

COSMETIC RESULTS OF RECONSTRUCTION OF FULL THICKNESS NASAL ALAR DEFECTS USING CHEEK SKIN FLAPS

© SERGEI A. IVANOV, VLADISLAV N. YADCHENKO, ARTYOM A. PODDUBNY, EKATERINA S. IVANOVA

Gomel State Medical University, Gomel, Republic of Belarus

ABSTRACT

Objective: to analyze cosmetic results following reconstruction of nasal alar defects using cheek skin flaps.

Material and methods. The results of 29 operations were analyzed. The reconstruction was performed with nasolabial flaps and jigsaw puzzle flaps. The cosmetic outcomes were evaluated by the five-point scale by means of patient-report and specialist-report questionnaire.

Results. Acceptable overall outcomes were achieved in 22 cases according to the experts' assessment and in 24 cases according to the patients' assessment. The highest scores were noted for alar color and position, and the lowest scores – for alar size, shape, and nostril size. The complication rate was 11.1 %. Delayed surgical corrections were undertaken in 10 patients.

Conclusion. The reconstruction of full thickness nasal alar defects using cheek skin flaps made it possible to achieve acceptable outcomes with minimal donor site damage in the majority of the patients.

Key words: nasal alar reconstruction, nasal alar defect, nasolabial flap, jigsaw puzzle flap.

FOR CITATION:

Ivanov SA, Yadchenko VN, Poddubny AA, Ivanova ES. Cosmetic results of reconstruction of full thickness nasal alar defects using cheek skin flaps. *Problems of Health and Ecology = Problemy Zdorov'ya i Ekologii*. 2020;64(2):70-77. (In Russ.)

КОСМЕТИЧЕСКИЕ РЕЗУЛЬТАТЫ ПРИ УСТРАНЕНИИ СКВОЗНЫХ ДЕФЕКТОВ КРЫЛА НОСА ЛОСКУТАМИ ИЗ ЩЕКИ

© С.А. ИВАНОВ, В.Н. ЯДЧЕНКО, А.А. ПОДДУБНЫЙ, Е.С. ИВАНОВА

УО «Гомельский государственный медицинский университет», г. Гомель, Республика Беларусь

РЕЗЮМЕ

Цель исследования: проанализировать косметические результаты после устранения сквозных дефектов крыла носа лоскутами из щеки.

Материал и методы. Исследованы результаты 29 операций. Реконструкции выполняли носогубным лоскутом и пазл-лоскутом. Косметические результаты оценивали по 5-балльной шкале путем опроса пациентов и экспертов.

Результаты. Приемлемые результаты получены в 22 случаях по оценке экспертов и в 24 случаях – по оценке пациентов. Более высоко оценены цвет кожи и положение крыла носа, более низко – величина и форма крыла носа, размер наружного носового отверстия. Частота осложнений составила 11,1 %. Отсроченные корригирующие операции выполнены 10 пациентам.

Заключение. Реконструкция крыла носа лоскутами из щеки при сквозном дефекте позволила получить приемлемый результат у большинства пациентов при минимальных изменениях донорской зоны.

Ключевые слова: реконструкция крыла носа, дефект крыла носа, носогубный лоскут, пазл-лоскут.

ДЛЯ ЦИТИРОВАНИЯ:

Иванов СА, Ядченко ВН, Поддубный АА, Иванова ЕС. Косметические результаты при устранении сквозных дефектов крыла носа лоскутами из щеки. *Проблемы Здоровья и Экологии*. 2020;64(2):70-77.

Introduction

The nasal alar is a paired anatomical subunit with a multilayer structure. It includes the external skin, inner epithelial lining, major and minor alar cartilages. Cartilages do not occupy the entire alar subunit. Alar is limited by alar-buccal sulcus from backside and by free margin of the nostril from below. The appearance of this subunit

determines the cosmetic perception of the human face and its individuality to a significant extent [1]. Reconstruction of full thickness alar defects is a difficult task for reconstructive surgeon. It is necessary not only to repair the skin integrity, but also to form the inner epithelial lining, to achieve symmetry of the nasal lower third and a stable shape of the remodeled subunit, and to ensure free air passage [2, 3]. Up to now the basic material

