, the required radicality can be achieved with good cosmetic results. If needed – in certain severe cases, where e.g. orbital surgery (e.g. exenteration) is also necessary – the method could also be combined with the open approach (63). The latter should possibly be avoided nowadays as a first-line approach due to the stigmatizing skin scars and facial deformities.

According to our experience TOFs might be safe tissue replacement alternatives even in special cases without much operative burden, when e.g. the surrounding tissue is scabby and irradiated or tissue harvesting is limited due to the anatomic localization. The presented cases are fortunately not frequent; however, according to the international literature standard deviation among irradiated patients is relatively high (2-66%). The demonstrated surgical methods are able to restore anatomical and physiological functions through the reconstruction of head-neck defects, which are result of radical tumor resection or develop as a complication. Another advantage of these flaps is the relatively low operative burden and that they can be harvested from the surroundings rather easily, however the over-irradiated skin can be the risk factor of failure. In such cases musculocutaneous flaps are the gold standard of therapy, but in our demonstrated patients no permanent success has been reached by them, no matter the routine use of these flaps and our great operative experience. TOFs then are adequate alternatives, as they can be easily prepared from the remnants of the musculocutaneous flap.

The ELTMF flap has several advantages: the donor site can usually be closed easily, resulting in a tension-free but rather long scar; the flap fills the defect created by the neck dissection and covers the vessels of the neck, preventing damage to the vessels; and the long,

thin musculocutaneous pedicle allows for easy transfer of the island flap, which can even be tunneled into a defect if necessary (15, 50, 52, 53).

6.2. COMPLICATIONS OF WOUND HEALING AND REJECTION RELATED TO COCHLEAR IMPLANTS – SURGICAL SOLUTIONS AND PREVENTION OPTION

CI is one of the most advanced surgical interventions to restore hearing. Skin necrosis and concomitant implant rejection seems to be one of the most difficult problems to handle from among the possible complications. In our experience the closure of the skin defect over the implant with loco-regional flaps or the numerous plastic surgical operations done in accordance with international recommendations, does not always provide a permanent solution. However, we think, that the method described above could be a safe, non-invasive, fast method to test the possibility of skin necrosis and implant rejection in case of a silicone-covered CI also in children. Final recovery of the surgical site and the skin defect – because of the factors mentioned above – can only be expected after the removal of the implant.

6.3. SECONDARY CORRECTION OF NASAL DEFORMITIES IN CLEFT LIP AND PALATE PATIENTS: SURGICAL TECHNIQUE AND OUTCOME EVALUATION

In our opinion with the above mentioned operative protocol we were able to standardize our surgical technique in the secondary septo-rhinoplasty of patients with CLP. Skin incisions, cartilage harvesting and grafting, endonasal surgery and re-establishment of the nasal framework were successfully unified thus providing a more predictable functional and aesthetic outcome for the already psychosocially affected CLP patients.

Statistical comparative analysis of the pre- and postoperative data from our ROEQ confirmed, that with our standardized surgical protocol improved aesthetic and functional results and good patient satisfaction rates were achieved.

We think our modified ROEQ is an adequate and simple method for the evaluation of the surgical results of secondary septo-rhinoplasty among patients with CLP.

7. ACKNOWLEDGEMENT

Without help, support and encouragement from many colleagues, I would have never been able to complete this work.

First of all, I would like to express my gratitude and thanks to my supervisor, Dr. László Iván and my professor László Rovó, for encouraging and supporting my work from the very beginning.

I wish to express my gratitude to Professor József Jóri and Professor József Géza Kiss who introduced me to clinical work and provided me with the opportunity to begin my scientific career.

I would like to express my gratitude to Professor Lajos Kemény, Head of Department of Dermatology and Allergology, and Dr. Klára Kapitány, the former Head of Plastic Surgery Ward for providing me the opportunity to start my plastic surgery training.

I am deeply indebted to my colleagues, János Varga and Gábor Mohos, my teachers and mentors in plastic surgery for their cooperative work.

