



Tulebaev R.¹ ✉, Makhambetova E.^{1,2}, Azhenov T.¹

¹ Astana Medical University, Astana, Kazakhstan

² ENT Center Sezim, Astana, Kazakhstan

Features of Rhinoseptoplasty in Patients of the Kazakh Population

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Contacts: rais007@yandex.kz

Abstract

Introduction. Currently, the world's population has about a hundred different ethnic groups with intergroup differences (Liao W.C., 2007) and almost each of them has special anatomical and functional features. Researchers are studying a special section of physical anthropology, which reflects the geographical variations of morphological, physiological and biochemical indicators of a healthy human body – ethnic anthropology. The foresaid confirms the extreme relevance of modern problems of rhinoseptoplasty, reflecting some of the issues of aesthetic rhinoplasty in various populations.

Purpose. To develop and substantiate the ethnic aspects of rhinoseptoplasty in the Kazakh population and improve modern rhinosurgery in case of external nose deformity.

Materials and methods. The material is based on examination data of 740 people and the results of a targeted study of computer X-ray tomographic data of the nasal cavity of 150 patients. In addition, the anthropometric features of the structure and parameters of the external nose and intranasal structures in individuals in the Kazakh population were studied. Separately, in clinical observations, the effectiveness of the developed methods of rhinosurgery was studied, taking into account the ethnic characteristics of the anatomy of the nose.

Results. Basis of our study, an algorithm of Kazakh ethnic rhinoplasty was formed, which consisted of a sequence of the following mandatory surgical techniques: thinning of the skin-aponeurotic flap; minimally invasive smoothing of the hump, followed by an increase in the projection of the back with grafts of various nature; insertion of a transplant to elongate the nasal septum; nose tip shaping using through dome and inter dome sutures and tip grafts; base resection.

Conclusion. The nose characteristic in the Kazakh population are as follows, thick skin in the region of the tip of the nose with a pronounced subcutaneous fat layer (in 86.2% of the examined); low and wide back with a mild, predominantly cartilaginous hump (Goode index $59.16 \pm 4.31\%$ and nasofrontal angle 133.11 ± 4.980 in men; Goode index $49.50 \pm 4.34\%$ and nasofrontal angle 136.4 ± 8.660 in women); wide nasal tip (lobular index in men $88.9 \pm 4.31\%$ and in women $79.03 \pm 3.05\%$); hypoprojection of the tip (projection of the tip according to Gunter $60.17 \pm 4.31\%$ in men and $50.4 \pm 4.89\%$ in women); wide

wings of the nose ($36.9 \pm 0.78\%$ in men and $34.6 \pm 1.46\%$ in women); closed V-type nostrils in 55.5% of men and 69.4% of women; columella retraction – in 61.6% of men and 83.9% of women.

Keywords: rhinoseptoplasty, hypoprojection, rhinosurgery, anthropology, algorithm

Тулебаев Р.К.¹ ✉, Махамбетова Е.А.^{1,2}, Аженов Т.М.¹

¹ Медицинский университет Астана, Астана, Казахстан

² ЛОР-центр «Сезим», Астана, Казахстан

Особенности риносептопластики у пациентов казахской популяции

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Контакты: rais007@yandex.kz

Резюме

Введение. В настоящее время население Земли насчитывает около ста различных этнических групп, имеющих межгрупповые различия (Liao W.C., 2007), и почти каждая из них имеет особые анатомические и функциональные особенности. Исследователи изучают специальный раздел физической антропологии, отражающий географические вариации морфологических, физиологических и биохимических показателей здорового человеческого организма, – этническую антропологию. Сказанное подтверждает чрезвычайную актуальность современных проблем риносептопластики, отражающих некоторые проблемы эстетической ринопластики в различных популяциях.

Цель. Разработать и обосновать этнические аспекты риносептопластики у пациентов казахской популяции и усовершенствовать современную ринохирургию при деформации наружного носа.

Материалы и методы. Материал основан на данных обследования 740 человек и результатах прицельного изучения данных компьютерной рентгеномографии полости носа 150 пациентов. Кроме того, изучены антропометрические особенности строения и параметры наружных и интраназальных структур у лиц казахской популяции. Отдельно в клинических наблюдениях изучалась эффективность разработанных методов ринохирургии с учетом этнических особенностей анатомии носа.