for the alar reconstruction are the patient's own tissues [2]. There are two fundamental approaches: replacing a defect using a full thickness auricular graft or forming the skin and lining with flaps adding a supportive graft implantation [4, 5]. Each method has its advantages and disadvantages. Auricular graft allows remodeling of all tissue layers at once [6]. However senior authors request to limit its usage in defects more than 1 cm. Using of auricular graft is not recommended especially in patients with a high risk of ischemic complications. Skin flaps allow alar reconstruction when an auricle graft cannot be chosen. The distal part of the flap can be folded to form the inner lining [7].

The standard material to create nasal skin is flaps from medial cheek. The cheek skin is the most suitable donor site for the alar reconstruction due to its external characteristics. Elastic skin provides sufficiency of flap size to cover the isolated alar defect. Surgical procedure in rule can be performed under local anesthesia. Postoperative restriction of life activity is minimal. However, the degree of damage to the esthetically important donor area should be taken into account. The most commonly used types of cheek flaps are strip-shaped or insular nasolabial (melolabial) transposition flap (NLF) on the upper or lower base [8] and advancement jigsaw puzzle-flap (PF) [9].

The major part of the alar does not have a cartilage layer. Yet, only the epithelial layer remodeling often does not provide a stable shape and position of the subunit [1, 3]. This can lead to scar deformity or external nasal valve collapse during inspiration. Forming of a non-anatomical support in the projection of the free margin of the alar is suggested as a preventive measure [4, 5]. The support structures can be created both by autologous and allogeneic materials [10].

One of the NLF disadvantages is detectable prominence at the base of the flap, which interrupts the relief of the middle zone of the face. Corrective interventions are performed in 3-4 weeks after the first step. Reconstruction with PF can be performed in one step, but the technique of the operation is more complicated. Alar reconstruction is aimed to achieve natural shape, size, position, color, subunit border and normal nostril size [1, 4, 11]. The available publications of recent 10 years on total nasal alar reconstruction present data based on not more than 40 cases [3, 6, 8, 9]. This suggests that this procedure can be defined as routine and frequently made. The authors report that satisfactory

cosmetic results were achieved in 80-90 % of patients [3, 8, 9]. The analysis of single center experience is practically significant for data collecting and comparing different surgical techniques of.

The aim of the study is a descriptive analysis of cosmetic results after full thickness nasal ala defect reconstruction using cheek skin flaps at one surgical center.

Material and methods

The results of 29 reconstructions of the nasal alar in patients with full-thickness defects were analyzed. Interventions were completed within 2013-2019 years at Gomel Regional Clinical Oncology Center. The studied group consisted of 16 women and 13 men at the age of 36 to 82. Removal of skin carcinoma was the cause of the defect in all cases. The lost more than half of the subunit was presented in all case. NLF technique was used for reconstruction in 15 cases, PF technique was used in 14 cases. Risk factors of ischemic complications were presented in 18 patients including previous radiation therapy, diabetes mellitus and long term smoking history. Patient-report and specialist-report questionnaire was used to evaluate postoperative results. Questionnaire comprises 8 items to assess satisfaction with cosmetic outcomes: (1) alar size, (2) alar shape, (3) position of alar, (4) skin color of reestablished subunit, (5) appearance of the alar-cheek crease, (6) nostril size, (7) overall appearance of alar, (8) donor area of medial cheek appearance. Five-point scale was used. Scale scores were grading as next: 5 points – excellent, 4 points – good, 3 points – moderate, 2 points – poor, 1 point – very poor. Each indicator was evaluated separately by the patient and three independent experts within 12 months after reconstruction. Specialists have reconstructive nasal surgery experience, but did not participate in the operations of the studied patients were invited as experts. The experts independently carried out the evaluation of the results according to presented photo images. Subsequently, the average of three findings for each parameter was used. Statistical processing was performed by the Statistica 8.0 software package (StatSoft Inc, USA). Data are presented as a median (Me) and an interquartile range (Q₂₅; Q₇₅). Comparison of expert and patient ratings was performed using the Wilcoxon Test and Sign Test criteria for two related groups. The critical significance level of the null statistical hypothesis (p) was taken as 0.05.