Thanks to my colleagues at the Department of Oto-Rhino-Laryngology and Head-Neck Surgery and the Department of Dermatology and Allergology – Plastic Surgery.

Last but not least, I wish to thank my family and friends for their constant support and encouragement.

8. REFERENCES

1. Lund VJ, Stammberger H, Nicolai P, Castelnuovo P, Beal T, Beham A, et al. European position paper on endoscopic management of tumours of the nose, paranasal sinuses and skull base. Rhinology Supplement. 2010(22):1-143.
2. Fergusson W. Operations of the upper jaw. 2nd ed. Fergusson W, editor. Philadelphia: Lea and Blanchard; 1845.
3. Conley J, Price JC. Sublabial approach to the nasal and nasopharyngeal cavities. Am J Surg. 1979;138(4):615-8.
4. Caronia FP, Fiorelli A, Santini M, Castorina S. A persistent tracheocutaneous fistula closed with two hinged skin flaps and rib cartilage interpositional grafting. Gen Thorac Cardiovasc Surg. 2016;64(10):625-8.
5. Liang W, Zhou Z, Zhao Z. Application of split gluteus maximus muscle--adipofascial turnover flap and subcutaneous tension-reducing suture technique in repair of decubitus ulcers. Int Surg. 2014;99(4):447-51.
6. Tatekawa Y, Yamanaka H, Hasegawa T. Closure of a tracheocutaneous fistula by two hinged turnover skin flaps and a muscle flap: A case report. Int J Surg Case Rep. 2013;4(2):170-4.
7. Zahiri HR, Lumpkins K, Kelishadi S, Stromberg JA, Silverman RP, Slezak S, et al. Pectoralis major turnover versus advancement technique for sternal wound reconstruction. Ann Plast Surg. 2013;70(2):211-5.
8. Neubauer P, Canadas K, Sasaki CT. Delayed platysma myocutaneous turnover flap for repair of pharyngocutaneous fistula. Am J Otolaryngol. 2015;36(1):93-6.
9. Patel KB, Taghinia AH, Proctor MR, Warf BC, Greene AK. Extradural myelomeningocele reconstruction using local turnover fascial flaps and midline linear skin closure. Journal of plastic, reconstructive & aesthetic surgery : JPRAS. 2012;65(11):1569-72.
10. Sierakowski A, Niranjan N. Sternomastoid fascial turnover flap for Frey syndrome: An unusual case. Journal of plastic, reconstructive & aesthetic surgery : JPRAS. 2011;64(2):e53-4.

11. Silva JB, Faloppa F, Albertoni W, Gazzalle A, Cunha GL. Adipofascial turnover flap for the coverage of the dorsum of the thumb: an anatomic study and clinical application. J Hand Surg Eur Vol. 2013;38(4):371-7.
12. Mohos G, Vass G, Kemeny L, Jori J, Ivan L. Extended lower trapezius myocutaneous flap to cover a deep lateral neck defect on irradiated skin: a new application. Journal of plastic surgery and hand surgery. 2013;47(1):70-2.
13. Ndayishimiye JM, Husson JL, Watier E. Reconstruction of extensive posterior mid-thoracic soft-tissue defects after spinal surgery on irradiated skin. Orthop Traumatol Surg Res. 2009;95(4 Suppl 1):S35-40.
14. Datta G, Boriani F, Degano K, Carlucci S, Ferrando PM, Verna G. Combination of two long-pedicled myocutaneous flaps for closure of a complex contralateral dorsal defect. Ann Thorac Surg. 2009;87(6):1930-3.
15. Papadas T, Goumas P, Alexopoulou MM, Papakyriakos I, Papavasiliou D, Antonopoulos D. Cancer patients with large defects. Reconstructional options: a case study. Braz J Otorhinolaryngol. 2005;71(1):87-90.
16. Ribari O, Kustel M. Overview of our 13-year-long experience with cochlear implants. Acta chirurgica Hungarica. 1998;37(1-2):33-7.
17. Kempf HG, Johann K, Lenarz T. Complications in pediatric cochlear implant surgery. Eur Arch Otorhinolaryngol. 1999;256(3):128-32.
18. Miyamoto RT, Young M, Myres WA, Kessler K, Wolfert K, Kirk KI. Complications of pediatric cochlear implantation. Eur Arch Otorhinolaryngol. 1996;253(1-2):1-4.
19. Cohen NL, Hoffman RA. Complications of cochlear implant surgery in adults and children. Ann Otol Rhinol Laryngol. 1991;100(9 Pt 1):708-11.
20. Kim CS, Oh SH, Chang SO, Kim HM, Hur DG. Management of complications in cochlear implantation. Acta Otolaryngol. 2008;128(4):408-14.
21. Migirov L, Taitelbaum-Swead R, Hildesheimer M, Kronenberg J. Revision surgeries in cochlear implant patients: a review of 45 cases. Eur Arch Otorhinolaryngol. 2007;264(1):3-7.
22. Rubio A, Ponvert C, Goulet O, Scheinmann P, de Blic J. Allergic and nonallergic hypersensitivity reactions to silicone: a report of one case. Allergy. 2009;64(10):1555.