Результаты. На основе нашего исследования был сформирован алгоритм казахской этнической ринопластики, который состоял из последовательности следующих обязательных хирургических приемов: истончение кожно-апоневротического лоскута; малоинвазивное сглаживание горба с последующим увеличением проекции спинки трансплантатами различной природы; установка трансплантата для удлинения носовой перегородки; формирование кончика носа с помощью сквозных и межкупольных швов и трансплантатов кончика носа; резекция основания.

Заключение. Характерными чертами носа у казахской популяции являются толстая кожа в области кончика носа с выраженным подкожно-жировым слоем (у 86,2% обследованных); низкая и широкая спинка с невыраженным, преимущественно хрящевым горбом (индекс Гуда $59,16 \pm 4,31\%$ и носолобный угол $133,11 \pm 4,980$ у мужчин; индекс Гуда $49,50 \pm 4,34\%$ и носолобный угол $136,4 \pm 8,660$ у женщин); широкий кончик носа (дольковый индекс у мужчин $88,9 \pm 4,31\%$ и у женщин $79,03 \pm 3,05\%$); гипопроекция кончика (проекция кончика по Гюнтеру $60,17 \pm 4,31\%$ у мужчин и $50,4 \pm 4,89\%$ у женщин); широкие крылья носа ($36,9 \pm 0,78\%$ у мужчин и $34,6 \pm 1,46\%$ у женщин); закрытые ноздри V-типа – у 55,5% мужчин и 69,4% женщин; ретракция колумеллы – у 61,6% мужчин и 83,9% женщин.

Ключевые слова: риносептопластика, гипопроекция, ринопластика, антропология, алгоритм

■ INTRODUCTION

Currently, the world's population has about a hundred different ethnic groups with intergroup differences [1] and almost each of them has special anatomical and functional features. Researchers are studying a special section of physical anthropology, which reflects the geographical variations of morphological, physiological and biochemical indicators of a healthy human body – ethnic anthropology. The foresaid confirms the extreme relevance of modern problems of rhinoseptoplasty, reflecting some of the issues of aesthetic rhinoplasty in various populations.

■ PURPOSE OF THE STUDY

To develop and substantiate the ethnic aspects of rhinoseptoplasty in the Kazakh population and improve modern rhinosurgery in case of external nose deformity.

■ MATERIALS AND METHODS

The material is based on examination data of 740 people and the results of a targeted study of computer X-ray tomographic data of the nasal cavity of 150 patients. In addition, the anthropometric features of the structure and parameters of the external nose and intranasal structures in individuals in the Kazakh population were studied. Separately, in clinical observations, the effectiveness of the developed methods of rhinosurgery was studied, taking into account the ethnic characteristics of the anatomy of the nose.

Of the total number of surveyed, the first cross-sectional cohort study was conducted, the participants of which were 500 volunteers of Kazakh nationality (group 1). Volunteers from among the students of Nazarbayev University and the Astana Railway School aged 16 to 25 years (20 ± 3.5 years) ranged as a sample from the general population, of which 197 (39.4%) were women and 303 (60.6%) men. Measurements of the external nose were performed in real time with a normal anatomical position of the head, in millimeters, using a digital caliper, headlight and calculator, as well as virtually – on digital color photographs taken in standard views.

The study of intranasal structures of the features of the nose in the Kazakh population according to computed tomography was carried out on the basis of the medical center "Profident" (Almaty). The study material included 150 images of the nasal cavity

in 75 Kazakh populations (group II, a) and 75 Slavic patients (group II b). In both groups, the parameters of the structures of the nasal cavity were measured and compared.

Data represent two prospective comparative controlled randomized trials. On the basis of the data obtained, with substantiation of the results of clinical, functional, X-ray tomography, analysis of structural changes before surgery, optimal options for rhinoplasty were developed, taking into account ethnic aspects in the Kazakh population.

Patients were examined before surgery, then 1, 3 months and 1 year after surgery. It included the collection of complaints and disease history, blood tests, the standard ENT examination, specific tests with a mechanical expansion of the nasal valve area ("push-up", a cotton ball test, a Cottle test and a mechanical intranasal expansion of the nasal valve using a bellied probe) and endoscopic examination of the nasal cavity.

The NOSE (Nasal Obstruction Symptom Evaluation) questionnaire was used, which contained 4 main items: "difficulty in nasal breathing", "nasal congestion", "quality of sleep" and "character of breathing during exercise". Answers were evaluated on a five-point scale. The questionnaire for evaluating the aesthetic result of the operation included one question – «did the shape of the nose change as a result of the intervention?» There were five possible answers.