Operation Technique

A NLF with an upper base was elevated in the medial part of the cheek (Figure 1a). Preoperative marking of flap paddle was performed using plastic templates and taking into consideration parameters of contralateral intact subunit. The flap was transferred

from the donor site to the defect. Subdermal fat was aggressively removed from the distal part with a width of 0.5-0.8 cm. A fold was formed in the distal part of the NLF (Figure 1b). Distal skin was sutured to inner lining wound edge. Proximal skin of the flap was sutured to external defect edges.

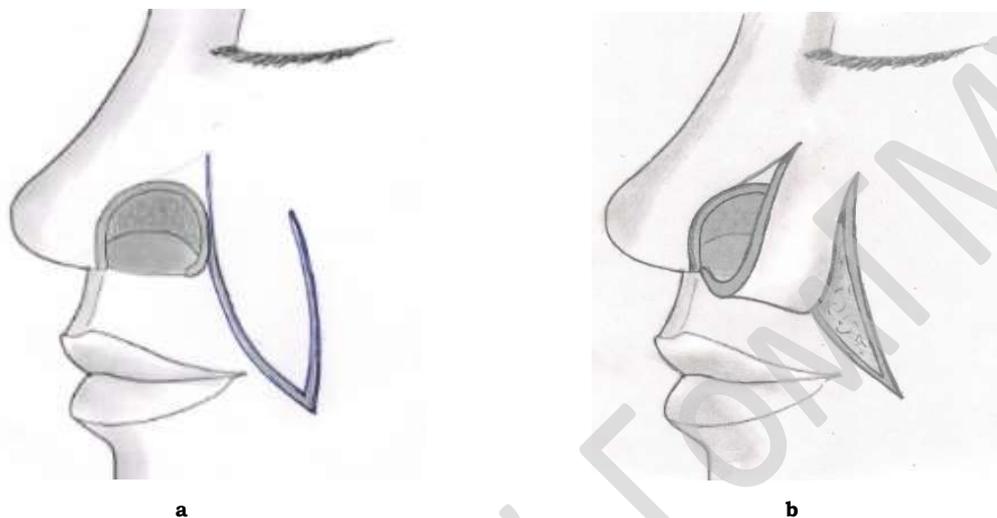


Figure 1 – a. Nasolabial flap design; b. Fold forming

PF was cut out from the skin of the medial part of the cheek in the form of a round prominence like jigsaw puzzle (Figure 2a). Flap was mobilized in the lateral direction up to 3-4 cm long. Movement to the alar area was performed by advancement (sliding) without rotation. The lower part of the skin was folded to create the inner lining (Figure 2b). Then, the extending part of the NLF left without curving, respectively, to the angle between the alar and the cheek. Abundant parts of skin were cut up at the puzzle base, as shown in Figure 2c. This technique made it possible to create a deeper alar-cheek crease in single procedure. Defect wound closure were made easily due to laxity of separated cheek skin.

Non-anatomical cartilage graft transplantation was made in 18 patients. A graft of the required shape and size was formed manually from a fresh frozen rib cartilage from a cadaver donor as a biological product. End parts of graft were inserted into pockets at the medial and lateral wound edges. The graft was sutured to the wound soft tissue. Cartilage graft appeared between the skin layers after folding the distal part of the flap. This procedure provides structural support of reestablished ala to prevent nasal valve collapse and scar caused deformity of subunit.

16 operations were performed under local anesthesia and 12 operations were performed

under general anesthesia. All patients in the perioperative period received standard treatment including analgesics and antihistamines for 2 days, vasodilators for 2-3 days, antibiotics for 2-5 days depending on risk factors. Standard wound cleaning and change of aseptic dressing was made. Suture removal was performed due to completed scar epithelialization after 7-9 days.