23. Teuber SS, Rowley MJ, Yoshida SH, Ansari AA, Gershwin ME. Anti-collagen autoantibodies are found in women with silicone breast implants. Journal of autoimmunity. 1993;6(3):367-77.
24. Fisher DM, Sommerlad BC. Cleft lip, cleft palate, and velopharyngeal insufficiency. Plast Reconstr Surg. 2011;128(4):342e-60e.
25. Piffko J, Meyer U, Joos U. Possibilities and limitations in evaluating treatment concepts in lip-jaw-palate clefts. Mund-, Kiefer- und Gesichtschirurgie : MKG. 2002;6(1):49-52.
26. Nakamura N, Sasaguri M, Okawachi T, Nishihara K, Nozoe E. Secondary correction of bilateral cleft lip nose deformity - Clinical and three-dimensional observations on pre- and postoperative outcome. J Craniomaxillofac Surg. 2011;39(5):305-12.
27. Nolst Trenité GJ. Secondary surgery of the cleft-lip nose. Nolst Trenité GJ, editor. Amsterdam: Kugler Publications; 1993.
28. Pitak-Arnnop P, Hemprich A, Dhanuthai K, Yildirim V, Pausch NC. Panel and patient perceptions of nasal aesthetics after secondary cleft rhinoplasty with versus without columellar grafting. J Craniomaxillofac Surg. 2011;39(5):319-25.
29. Baumann A, Ewers R. Midfacial degloving: an alternative approach for traumatic corrections in the midface. Int J Oral Maxillofac Surg. 2001;30(4):272-7.
30. El-Banhawy OA, Shehab El-Dien Ael H, Amer T. Endoscopic-assisted midfacial degloving approach for type III juvenile angiofibroma. International journal of pediatric otorhinolaryngology. 2004;68(1):21-8.
31. Ferreira LM, Rios AS, Gomes EF, Azevedo JF, Araujo Rde P, Moraes RB. Midfacial degloving--access to nasal cavity and paranasal sinuses lesions. Braz J Otorhinolaryngol. 2006;72(2):158-62.
32. Kitagawa Y, Baur D, King S, Helman JI. The role of midfacial degloving approach for maxillary cysts and tumors. J Oral Maxillofac Surg. 2003;61(12):1418-22.
33. Jaber JJ RF, Zender CA. Facial degloving approach to the midface. Op Tech Otolar. 2010;21:171-4.
34. Zaghloul AS, Nouh MA, Fatah HA. Midfacial degloving approach for malignant maxillary tumors. J Egypt Natl Canc Inst. 2004;16(2):69-75.
35. Har-El G. Medial maxillectomy via midfacial degloving approach. Op Tech Otolar. 1999;10(2):82-6.