For photography documentation, we used a semi-professional digital camera with 10-16x optical zoom and high resolution before and after the operation in 6 views (frontal, lateral, semi-lateral and basal). The obtained photographs were evaluated before and in dynamics 6 months and a year after the operation.

Anthropometry of the external nose as measurements of the parameters of the external nose were performed in real time with a normal anatomical position of the head in millimeters using a digital caliper, headlight and calculator, as well as virtually – on digital color photographs taken in standard views. The results were entered into a common database and individual registration cards of the subjects (IRC) with subsequent calculation of proportions, comparison of parameters and statistical analysis.

To obtain the most accurate result in the anthropometric measurement of the external nose, the standard identification points were evaluated by the method: tip of the nose, ala, columella, nostrils, glabella, nasion, pogonion.

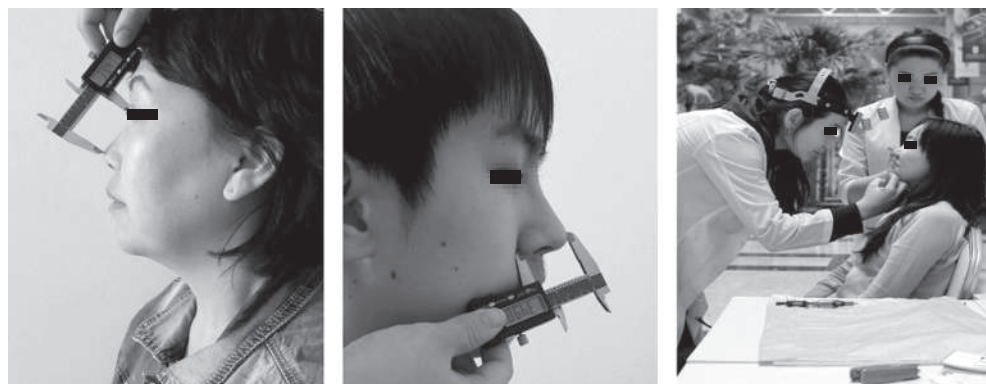


Fig. 1. Measurement of the parameters of the external nose using a caliper and a ruler

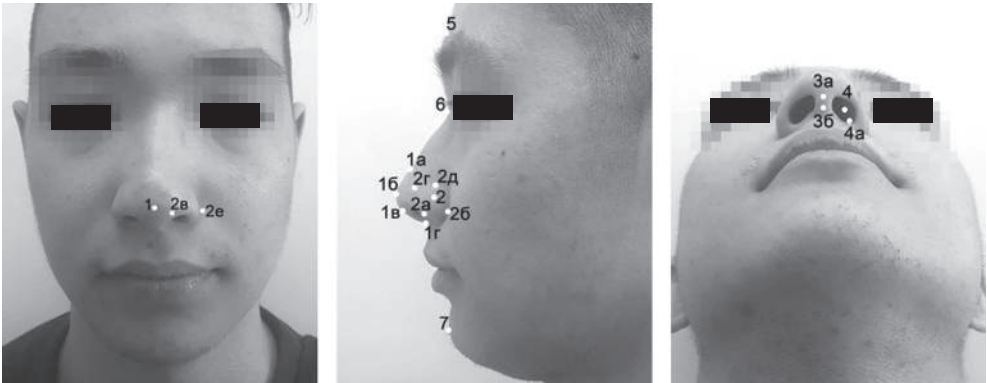


Fig. 2. Identification points of the external nose

The type of external nose was determined as leptorhinic with nasal index up to 69.9; mesorhine with an index of 70.0 to 84.9 and plathyrinic, index over 85.

The following parameters were calculated: nose height (NH), nose width (SN), nasal index, nasolabial angle, nasolabial angle, nose projection index by Goode, Gunter's nasal tip projection index, nasal tip rotation, and projection of the columella margin in profile to the margin of the alar, according to Gunther's classification.

During statistical analysis, the average values of the indicators and their standard deviations by groups were determined. Then, the average values obtained between the groups were compared with the conditional norm. The data were analyzed using the Statistica program (SPSS 11.0).

The significance of differences between the compared sample mean quantitative indicators was determined by Student's t-test. Differences were considered statistically significant if the null hypothesis was true <5% ($p < 0.05$). For an objective study of nasal functions, Rhinomanometry (RMM), rhinoresistometry (RRM) and acoustic rhinometry (AR) were performed, which are the generally accepted standard for objective assessment of nasal breathing function [2, 5].

