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The state of cerebral hemodynamics in patients with deviation of the nasal septum

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***Abstract*---**Violation of the ecological state of the environment has led to the fact that the center of gravity in otorhinolaryngology has shifted towards rhinology. The curvature of the nasal septum is the most common cause of persistent and severe obstruction of nasal breathing, as well as violations of all the numerous functions of the nose, the development of inflammatory and degenerative processes in the upper respiratory tract. In the case of trouble-free functioning of the nasal cavity of a person, first of all, he is worried (or not worried) by the existing cosmetic function, its preservation or correction. However, the situation changes dramatically when there are disorders of the respiratory, olfactory, protective functions of the nasal cavity. Violation of these functions can cause a person to have complaints and symptoms that are understandable to him, such as difficulty in nasal breathing, one or two sides, excessive secretion of nasal secretions, postnasal rhinorrhea, frequent acute sinusitis or exacerbation of chronic sinusitis, and it is not clear how headache pain, otitis media, dysfunction of the auditory tube, manifestations of rhinocardinal, rhinocerebral and rhinopulmonary reflexes. And not the last place in the occurrence of these complaints and conditions belongs to the nasal septum.

***Keywords*---**deviated septum, breathing, tube dysfunction, auditory, rhinocerebral reflexes.

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Introduction

varying severity, according to different authors, reaches from 44.8 to 95% (Karamese, 2021). According to V.I. Woyachek deformity of the nasal septum is present in 89.2% of the population. L. Gray, examining 2112 patients, revealed this pathology in 79% (Botirov, Isroilov, Matkuliyev., Akhundjanov, , Djuraevk& Zokirova,2020). According to the results of a study by R. Mladina, PN deviation occurs in 68% of the adult working population. G.Z. Piskunov wrote that a perfectly straight nasal septum is quite rare (Jianfang, 2021; Çakır, 2021), however, this is not always associated with difficulty in nasal breathing. H.E. Ozel revealed PN curvature in 70.9% of the population (Botirov, Isroilov, Matkuliyev., Akhundjanov, , Djuraevk& Zokirova,2020), and J.C. Ahn only 44.8% (Jang, 2022). Literary sources indicate that deformity of the nasal septum is more often observed in men (Çakır, 2021). According to the etiology of the curvature of the nasal septum, it is customary to divide it into post-traumatic and non-traumatic.

Materials and Methods

From the standpoint of phylo- and ontogenesis, the formation of deformities of the nasal septum occurs as a result of a change in the structure of the base of the skull, which is the result of human evolution (Vokhidov, Shernazarov, Yakubdjanov, Djuraev & Sharipov, 2021; Öztürk, 2022). The influence of the shape of the base of the skull on the formation of a curvature of the nasal septum in humans was first mentioned by Šercer in 1936 [13]. The author noted that the deformation of the septum cannot occur in tetrapods, since they have a flat base of the skull. In an adult, on the contrary, the structure of the base of the skull is such that its anterior and posterior sections are connected to each other, forming an obtuse angle, open downwards (about 135 °) - Huxley's angle. According to Šercer, it is precisely because of this that the brain region of the skull (neurocranium) presses from above on the facial region (splanchnocrania), causing deformation of the septum. Šercer called this system "cranial pincers". He also drew attention to the fact that in newborns and young children the base of the skull is flatter, without an angle at the junction of the two sections, but with age it gradually becomes more and more curved until it reaches its final shape. Clinically, this is confirmed by the fact that the incidence of septal deformities in newborns ranges from 0.9% to 17% (Gökler & Koçak, 2021), gradually increasing with age. At 19-20 years of age, the frequency of septal deviation reaches approximately 55% (Srivastava & Saxena, 2022).

According to R. Takahashi, other changes in the structure of the skull base during evolution also lead to the development of septal curvature: autonomous growth of the septal cartilage, changes in the ratio between the quadrangular cartilage and the vomer supporting the cartilage from below, as well as regression of the maxillofacial parts of the skull and an increase in the neurocranium in the primate stage (Vokhidov, Shernazarov, Yakubdjanov, Djuraev & Sharipov, 2021).
Non-traumatic postnatal deformities begin to form almost immediately after birth. The quadrangular cartilage grows faster than the bone frame surrounding it, represented by the vault and floor of the nasal cavity. As a result, the cartilage bends. In the area of bone-bone and bone-cartilaginous sutures, spikes and ridges can form (Singh & Bomanwar, 2021).