36. Chaithanyaa N, Rai KK, Shivakumar HR, Upasi A. Evaluation of the outcome of secondary rhinoplasty in cleft lip and palate patients. Journal of plastic, reconstructive & aesthetic surgery : JPRAS. 2011;64(1):27-33.
37. Alsarraf R, Larrabee WF, Jr., Anderson S, Murakami CS, Johnson CM, Jr. Measuring cosmetic facial plastic surgery outcomes: a pilot study. Arch Facial Plast Surg. 2001;3(3):198-201.
38. Arima LM, Velasco LC, Tiago RS. Crooked nose: outcome evaluations in rhinoplasty. Braz J Otorhinolaryngol. 2011;77(4):510-5.
39. Jeon SY, Jeong JH, Kim HS, Ahn SK, Kim JP. Hemifacial degloving approach for medial maxillectomy: a modification of midfacial degloving approach. Laryngoscope. 2003;113(4):754-6.
40. Kim HJ, Kim CH, Kang JW, Shin WC, Kim YS, Do YK, et al. A modified midfacial degloving approach for the treatment of unilateral paranasal sinus tumours. J Craniomaxillofac Surg. 2011;39(4):284-8.
41. Fu TS, Monteiro E, Muhanna N, Goldstein DP, de Almeida JR. Comparison of outcomes for open versus endoscopic approaches for olfactory neuroblastoma: A systematic review and individual participant data meta-analysis. Head Neck. 2016;38 Suppl 1:E2306-16.
42. Lindemann J, Leiacker R, Sikora T, Rettinger G, Keck T. Impact of unilateral sinus surgery with resection of the turbinates by means of midfacial degloving on nasal air conditioning. Laryngoscope. 2002;112(11):2062-6.
43. Sadigh PL, Wu CJ, Feng WJ, Hsieh CH, Jeng SF. New double-layer design for 1-stage repair of orocutaneous and pharyngocutaneous fistulae in patients with postoperative irradiated head and neck cancer. Head Neck. 2016;38 Suppl 1:E353-9.
44. Godoy-Gijon E, Palacio-Aller L, Gonzalez-Sabin M. Reconstruction of the ala nasi using a malar turnover island pedicle flap. Actas dermo-sifiliograficas. 2015;106(3):233-5.
45. Jellinek NJ, Nguyen TH, Albertini JG. Paramedian forehead flap: advances, procedural nuances, and variations in technique. Dermatologic surgery. 2014;40 Suppl 9:S30-42.

46. Shim HC, Kim G, Choi JH, Kim JH, Kim EJ, Park HJ, et al. The reverse nasolabial flap with a cartilage graft for the repair of a full-thickness alar defect: a single-stage procedure. Ann Dermatol. 2014;26(3):377-80.
47. Demergasso F, Piazza MV. Trapezius myocutaneous flap in reconstructive surgery for head and neck cancer: an original technique. Am J Surg. 1979;138(4):533-6.
48. Baek SM, Biller HF, Krespi YP, Lawson W. The lower trapezius island myocutaneous flap. Ann Plast Surg. 1980;5(2):108-14.
49. Tan KC, Tan BK. Extended lower trapezius island myocutaneous flap: a fasciomyocutaneous flap based on the dorsal scapular artery. Plast Reconstr Surg. 2000;105(5):1758-63.
50. Ugurlu K, Ozcelik D, Huthut I, Yildiz K, Kilinc L, Bas L. Extended vertical trapezius myocutaneous flap in head and neck reconstruction as a salvage procedure. Plast Reconstr Surg. 2004;114(2):339-50.
51. Chen WL, Li JS, Yang ZH, Huang ZQ, Wang JQ. Extended vertical lower trapezius island myocutaneous flap for repairing extensive oropharyngeal defects. J Oral Maxillofac Surg. 2009;67(6):1349-53.
52. Stillaert FB, Van Landuyt K. Stable coverage of a cervico-thoracic defect with an extended lower trapezius myocutaneous flap. Journal of plastic, reconstructive & aesthetic surgery : JPRAS. 2009;62(5):e101-2.
53. Urken ML, Naidu RK, Lawson W, Biller HF. The lower trapezius island musculocutaneous flap revisited. Report of 45 cases and a unifying concept of the vascular supply. Arch Otolaryngol Head Neck Surg. 1991;117(5):502-11.
54. Ovesen T, Johansen LV. Post-operative problems and complications in 313 consecutive cochlear implantations. J Laryngol Otol. 2009;123(5):492-6.
55. Arnoldner C, Baumgartner WD, Gstoettner W, Hamzavi J. Surgical considerations in cochlear implantation in children and adults: a review of 342 cases in Vienna. Acta Otolaryngol. 2005;125(3):228-34.
56. Beckenstein MS, Steenerson RL, Elliott LF, Hartrampf CR, Jr. Use of a superficial temporal fascia flap for coverage of an exposed cochlear implant. Otolaryngology-Head and Neck Surgery. 1999;120(6):940-2.