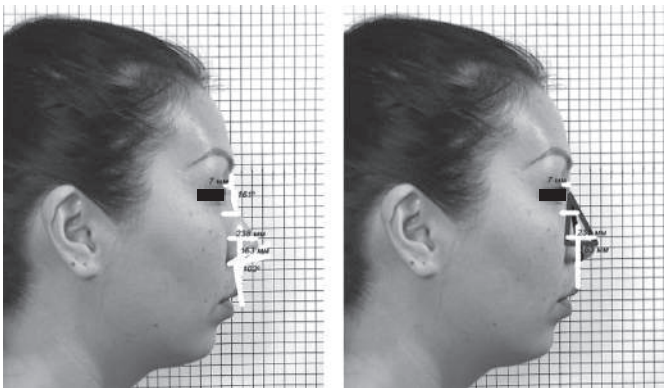


Fig. 3. Main parameters of the external nose

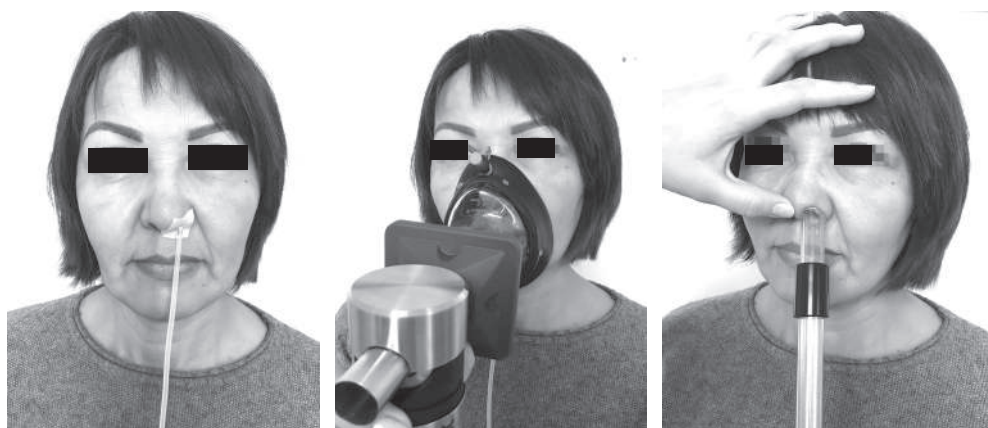
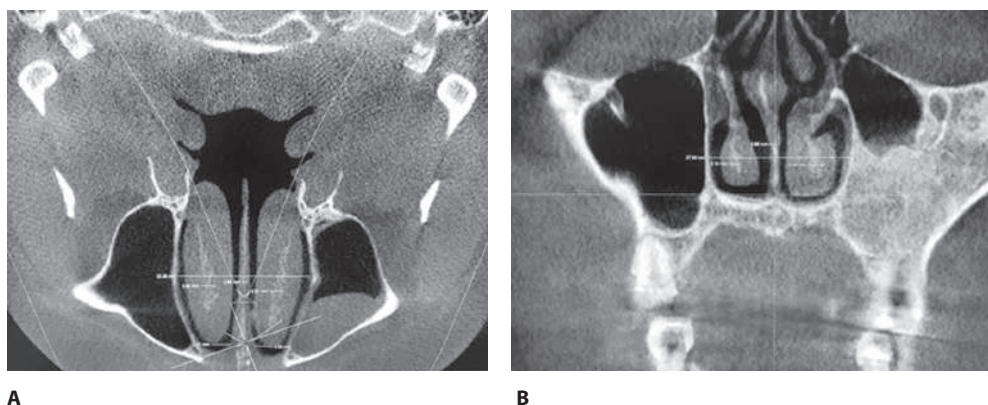


Fig. 4. Studying nasal function

Before surgery, the results of a comprehensive functional examination of the nose allow the surgeon to determine the degree and cause of difficulty in breathing through the nose, and in the postoperative period, to objectively assess the effectiveness of the operation (Ching S., 2003). The Rhinomanometric complex OtoprontRhino-Sys (Happersberger Otopront), which consists of the RHINO-BASE platform, a laptop computer, a portable RHINO-MOVE module for 24-hour rhinoflowmetry, and the RHINO-ACOUSTIC system for acoustic measurements of the nasal passway.

Computed tomography of the nose and paranasal sinuses was included in the list of mandatory preoperative examination methods to identify concomitant pathology of the nasal cavity and paranasal sinuses.

