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## THE RELATIONSHIP OF LOGOPEDIC DISORDERS WITH MALOCCLUSIONS

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Insufficient functioning of the speech apparatus leads to insufficient language practice in the most active period of speech development. The experiences associated with the awareness of one's defect and the negative reaction of others to the speech defect negatively affect the child's desire to communicate. This, in turn, affects speech development even more. Malocclusion also adversely affect the appearance and psyche of the patient. The purpose of this study was to identify speech therapy features in orthodontic patients with various types of malocclusion. An analysis of 536 case histories of orthodontic patients aged 5–30 years and 104 of them with speech disorders taking into account age, gender, orthodontic diagnosis, study of speech therapy status with statistical processing of the results was carried out. The most frequent speech therapy problems occurred with class I malocclusion according to Angle. The second and third places in terms of the frequency of impaired function of the articulatory apparatus are occupied by Angle II class and open bite, respectively. In patients with progenia, that is, with class III according to Angle, speech disorders were detected much less often. The obtained data indicate that in the 21st century, logopedic disorders become an important etiological factor in the occurrence of malocclusions. In the vast majority malocclusions are combined with complex dyslalia, which significantly complicate orthodontic treatment and lead to the recurrence of bite anomalies.

**Key words:** ortodontics, teeth, jaws, anomalies, patients, allolalias.

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## ЗВ'ЯЗОК ЛОГОПЕДИЧНИХ ПОРУШЕНЬ ІЗ ЗУБОЩЕЛЕПНИМИ АНОМАЛІЯМИ

Недостатнє функціонування мовленнєвого апарату призводить до недостатньої мовної практики у найактивніший період розвитку мовлення. Переживання, пов'язані з усвідомленням свого дефекту, і негативна реакція оточуючих на мовленнєву ваду негативно впливають на прагнення дитини до спілкування. Це, своєю чергою, ще більше позначається на мовленнєвий розвиток. Зубощелепні аномалії також несприятливо впливають на зовнішній вигляд та психіку пацієнта. Метою даного дослідження було виявити логопедичні особливості у ортодонтичних пацієнтів із різними видами зубощелепних аномалій. Проведено аналіз 536 історій хвороби ортодонтичних пацієнтів віком 5–30 років та 104 з них, які мають логопедичні порушення з урахуванням віку, статі, ортодонтичного діагнозу, вивченням логопедичного статусу зі статистичною обробкою отриманих результатів. Найчастіші логопедичні проблеми мали місце при аномаліях прикусу I класу за Енгле. Друге і третє місце за частотою порушеної функції артикуляційного апарату займають відповідно II клас за Енгле і відкритий прикус. У пацієнтів з прогенією, тобто з III класом за Енгле, порушення мовлення були виявлені значно рідше. Отримані дані свідчать, що у XXI столітті логопедичні порушення стають вагомим етіологічним фактором у виникненні зубощелепних аномалій. У переважній більшості зубощелепні аномалії поєднуються зі складними дислаліями, які суттєво ускладнюють ортодонтичне лікування та призводять до рецидива аномалій прикусу.

**Ключові слова:** ортодонтія, зубощелепні аномалії, порушення мовлення.

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Timely mastery of correct and clear speech is important in forming a full-fledged personality. A person with well-developed speech adapts well in society, and, on the contrary, unclear speech often negatively affects the psychological state of an adult and the development of a child, complicates relationships with others [2, 5, 6, 10]. Insufficient functioning of the speech apparatus leads to insufficient language practice in the most active period of speech development. The experiences associated with the awareness of one's defect and the negative reaction of others to the speech defect negatively affect the child's desire to communicate. This, in turn, affects speech development even more [8]. Malocclusions also adversely affect the appearance and psyche of the patient [3, 4].

Speech is not an innate ability, it is formed gradually as the child grows and develops, and its development depends on many reasons. The correct structure and full functions of the articulation apparatus are a mandatory and necessary factor in the development of speech. The structure and functions of the oral cavity play a special role in the clarity of pronunciation of sounds [7, 9]. In the occurrence of defects in the pronunciation of whistling and hissing sounds, anomalies of occlusion and position of teeth play a significant role. In the 20th century a number of domestic researchers have confirmed that malocclusions dramatically distort pronunciation and make the results of speech therapy ineffective. About 50 years ago, N.A. Omelchenko [2] found that 95.4 % of children with speech disorders had various types of deformations of the maxillofacial apparatus. Particularly important is the fact established by the author that

in 24.3 % of patients with malocclusions, the phonetic speech corresponds to generally accepted phonetic norms, but the articulation arrangement of the tongue is incorrect. Only complex correction of bite and speech disorders in the combined work of a speech therapist and an orthodontist can give a stable positive result of speech therapy and orthodontic treatment [3, 11].

This is confirmed by the work experience of the post-graduate education department of orthodontists of the Poltava State Medical University, where for more than 20 years training hours have been introduced for the in-depth study of logopedic correction in the complex treatment of malocclusions in children and adults. An employee of the department – a speech therapist of the highest category conducts consultations and speech therapy training of orthodontic patients in classes with interns, trainees and foreign clinical residents.