Its various variants of deformations of both the cartilaginous and bone sections are known. It is known that the optimal method of treatment in case of curvature of the nasal septum is surgical. There are also various options for surgical interventions to correct it, both archaic and more modern (submucosal resection of the nasal septum, mobilization, circular resection according to Voyachek, septoplasty according to Cottle, septoplasty with cartilage reimplantation, sparing operations, etc.). Violation of nasal breathing leads to a decrease in the airiness of the paranasal sinuses in the form of a parietal veil. Surgical intervention in case of deviated septum of the nose should be carried out as early as possible, even with an average degree of deformity, and simultaneously supplemented with autocartilage reimplantation with an impact on the inferior turbinates. If reimplantation is considered as restoration of the anatomical structure of an organ to prevent flotation and suction, then a change in the position and reduction of the inferior turbinates is considered as the elimination of an obstacle to nasal breathing and the restoration of homeostasis in the neurovascular supply of the nasal cavity. However, “dark” spots (unresolved points) remain in the treatment of nasal septal curvature in childhood, namely: why almost similar septal deformities in some children cause respiratory failure and other dysfunctions of the nasal cavity and adjacent areas, while others do not; why minor, isolated by a certain area (bone or

cartilage) deformities of the nasal septum cause significant functional inconvenience in some children and gross, complex deformities of the nasal septum do not affect the functioning of the nasal cavity in others; why the problem of the curvature of the nasal septum becomes relevant in some people already in childhood, while others do not even bother in old age; why secondary deformities of the nasal septum and the symptom complex of the "empty" nose occur and what options for surgical interventions are optimal in children, depending on local and general manifestations of deformity of the nasal septum. We observed 110 patients with deviated nasal septum aged from 7 to 57 years. In addition, we examined 40 healthy individuals aged 9 to 47 years who had no history of traumatic brain injury, neuroinfection, secretory otitis, did not take ototoxic antibiotics, which made up the control group. A total of 150 people were examined.

The work was performed at the private otorhinolaryngological clinic “QO’QON DUNYO JAVOHIRI”, Kokand city. When analyzing the causes of nasal septal deformity, a well-known classification was taken into account, which includes physiological (hereditary), traumatic, and compensatory curvatures (Jianfang, 2021). We supplemented this classification with the heading atypical deformity (curvature due to the penetration of tissues atypical for it into the septum). To the latter, we attributed the location in the thickness of the septum of the tooth, osteoma and other formations that are not characteristic of the structures of the nasal septum.

Results and Discussions

To determine the pathology in the nasal cavity, we used rigid Hopkins endoscopes (Karl Storz, Germany) with a diameter of 4 mm, 0^0 and 30^0 fields of view. After obtaining complete information about the state of the anterior sections of the

nasal septum, we assessed the size, shape and position of the turbinates, the severity of edema and the color of the mucous membrane, the condition of the posterior sections of the nasal cavity and nasopharynx, examined the middle nasal passage, and after completing the study, removed the endoscope from the nasal cavity.

The study was started without prior anesthesia and preparation of the nasal cavity. At the same time, the anterior parts of the nasal cavity, the angle of the nasal valve, the color of the mucous membrane, the presence of discharge in the nasal passages, and the size of the inferior nasal concha before anemization were first evaluated.

For further study of other deeper parts of the nasal cavity, we installed cotton turundas moistened with 2% lidocaine solution with the addition of 0.1% adrenaline solution in the common nasal passages for 2 minutes. After achieving the necessary anemization and local anesthesia of the mucous membrane, the common nasal passage was sequentially examined along the bottom of the nasal cavity, the lower and middle turbinates, to the nasopharynx (Fig. 1). As the endoscope advanced, special attention was paid to the state of the nasal septum, the localization, shape and severity of the curvature were assessed.

Figure 1. Endoscopic examination of the nasal cavity (left half of the nasal cavity)

During endoscopic examination of the nasal cavity, in addition to obtaining information about the shape and severity of the curvature of the nasal septum, and the condition of the turbinates, we assessed the three main clinical signs that determine the state of the nasal mucosa (hyperemia, edema, and the amount of discharge in the nasal passages). The examination was carried out before the operation, on the 1st day after the operation (after removal of tampons in the control group), on the 7th day, 1 month after the intervention. Each criterion was assessed by points, where 1 point corresponded to the absence of a sign, 2 points were characterized as a minor manifestation, 3 points - moderate, 4 points indicated severe hyperemia, edema or copious discharge. The highest score corresponded to the worst result and vice versa.