After computed tomography of the structures of the nasal cavity, 3d-tomograms were analyzed using the Sidexis-4 program, performed on the Sirona Galileos device in the patient's standing position. Images were evaluated in tangential and transverse



A

B

Fig. 5. The results of measuring the parameters of the intranasal structures on the Galileos 3d tomograph

projections. As evaluation criteria, we chose the distance between the caudal edge of the nasal septum and the most caudal point of the inferior turbinate on the right and left, the thickness of the bony plate of the inferior turbinates, the thickness of the nasal septum in the middle of the height of the caudal edge, the width of the nasal cavity aperture and the width of the anterior nasal spine.

■ RESULTS AND DISCUSSION

Basis of our study, an algorithm of Kazakh ethnic rhinoplasty was formed, which consisted of a sequence of the following mandatory surgical techniques: thinning of the skin-aponeurotic flap; minimally invasive smoothing of the hump, followed by an increase in the projection of the back with grafts of various nature; insertion of a transplant to elongate the nasal septum; nose tip shaping using through dome and inter dome sutures and tip grafts; base resection [5].

Nasal septal extension graft (SEG)

To strengthen the medial crura, increase the projection and the rotation of the nasal tip, lengthen the dorsum of the nose, advance the columella anteriorly and improve the nasolabial angle, improve the shape of the nostrils, we used a graft, additionally fixed to the nasal septum and lengthening it. The technique was used in various modifications: paired spreading, paired framing and straight lengthening grafts. In the case of an straight lengthening grafts technique, the grafts laid down along the dorsal part of the nasal septum to the medial crura of the lower lateral cartilages [6].

If the purpose of the operation is to increase the projection of the nasal tip, which happens in almost every ethnic rhinoplasty, the graft must be modified so that its distal end is directed slightly upward and forward over the elongated line of the dorsal nasal septum that is created.

In the case of using the framing graft technique, the latter was located diagonally and transversely to the nasal septum towards the tip of the nose, regulating its projection and rotation [7]. This type of graft was used when a significant increase in the projection of the nasal tip was required.