Results and discussion

Sufficient amount of donor cheek skin was obtained to successfully cover defect of external skin with elevated flap in all cases. In all observations, it was possible to reestablish the missed inner lining with folded part of the flap. The donor wound closure didn't require additional reconstructive procedures at the cheek site. It should be noted, preoperative planning included probable using of cheek remodeling if necessary. In the postoperative period, two partial necroses of the skin flap and 1 wound dehiscence were registered. Two of complications occurred after reconstruction with NLF and one complication noted after the PF using. All of these patients had risk factors: a long term smoking history and a history of radiation therapy. No complications such as wound infection, hematoma, protrusion or necrosis of cartilage

allograft occurred. The overall morbidity rate in our patient cohort was 11.1%. The wound surface healed by secondary intention after removal of necrotic masses in case of partial necrosis development. In the remaining observations wound healing completed with primary intention.

Planned second intervention was undertaken in 7 patients to eliminate significant puckering at the NLF base. All corrective operations were performed under local anesthesia in 3-4 weeks after the first step.

Cosmetic results of alar remodeling for each parameter are presented in the table.



Figure 2 – a. Jigsaw puzzle flap design; b. Folding and cartilage graft insert; c. Groove forming at the border of the prominent part

Table – Evaluation scores by patients and experts

Parameter	Patients' assessment, points, Me (Q ₂₅ ;Q ₇₅)	Experts' assessment, points, Me (Q ₂₅ ;Q ₇₅)	Level of significance, p
Alar size	5 (4;5)	4 (3;5)	0.005
Alar shape	4 (4;5)	4 (3;5)	0.012
Position of alar	5 (5;5)	5 (4;5)	0.002
Alar skin color	5 (5;5)	5 (4;5)	0.018
Alar-cheek crease	5 (5;5)	4 (4;5)	0.001
Nostril size	5 (4;5)	4 (4;5)	<0.001
Overall appearance of alar	4 (4;5)	4 (3;4)	0.005
Donor site appearance	5 (4;5)	4 (4;5)	0.139

The highest level of results was noted for alar color, position of alar and donor site appearance. The lowest level of scores was registered for alar size, alar shape and nostril size. This trend can be observed in the distribution of patients' and experts' scores. A lower value for the alar overall appearance can be explained by significance of each particular parameter in overall perception of middle face. A score decrease for two or three separate positions in our material led to an overall item score decrease. Difference between patients related and experts related result for donor site appearance was statistically no significant.

Patient related results were generally higher than expert ones. Comparison of patient and expert points by every item couple

showed that patient scores of alar size, alar shape, position of alar, alar skin color, alar-cheek crease, nostril size and overall appearance of alar were higher than expert scores. Difference for every item couple is statistically significant. This can be explained by the fact that patients with skin carcinomas compared subconsciously the reconstruction result with the tumor appearance before surgery, and not with the intact subunit. The patient's opinion is subjective, it does not rely on special knowledge and depends on mental status. In this study, we considered it necessary to present expert assessments' analysis, despite the fact that the patient is the final medical care consumer. We divided the scores into two groups to simplify descriptive analysis. The image of each of the

indicators was designated as an «acceptable result» (AR) when assessed as 4 and 5 points and as an «unacceptable result» (UR) – when assessed as 1, 2 and 3 points.

AR of the overall appearance of alar was registered in 22 cases (76 %) according to experts' assessment and in 24 cases (83 %) according to patients' assessment. The overall appearance of alar was evaluated by experts

as excellent (5 points) in 7 patients (Figure 3) and as good (4 points) in 14 patients (Figure 4). Evaluation of any particular item of 3 points was noted in only three patients with a total AR. In each case, result for only one item was scored as moderate (3 points): alar position, nostril size and alar shape. This indicates the significance of the studied indicators for alar general perception.



Figure 3 – Excellent outcome of overall nasal alar appearance, experts' score – 5, patient' score – 5