In the presence of subluxation of the quadrangular cartilage or its significant curvature in the anterior section, to assess the effect of this deformity on the

difficulty of nasal breathing during the examination, the Cottle test was used, which consisted in the fact that the cheek on the side of difficult breathing is displaced away from the midline and thus the lateral the cartilage is retracted from the nasal septum. At the same time, the slit-like angle of the nasal valve increases its size, which in turn reduces the degree of difficulty in nasal breathing caused by the curvature of the nasal septum in the anterior section.

In order to study the state of cerebral hemodynamics in deviated nasal septum, an analysis of rheoencephalograms was performed in 60 patients (45 men and 15 women) aged 6 to 47 years. In patients with deformity of the nasal septum, rheoencephalograms and were studied in 2 groups of patients, depending on the etiology of the disease. In the first group (physiological curvature of the nasal septum) there were 42 patients, in the second group (traumatic curvature of the nasal septum) - 18 patients. The control group consisted of 20 healthy individuals without pathology of the nasal cavity. Rheoencephalograms were evaluated qualitatively and quantitatively. Quantitative analysis was carried out using a personal computer and a device of our own design.

Qualitative assessment revealed that prior to surgery, an increase in the tone of cerebral vessels and difficulty in venous outflow in the carotid system in groups 1 and 2 of patients with deviated nasal septum occurred in all the studied patients. Spasm of cerebral vessels was not observed. Almost similar data on the results of REG are observed in the vertebrobasilar system. A decrease in pulse blood filling, respectively, was not observed in both the carotid and vertebrobasilar systems. Quantitative indicators of REG in the carotid system in patients with deviated nasal septum of groups 1 and 2 and in persons of the control group are shown in Table 2.3, and REG indicators in the pool of the vertebrobasilar system and in persons of the control group are shown in Table 1.

Table 1
Quantitative indicators of REG in FM lead in the studied patients with physiological and traumatic curvature of the nasal septum (groups 1 and 2, respectively) and in the control group

REG indicators	Od. measure ments	Side R-rights L-left	REG quantitative indicators values			t		
			1 group (n=42)	2 group (n=18)	Control group (n=20)	I-K	II-K	I-II
			M ± m					
T	s	R L	0,62±0,02* 0,60±0,03	0,61±0,02* 0,59±0,03	0,58±0,001 0,58±0,001	2,0 0,67	1,50 0,34	0,35 0,24
α	s	R L	0,12±0,001* 0,11±0,001	0,11±0,001 0,12±0,001*	0,102±0,001 0,102±0,001	12,73 5,66	5,66 12,73	7,07 7,07
β	s	R L	0,51±0,01 0,52±0,01*	0,52±0,01* 0,54±0,01	0,48±0,02 0,48±0,02	1,34 2,24	1,79 2,68	0,71 0,71
α/T	%	R L	0,26±0,01* 0,28±0,01	0,27±0,01 0,29±0,01*	0,19±0,01 0,19±0,01	4,95 6,36	5,66 7,07	0,71 0,71
PI	Fr.	R L	1,15±0,03 1,17±0,02**	1,08±0,03* 1,12±0,02	1,2±0,03 1,2±0,03	1,89 1,11	3,06 2,49	1,18 1,77
DKI	%	R L	61,25±1,47* * 68,48±2,14*	62,47±2,08* 67,24±1,98	51,40±2,6 51,40±2,6	3,3 5,07	3,33 4,85	0,48 0,43
DKI	%	R	68,11±1,64*	70,38±2,04	59,3±2,8	2,72	3,2	0,87

		L	* 71,23±2,32*	76,37±2,12*	59,3±2,8	3,28	4,86	1,64

* p >0,05 The difference between the indicators in the groups is not statistically significant.
** p<0,05 Statistically significant difference between the indicators in the groups Statistically significant

The table shows that in patients of group 1, that is, with a physiological curvature of the nasal septum, compared with the control group, there is a statistically significant (p<0.01) lengthening of the anacrotic (α) phase of the REG curve. So, in these patients, α was (0.12±0.001) s, and in the control group it was (0.102±0.001) s (t=12.73; p<0.001). This indicates the presence of increased tone of cerebral vessels in these patients. An increase in the tone of the cerebral vessels in patients of group 1 is also confirmed by the indicators of the dicrotic index (DCI). Yes, in patients with deviated septum of the 1st group, the DCT was (61.25±1.47)%, and in the control group - (51.4±2.6)% (t=3.3; p<0, 01), on the left this difference was even more pronounced (t=5.07; p<0.001).