57. Harrison HC, Gibson WP, Thompson PG. Cochlear implant extrusion in a young child--a preventive procedure. J Laryngol Otol. 1995;109(5):425-8.
58. Waldman EH NJ. The avoidance and treatment of scalp flap complications in cochlear implant surgery. Oper Techn Otolaryngol. 2005;16:149-53.
59. Sorrentino T, Cote M, Eter E, Laborde ML, Cochard N, Deguine O, et al. Cochlear reimplantations: technical and surgical failures. Acta Otolaryngol. 2009;129(4):380-4.
60. Rowley MJ, Cook AD, Mackay IR, Teuber SS, Gershwin ME. Comparative epitope mapping of antibodies to collagen in women with silicone breast implants, systemic lupus erythematosus and rheumatoid arthritis. Current topics in microbiology and immunology. 1996;210:307-16.
61. Nelson JL, Mowad CM. Allergic Contact Dermatitis: Patch Testing Beyond the TRUE Test. The Journal of clinical and aesthetic dermatology. 2010;3(10):36-41.
62. Ikeda K, Suzuki H, Oshima T, Nakatsuka S, Takasaka T. Midfacial degloving approach facilitated by endoscope to the sinonasal malignancy. Auris Nasus Larynx. 1998;25(3):289-93.
63. Browne JD, Messner AH. Lateral orbital/anterior midfacial degloving approach for nasopharyngeal angiofibromas with cavernous sinus extension. Skull Base Surg. 1994;4(4):232-8.

9. APPENDIX

ROE (RHINOPLASTY OUTCOME EVALUATION) KÉRDŐÍV

1. kérdés: Elégedett volt Ön az orra külalakjával a műtét előtt?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

2. kérdés: Jól kapott az orrán levegőt a műtétet megelőzően?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

3. kérdés: Családtagjai, barátai és ismerősei meg voltak elégedve az orra külalakjával a műtét előtt?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

4. kérdés: Befolyásolta valaha az orra kinézete a mindennapi életét vagy a munkáját a műtétet megelőzően?

- Mindig (0)
- Gyakran (1)
- Néha (2)
- Ritkán (3)
- Soha (4)

Preop.

---

5. kérdés: Elégedett Ön az orra külalakjával a műtét után?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

Postop.

6. kérdés: Jól kap az orrán levegőt a műtétet követően?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

7. kérdés: Családtagjai, barátai és ismerősei meg vannak elégedve az orra külalakjával a műtét után?

- Egyáltalán nem (0)
- Csak kis mértékben (1)
- Többé-kevésbé (2)
- Majdnem teljesen (3)
- Teljes mértékben (4)

8. kérdés: Befolyásolta-e az orra kinézete a mindennapi életét vagy a munkáját a műtétet követően?

- Mindig (0)
- Gyakran (1)
- Néha (2)
- Ritkán (3)
- Soha (4)