**The purpose** of the study was to identify logopedic features in orthodontic patients with various types of malocclusions.

**Materials and methods.** A medical history analysis of 536 orthodontic patients aged 5–30 and 104 of them with speech disorders, taking into account age, gender, and orthodontic diagnosis, with statistical processing of the results, was carried out. A professional speech therapist stated speech therapy deviations in patients with various types of malocclusions.

The clinical study began with a survey of parents and the child, which was conducted according to a generally accepted scheme: complaints, life and disease history, presence of concomitant pathology.

A dental card was filled out for each subject, where the age, sex, history of the mother's pregnancy, life of the child, accompanying somatic diseases, the presence of ENT pathology, speech disorders, bad children's habits, etc. were noted.

Special attention was paid to the orthodontic status (aesthetic, morphological and functional characteristics of the bite), facial signs of pathology, natural folds, position of the lips were described, and the functions of the oral cavity were evaluated. The patient's type of swallowing and breathing was determined. By taking an anamnesis, the presence of harmful children's habits was established.

Malocclusion was assessed according to Angle's classification (1898). In addition, deep and open bite were distinguished.

The speech therapy examination of sound pronunciation was carried out by a speech therapist according to the classical method [6], additionally an express test was used, which included the study of the pronunciation of sounds.

According to the results of the speech therapy examination and express test, the speech therapist made a diagnosis, which was entered in the patient's card.

Statistical method of processing results. The digital indicators of the research results are given in the international system of measurements (CI) and processed by variational statistics. Reliability assessment (P) was performed using Student's t-test.

**Results of the study and their discussion.** Out of 104 patients aged 5–30 years with malocclusions and speech therapy disorders, 41.3 % were male and 58.7 % were female. In patients under 12 years of age, i.e., during the period of variable bite, malocclusions in combination with speech therapy disorders

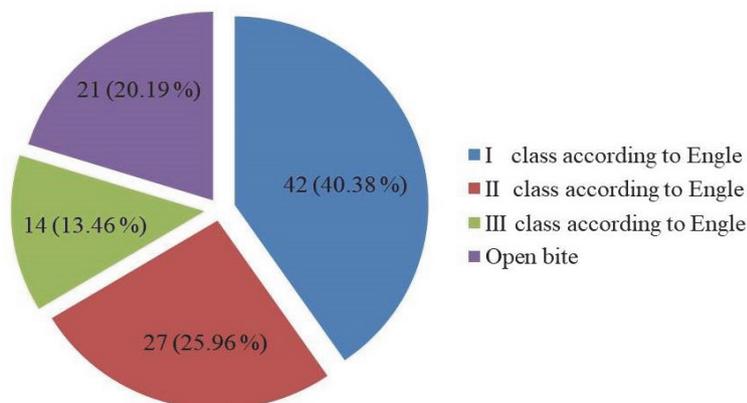


Fig. 1. Type of occlusion in orthodontic patients with speech disorders.

occurred in 61 % of cases. Impaired function of the speech apparatus in orthodontic patients during the period of permanent bite was detected in 43 % of cases, i.e. with age, despite the presence of malocclusion, the functional compensatory capabilities of an adult's body are manifested less due to the leveling of logopedic disorders.

The most frequent speech therapy problems occurred with class I malocclusion according to Angle and accounted for 40.38 % (Fig.1).

The second and third places in terms of frequency of the impaired function of the articulatory apparatus are, respectively, II class according to Angle (25.96 %) and open bite (20.19 %). In patients with progenia, i.e., class III according to Angle, speech disorders were found in 13.46 %.

Conditionally dividing the patients according to the three speech therapy diagnoses (simple dyslalia, complex dyslalia, and erased form of dysarthria), we found that malocclusions are mostly combined with complex dyslalia (Table 1).

Dyslalia is a pronunciation disorder with normal hearing and preserved innervation of the speech apparatus. Dyslalia is observed in 25 % of preschoolers. A distinction is made between mechanical and functional dyslalia.

Table 1

**Speech therapy disorders with anomalies of occlusion**

Speech therapy diagnosis	Speech therapy diagnoses in orthodontic patients							
	I class according to Angle		II class according to Angle		III class according to Angle		Open bite	
	number	%	number	%	number	%	number	%
simple	8	19.05	4	14.81	2	14.29	3	14.29
complex dyslalia	31	73.81	23	85.10	11	78.57	18	85.71
erased form of dysarthria	3	7.14	-	-	1	7.14	-	-
total	42	100	27	100	14	100	21	100

Mechanical (organic) dyslalia, according to speech therapists, is a consequence of organic defects of the peripheral speech apparatus, i.e., organs of articulation (shortened frenulum of the tongue, change in the size of the tongue, malocclusion, change in the structure of the palate, impaired lip function). So, most often – in 85.71 % of cases – complex dyslalia occurs with an open bite. Multiple disorders of the articulatory apparatus, on the one hand, are one of the etiological factors of vertical bite disorders, in particular, clefts in the frontal area. On the other hand, the violation of clarity of the pronunciation of sounds, as a result of the imperfect structure of the articulation apparatus and the functions of the oral cavity, is a significant problem in the process of orthodontic treatment. Uncorrected logopedic disorders in the retention period are a particular danger for the orthodontist, as they are the absolute cause of relapse of orthodontic pathology. Also, often (85.19 %) the diagnosis of “complex dyslalia” is established by a specialist speech therapist in case of prognathism (II class according to Angle). Malocclusions of class III according to Angle are combined with complex dyslalia in 78.57 % of cases.