In patients with deviated septum of the 1st group, there was also a difficulty in venous outflow in the carotid system. This is evidenced by the indicators of the diastolic index (DSI). So, so far, in patients of group 1, the case was 68.11±1.64%, and in the control group - 59.3±2.8% (t=2.72; p<0.05). Similar disorders in the vessels of the brain were found in the carotid system in the examined patients of the 1st group in the left hemisphere. Regarding pulse blood filling, it was within the normal range in both groups of patients, as evidenced by the normal values of the rheographic index (RI). The state of the cerebral vessels in the vertebrobasilar basin (Table 2) in patients with physiological and traumatic curvature of the nasal septum (groups 1 and 2, respectively) practically did not differ from the state of the vessels of the carotid system.

Table 2
Quantitative indicators of REG in the OM lead in the studied patients with physiological and traumatic curvature of the nasal septum (groups 1 and 2, respectively) and in the control group

REG indicators	Od. measurements	Side R-rights L-left	REG quantitative indicators values			t		
			1 group (n=42)	2 group (n=18)	Control group (n=20)	I-K	II-K	I-II
			M ± m					
T	s	R L	0,66±0,03 0,63±0,03	0,68±0,02 0,61±0,02	0,58±0,001 0,58±0,001	2,67 1,67	4,99 1,5	0,55 0,55
α	s	R L	0,12±0,001 0,13±0,001	0,12±0,001 0,14±0,001	0,102±0,001 0,102±0,001	12,73 19,8	12,73 26,87	0 0
β	s	R L	0,52±0,01 0,54±0,01	0,55±0,01 0,57±0,01	0,48±0,02 0,48±0,02	1,79 2,68	3,13 4,02	2,12 2,12
α/T	%	R L	0,29±0,01 0,28±0,01	0,28±0,01 0,31±0,01	0,19±0,01 0,19±0,01	7,07 6,36	6,36 8,49	0,71 2,12
PI	Fr. Fr.	R L	1,03±0,02 1,04±0,03	1,01±0,02 1,06±0,02	1,21±0,03 1,21±0,03	4,99 4,01	5,55 4,16	0,71 0,55
DKI	%	R L	68,35±2,17 71,29±2,21	72,91±1,96 74,15±2,12	51,40±2,6 51,40±2,6	5,01 5,83	6,61 6,78	1,56 0,93
DKI	%	R L	72,35±2,31 76,41±2,15	69,98±2,18 72,24±2,19	59,3±2,8 59,3±2,8	3,6 4,85	3,01 3,64	0,75 1,36

* p >0,05 The difference between the indicators in the groups is not statistically significant.
** p<0,05 Statistically significant difference between the indicators in the groups Statistically significant

There was no significant difference (p>0.05) in these indicators in patients with deviated nasal septum of groups 1 and 2. So, our studies have shown that the state of the brain vessels according to the results of REG in patients with nasal septum deviated significantly differs from the control group without nasal septal curvature in both FM and OM leads. At the same time, in patients of both groups, in comparison with the control group, there is an increase in the vascular tone of the brain and difficulty in venous outflow.

We did not find a statistically significant difference between the parameters of cerebral hemodynamics in patients with nasal septal curvature of a physiological nature and traumatic genesis. Based on this, it can be concluded that the main cause of cerebral hemodynamic disorders is not a history of nasal trauma, but difficulty in nasal breathing and reflex changes in the body caused by deformity of the nasal septum.

Conclusion

So, when examining patients with deformity of the nasal septum, it is necessary to take into account both local changes in the nasal cavity and the overall effect of this pathology on the body, in particular, rheoencephalography indicators that characterize the state of the cerebral vessels, in particular, the duration of the anacrotic phase of the REG curve and the magnitude of the dicrotic and diastolic indices, which in such a situation are the most informative.

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