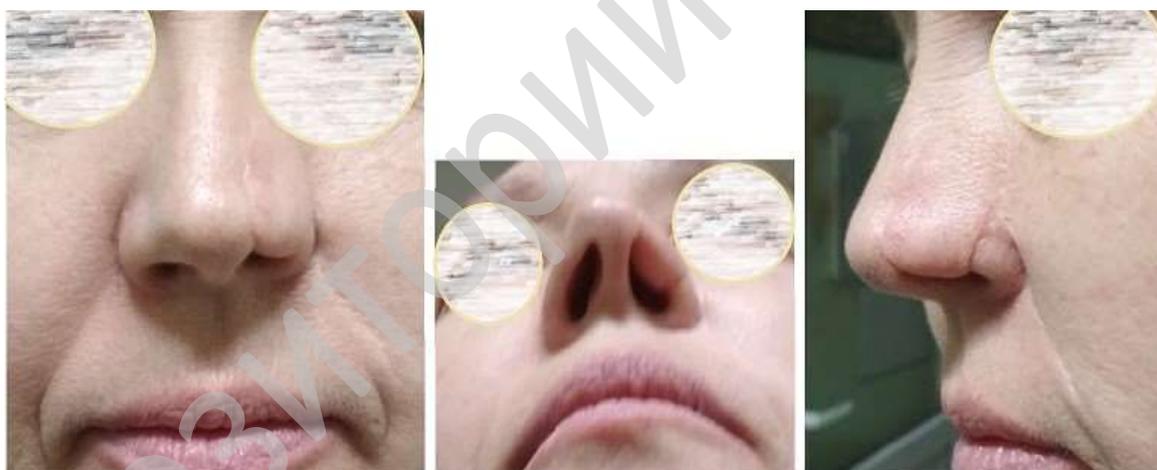


Figure 4 – Good outcome of overall nasal alar appearance, experts' score – 4, patient' score – 5, excess thickness of ala



Figure 5 – Good outcome of overall nasal alar appearance, experts' score – 4, patient' score – 5, absence of alar-cheek crease

The experts marked the overall appearance of alar as poor (2 points) in 2 patients and as moderate (3 points) in 6 patients. Thus, according to experts, UR of reconstruction was noted in 8 patients (28 %). Alar size and shape incompliance with normal parameters was the most often reason for the score decrease. Excessive subunit size was ob-

served in 3 patients with UR. This was the result of the incomplete fat layer removal during the flap preparing and folding. The size of reestablished ala was significantly smaller than normal in 3 patients. Partial necrosis of the flap or a wound dehiscence followed by scar retraction was observed in cases with related UR.



Figure 6 – Moderate outcome of overall nasal alar appearance, experts' score – 3, patient' score – 4, shortness and cranial displacement of ala, deformity of free margin, narrow nostril



Figure 7 – Poor outcome of overall nasal alar appearance, experts' score – 2, patient' score – 3, unnatural shape, cranial displacement and excess thickness of ala, deformity of free margin, narrow nostril, absence of alar-cheek crease

Unsatisfactory estimates of the alar shape were observed due to free margin distortion in 3 patients and an unnatural alar relief in 5 patients. The relief of the subunit was regarded as unnatural due to the absence of a supraalar concavity and a characteristic domed shape.

The alar position after reconstruction was given less than 4 points in 5 patients. The reason of alar displacement was scar retraction. This led to a cranial subunit drift in 4 cases and a dorsal shift in 1 case. The alar-

cheek crease appearance received points corresponding to UR in 7 patients. The alar-cheek crease was not sufficiently expressive in 6 observations after reconstruction with NLF and in 1 observation – after reconstruction with PF. Nostril size was significantly smaller than natural one in 5 patients and significantly larger than natural one in 2 patients. Nostril narrowing or external nasal valve collapse during inspiration caused periodic difficulty in nasal breathing in 4 patients.

Donor site of medial cheek were identified by patients as UR in 3 cases, by experts – in 5 cases. The reason of the score decrease was a significant change in the cheek relief and a visually defined scar. UR for the donor site appearance were registered in 4 cases out of 15 after reconstruction with NLF and in 1 case out of 14 after reconstruction with PF.

Additional unplanned second or third stage operations were indicated in 3 patients for the deformed ala correction. The objectives of the corrective interventions were as follows: creation of natural supraalar concavity, forming of deeper alar-cheek crease, elimination of puckering in the medial part of the cheek. Two more patients refused repeated improvement procedures, despite the fact that they gave 3 points to the overall result of reconstruction. Indications for unplanned corrective interventions arose in 4 cases after reconstruction using NLF and in 1 case after reconstruction using PF.