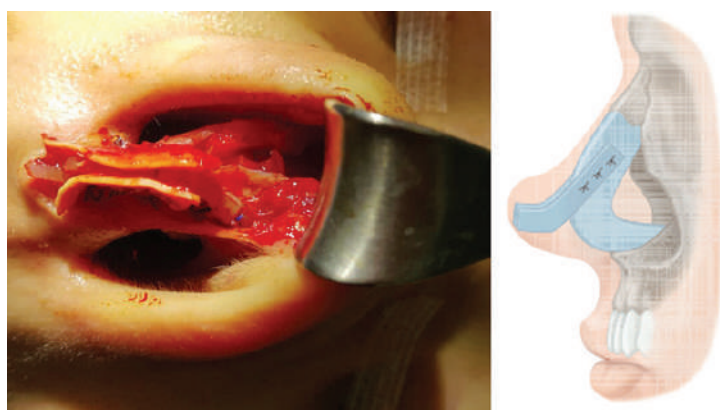


Fig. 6. Paired spreading grafts

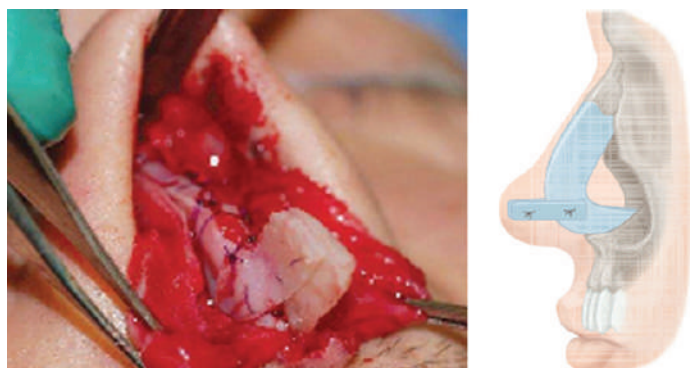


Fig. 7. Framing graft, lengthening the nasal septum

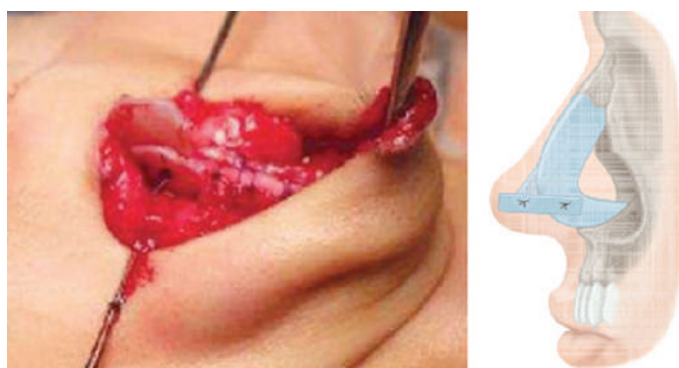


Fig. 8. "Spreading-framing" graft, lengthening the nasal septum

The "spreading-framing" type of graft (combination of spreading elongation graft on one side and framing graft – on the other), even when using relatively small grafts, is fixed more stably and makes it possible to adjust the degree of elongation and projection of the tip [16]. To increase the length of the nose, lengthening of the caudal part of the nasal septum was performed using septal cartilage, auricular cartilage, and in some cases, the perpendicular plate of the cribriform bone, after perforating it with a drill [9].

Increasing the nasal dorsum projection

For a slight increase in the height of the dorsum, as a rule, autocartilages taken from the auricular cartilage or the quadrangular cartilage of the nasal septum were used. The graft is leveled, modeled, excised and preliminarily measured in a pocket prepared under the periosteal layer. In this case, the thickness of the graft may be different: it is thicker in the region of the root of the nose, thinner in the region of the nasion and again becomes slightly thicker in the distal direction [10].

Fixation of the proximal graft is performed with 5/00 vicryl, while the needle with vicryl is used as a conductor, is removed through the skin and fixed with a sterile plaster. The

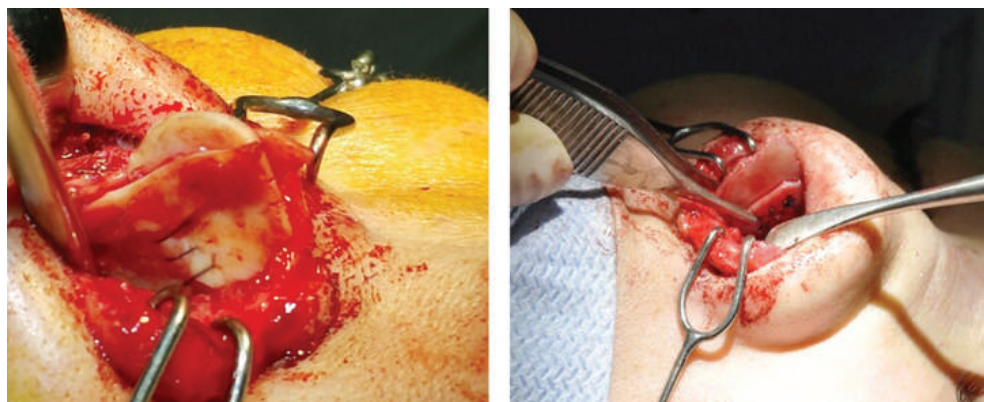


Fig. 9. End-to-end and side-to-side cartilage bypass

distal part of the graft is placed between the cephalic edges of the superolateral cartilages and fixed with 2–3 PDS 6/00 sutures. In some cases, we used sodium sulfacrylate glue for fixation [11]. To achieve a significant increase in the projection of the dorsum, rib cartilage was used.

Increasing the projection of the tip of the nose

The most important stage of Kazakh ethnic rhinoplasty. It performed after stabilization of weak medial crura with a columellar graft. On the medial cruras, we applied mattress sutures with 5/00 or 6/00 vicryl, without capturing the skin layer of the columella. If necessary, cephalic resection was performed [12]. After both domes were symmetrically positioned, transdome and interdome sutures PDS 5/00 or 6/00 were applied.

Autografts have been used in a variety of modifications: overlay grafts, single tip grafts, double cartilage grafts, multilayer, Sheen trapezoidal graft, Gunter graft, and other modifications and combinations (Fig. 11) [3, 13].

The grafts were fixed with PDS sutures or an adhesive composition based on cyanoacrylic acid, or both methods of fixation were combined (Fig. 12).



Fig. 10. Variations of Autografts of the Nasal Tip

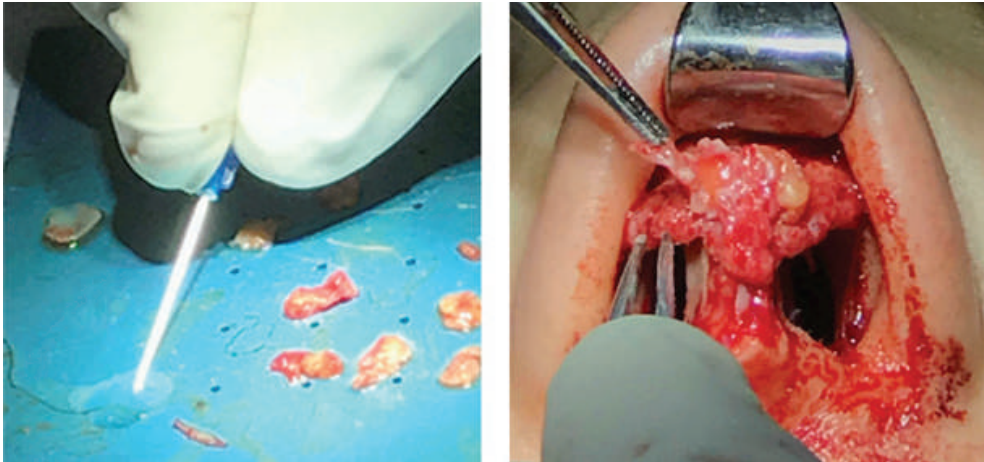


Fig. 11. Fixation of autografts with an adhesive composition

Thinning of the skin-aponeurotic layer

The procedure for thinning the soft tissues of the tip of the nose is carried out only over the area of its excessive presence. With thinning of the flap above the cartilage, the tip of the nose is smoother than with subcutaneous dissection at the cartilage level [14]. Soft tissues and fiber in the supra-tip region of the Kazakhs have a thick layer, part of which can be excised or saved for further use as a camouflage over the tip [2, 5].

An important point was the knowledge of the exact volume of excision to prevent postoperative circulatory disorders and tip necrosis [15]. Therefore, thin scissors, as shown in Fig. 13, excised only those soft tissues that created volume and were easily dissected when pulled with tweezers.



Fig. 12. Excision of excess subcutaneous adipose tissue

Wound closure

The final stage of the operation includes washing the surgical wound with an antibiotic or antiseptic solution and careful suturing. The skin is laid without tension and the edges of the wound are compared. With interrupted sutures, prolene 6/0-, the wound on the nasal column is first closed, then 6/00 vicryl sutures are applied to the underwing wounds. Next, a plaster splint or thermoplastic are applied. Bandaging reduces the mobility of the implant and grafts.

Base resection

Is indicated for most Kazakh ethnic noses. The wings of the nose acquire their final position after suturing all the wounds. Therefore, their correction is performed at the final stage after preliminary marking and infiltration with a solution of articaine with epinephrine. Depending on the shape, position, and width of the wings and bottom, several resection options were performed. The incision was made 1 mm above the buccal-wing groove, not higher than 2/3 of it.

In patients of Kazakh nationality, the method of base reduction was more often used without continuing into the bottom of the nostrils, since Kazakh noses did not have excessive nostril sizes. A total of 21 resections (26.5%) of 80 patients of the main group, and 5 triangular wing resections (6.25%) were performed, all female patients.

Septoplasty was performed considering ethnic characteristics: thin and atrophied mucous membrane of the nasal septum, thin quadrangular cartilage, thick bone part (thick vomer, thin perpendicular plate of the ethmoid bone), more dorsal location of the caudal section of the nasal septum, thin anterior nasal spine, so we fully compensated the resected fragments of cartilage and bone. To do this, almost all available fragments of the automaterial were reimplanted, having previously straightened, weakened. For fixation, an adhesive composition based on cyanoacrylic acid was used.

For the less traumatic septoplasty we used endoscopic method [4, 17]. It made it possible to preserve the integrity of the nasal septum in the anterior sections, without causing or aggravating the existing atrophy of the mucous membrane of the nasal septum in Kazakh patients.



A



B

Fig. 13. A – base reduction and resection the bottom of the nostril; B – triangular base resection

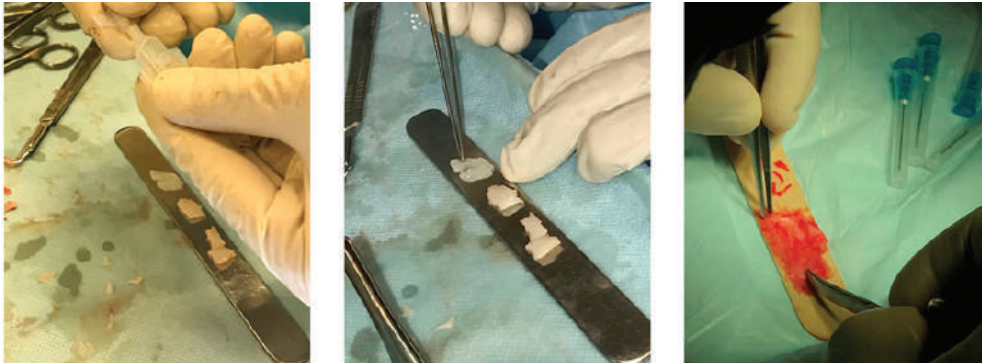


Fig. 14. Fixation of fragments of the septal cartilage with an adhesive composition