Conclusion

Reconstruction of full thickness nasal alar defects using cheek flaps allowed to achieve good and excellent cosmetic results in 76 % of cases according to experts' assessment and in 83 % of cases according to patients' assessment. Postoperative appearance of donor site was noted as acceptable in 83 % according to expert's opinion and in 90 % according to patients' opinion. Reconstruction was made as single stage procedure in 19 cases (66 %).

Received data can be used for comparing with alternative surgical techniques or results of other clinics. The use of cheek skin flaps is certainly one of the basic methods of nasal alar reconstructing. However, the limit of capabilities of each of the described techniques should be taken into account and discussed with the patient.

REFERENCES

1. Singh DJ, Bartlett SP. Nasal Reconstruction: Aesthetic and Functional Considerations for Alar Defects. *Facial Plastic Surgery*. 2003;19(1):1927. doi: 10.1055/s-2003-39128
2. Austin GK, Shockley WW. Reconstruction of nasal defects: contemporary approaches. *Curr Opin Otolaryngol Head Neck Surg*. 2016;24:453-60. doi: 10.1097/MOO.0000000000000295
3. Ortins-Pina A, Teixeira AI, Sanches M, Gouveia AI, Filipe PL, Silva JM. Nasal ala reconstruction: Surgical conundrum. *J Cutan Aesthet Surg*. 2017;10:55-8. doi: 10.4103/JCAS.JCAS_130_16
4. Driscoll BP, Baker SR. Reconstruction of nasal alar defects. *Arch Facial Plast Surg*. 2001;3(4):91-99

5. Bloom JD, Ransom ER, Miller CJ. Reconstruction of alar defects. *Facial Plast Surg Clin North Am*. 2011;19(1):63-83. doi: 10.1016/j.fsc.2010.10.009
6. Chen C, Patel R, Chi J. Comprehensive Algorithm for Nasal Ala Reconstruction: Utility of the Auricular Composite Graft. *Surg J*. 2018;4:e55-e61. doi: 10.1055/s-0038-1639581
7. Lohuis PJ, Godefroy WP, Baker SR, Tasman AJ. Transposition flaps in nasal reconstruction. *Facial Plast Surg Clin North Am*. 2011;19(1):85-106. doi: 10.1016/j.fsc.2010.10.002
8. Weathers WM, Wolfswinkel EM, Nguyen H, Thornton JF. Expanded uses for the nasolabial flap. *Semin Plast Surg*. 2013;27(2):104-109. doi: 10.1055/s-0033-1351234
9. Ivanov SA, Savenko YN. Rekonstruktsiya kryla nosa plasticheskim materialom na osnove modifitsirovannogo pazl-loskuta [Reconstruction of nasal ala with plastic material based on a modified puzzle flap]. *Rossiyskaya Rinologiya* [Russian rhinology]. 2017;25(4):30-34. (In Russ). doi: 10.17116/rosrino201725330-34
10. Ivanov SA, Zalutsky IV. Rekonstruktsiya naruzhnogo nosa autologichnymi tkanyami i plasticheskim materialom s vklucheniym allogennogo khryashcha [Reconstruction of the external nose with autologous tissues and plastic material including allogeneic cartilage]. *Doklady NAN Belarusi* [Reports of the NAN of Belarus]. 2016;60(6):103-10. (In Russ.)
11. Bi H, Xing X, Li J. Nasolabial-alar crease: a natural line to facilitate transposition of the nasolabial flap for lower nasal reconstruction. *Annals of Plastic Surgery*. 2014;73(5):520-24. doi: 10.1097/SAP.0b013e31827f547e