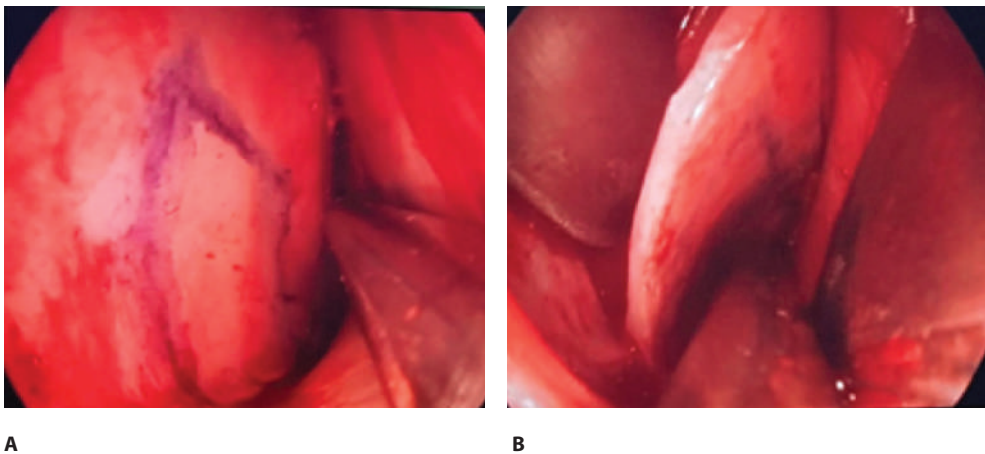


Fig. 15. Endoscopic picture: A – marking of the resection area of the quadrangular cartilage; B – cartilage resection

Conchoplasty in a patient was often combined on different sides with different types of plasty, for example, lateroposition or reduction of hypertrophied tissue with a bipolar electrode on the side of nasal septal deviation and excision of the bony part of the concha, on the side of compensatory hypertrophy.

For characterizing the external nose in the Kazakh population, we obtained the following picture: the skin of the noses of the population in the group with a nasal index corresponding to mesorrhine is thick, the tip of the nose is round, wide, poorly defined, the bone pyramid is wide, the projection of the back and tip of the nose is low, the rotation of the tip is medium, the direction of the nostrils is horizontal, more than 45 degrees. In some cases, there was asymmetry of the dorsum and nostrils. Columella is characterized by retraction of the column – type V. According to other parameters, the nose in the Kazakh population seems to be quite balanced, deviations from the aesthetic proportions accepted as "correct" are insignificant and are multidirectional in the male and female populations.

■ CONCLUSION

The nose characteristic in the Kazakh population are as follows, thick skin in the region of the tip of the nose with a pronounced subcutaneous fat layer (in 86.2% of the examined); low and wide back with a mild, predominantly cartilaginous hump (Goode index $59.16 \pm 4.31\%$ and nasofrontal angle 133.11 ± 4.980 in men; Goode index $49.50 \pm 4.34\%$ and nasofrontal angle 136.4 ± 8.660 in women); wide nasal tip (lobular index in men $88.9 \pm 4.31\%$ and in women $79.03 \pm 3.05\%$); hypoprojection of the tip (projection of the tip according to Gunter $60.17 \pm 4.31\%$ in men and $50.4 \pm 4.89\%$ in women); wide wings of the nose ($36.9 \pm 0.78\%$ in men and $34.6 \pm 1.46\%$ in women); closed V-type nostrils in 55.5% of men and 69.4% of women; columella retraction – in 61.6% of men and 83.9% of women.

The most significant characteristics of the external nose in terms of aesthetic perception of patients of Kazakh nationality who wish to undergo rhinoplasty are a too wide nose tip with a low projection (in 88.9% of men and in 79.03% of women), hypoprojection of the nose tip (30.8% of men and 62.7% of women), the symmetry of the dorsum and the width of the wings (38.9% of men and 85.7% of women). The low projection of the dorsum (23% complained) and retraction of the columella (9.1% of the complaints of males and 10.2% of females) disturb patients less often, which is explained by the ideas of a harmonious nose formed among the people.

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