ЛИТЕРАТУРА

1. Singh DJ, Bartlett SP. Nasal Reconstruction: Aesthetic and Functional Considerations for Alar Defects. *Facial Plastic Surgery*. 2003;19(1):1927. doi: 10.1055/s-2003-39128
2. Austin GK, Shockley WW. Reconstruction of nasal defects: contemporary approaches. *Curr Opin Otolaryngol Head Neck Surg*. 2016;24:453-60. doi: 10.1097/MOO.0000000000000295
3. Ortins-Pina A, Teixeira AI, Sanches M, Gouveia AI, Filipe PL, Silva JM. Nasal ala reconstruction: Surgical conundrum. *J Cutan Aesthet Surg*. 2017;10:55-8. doi: 10.4103/JCAS.JCAS_130_16
4. Driscoll BP, Baker SR. Reconstruction of nasal alar defects. *Arch Facial Plast Surg*. 2001;3(2):91-99.
5. Bloom JD, Ransom ER, Miller CJ. Reconstruction of alar defects. *Facial Plast Surg Clin North Am*. 2011;19(1):63-83. doi: 10.1016/j.fsc.2010.10.009
6. Chen C, Patel R, Chi J. Comprehensive Algorithm for Nasal Ala Reconstruction: Utility of the Auricular Composite Graft. *Surg J*. 2018;4:e55-e61. doi: 10.1055/s-0038-1639581
7. Lohuis PJ, Godefroy WP, Baker SR, Tasman AJ. Transposition flaps in nasal reconstruction. *Facial Plast Surg Clin North Am*. 2011;19(1):85-106. doi: 10.1016/j.fsc.2010.10.002
8. Weathers WM, Wolfswinkel EM, Nguyen H, Thornton JF. Expanded uses for the nasolabial flap. *Semin Plast Surg*. 2013;27(2):104-109. doi: 10.1055/s-0033-1351234
9. Иванов СА, Савенко ЮН. Реконструкция крыла носа пластическим материалом на основе модифицированного пазла-лоскута. *Российская Ринология*. 2017;25(4):30-34. doi: 10.17116/rosrino 201725330-34

10. Иванов СА, Залуцкий ИВ. Реконструкция наружного носа аутологичными тканями и пластическим материалом с включением аллогенного хряща. Докл. НАН Беларуси. 2016;60(6):103-10.
11. Bi H, Xing X, Li J. Nasolabial-alar crease: a natural line to facilitate transposition of the nasolabial flap for lower nasal reconstruction. *Ann Plast Surg.* 2014; 73(5):520-24. doi: 10.1097/SAP.0b013e31827f547

Поступила 04.05.2020

Received 04.05.2020

Принята в печать 24.06.2020

Accepted 24.06.2020

Information about authors:

Sergei A. Ivanov – Candidate of Medical Sciences, Associate Professor at the Department of Oncology of the EI «Gomel State Medical University»; e-mail: srgivgm@gmail.com; <https://orcid.org/0000-0002-9256-2910>

Vladislav N. Yadchenko – Candidate of Medical Sciences, Assistant lecturer at the Department of Traumatology, Orthopedics and Military Field Surgery with the course of Anesthesiology and Intensive Care of the EI «Gomel State Medical University»; <https://orcid.org/0000-0002-7342-3894>

Artyom A. Poddubny – 5-year student of the Faculty of General Medicine of the EI «Gomel State Medical University»; <https://orcid.org/0000-0002-4427-3268>

Ekaterina S. Ivanova – 5-year student of the Faculty of General Medicine of the EI «Gomel State Medical University»; <https://orcid.org/0000-0001-9590-0041>

Corresponding author:

Sergei A. Ivanov – e-mail: srgivgm@gmail.com

Сведения об авторах:

Иванов Сергей Анатольевич – к.м.н., доцент кафедры онкологии УО «Гомельский государственный медицинский университет»; e-mail: srgivgm@gmail.com; <https://orcid.org/0000-0002-9256-2910>

Ядченко Владислав Николаевич – к.м.н., ассистент кафедры травматологии, ортопедии и ВПХ с курсом анестезиологии и интенсивной терапии УО «Гомельский государственный медицинский университет»; <https://orcid.org/0000-0002-7342-3894>

Поддубный Артем Артурович – студент 5-го курса лечебного факультета УО «Гомельский государственный медицинский университет»; <https://orcid.org/0000-0002-4427-3268>

Иванова Екатерина Сергеевна – студент 5-го курса лечебного факультета УО «Гомельский государственный медицинский университет»; <https://orcid.org/0000-0001-9590-0041>

Автор, ответственный за переписку:

Иванов Сергей Анатольевич – e-mail: srgivgm@gmail.com