In patients with various anomalies of the position of individual teeth, complex dyslalia occurs only 4.76 % less often compared to patients with progeny (III class according to Angle). However, in general, almost 3/4 of orthodontic patients with class I malocclusions according to Angle are burdened with speech disorders, designated by speech therapists as “complex dyslalia” (in 73.81 % of cases). In general, there is a reason to say that, on average, with various occlusion disorders, the speech therapy diagnosis of “complex dyslalia” occurs in 80.82 %. The found fact in the most serious way focuses the attention of orthodontists on the need for basic knowledge of speech therapy, on mandatory consultation by a speech therapist of every patient with malocclusion and subsequent correction of speech disorders, as prevention of recurrence of orthodontic pathology.

The diagnosis of “simple dyslalia” occurred on average twice as often (40.61 %) as “complex dyslalia”. Erased forms of dysarthria were found in only 7.14 % and were a reflection of organic disorders of central origin, which belongs to the field of work of speech pathologists. Simple dyslalia, as minor violations of the clarity of pronunciation of sounds in various malocclusions, occurs 5 times less often than complex dyslalia. The difference in the frequency of occurrence of simple dyslalia with different types of malocclusion is statistically unreliable. The speech therapist, engaged in restoring the pronunciation of individual sounds, notes the following violations that are most often found: “sigmatism” – a violation of the pronunciation of whistling and hissing sounds [sh], [tsh], [s]; “rotacism” – a violation of the pronunciation of the sound [r], lambdacism – a violation of the pronunciation of the sound [l]. N. A. Omelchenko wrote 60 years ago that every third patient with malocclusion had indirect pronunciation, namely: impaired pronunciation of the sound [r] in 33.4 %; sound [l] – in 13.5 %; sound [s] – in 27.2 %; sound [sh] – in 13.1 %; other sounds [g, k, h, d, t, f, v] – in 12.8 %.

According to our data, among the various forms of sigmatism, interdental sigmatism was most common, accompanying an open bite in 90.48 % of cases (Table 2), that is, every 9 out of 10 patients with an open bite require long-term speech therapy correction.

With other malocclusions, the pronunciation of hissing and whistling sounds is broken in most cases: with class I – 89.74 %, with class II – 75 %, with class III according to Angle – 84.6 %.

We found lambdacism in 63.46 % of orthodontic patients, most often with prognathia (II class according to Angle) – 71.43 %. With the III class according to Angle, violations of the pronunciation of the letter [l] occur in 69.23 %, with an open bite – in 66.66 %, with anomalies in the position of individual teeth (I class according to Angle) – in 58.97 %.

Rotacism in some cases as a result of abnormal attachment of the frenulum of tongue in various malocclusions is 2.3 times less common than sigmatism and 1.7 times less common than lambdacism. On average, with various occlusion disorders, rotacism is 36.88 %, most often burdening the progeny by 46.15 %. With classes I, II and open bite, a violation of pronunciation of the letter [r] occurs in approximately the same number of cases (35.9 %; 32.14 %; 33.33 %, respectively).

Table 2

Speech disorders in orthodontic patients

Speech disorders in the form of:	I class according to Angle		II class according to Angle		III class according to Angle		Open bite	
		%		%		%		%
Sigmatism	35	89.74	21	75.00	11	84.62	19	90.48
Rotacism	14	35.90	9	32.14	6	46.15	7	33.33
Lambdacism	23	58.97	20	71.43	9	69.23	14	66.66
Disruption of the pronunciation of sounds [t, d]	21	53.85	10	35.71	7	53.85	13	61.90

Disruption of pronunciation of sounds [t], [d], etc. also quite often met with orthodontic pathology – in 51.3 %. Only with an open bite, the probability of relapse due to incorrect articulation of the tongue when pronouncing the sounds [t] and [d] was 61.9 %.

In the detailed analysis of the obtained data, we introduced the coefficient of logopedic pathology of the orthodontic patient [1]. Determination of the degree of severity of speech pathology for patients with malocclusions is calculated by the ratio of the total number of incorrectly pronounced sounds to the total number of patients in the group, according to the formula:

$$Clp = S/n,$$

- Clp - coefficient of logopedic pathology;
- S is the total number of unspoken sounds;
- n is the total number of patients in the group.

As a result of the calculations, it was established that the coefficient of logopedic pathology of an orthodontic patient was the highest with the III class according to Angle and was equal to 2.54, with an open bite – 2.52. In the first and second classes according to Angle, Clp was 2.38 and 2.22, respectively.

When compared with the data of speech therapy assessment of patients with malocclusions 50 years ago (N.A. Omelchenko), a significant increase in speech disorders was found – on average 3–4 times (Fig. 2).

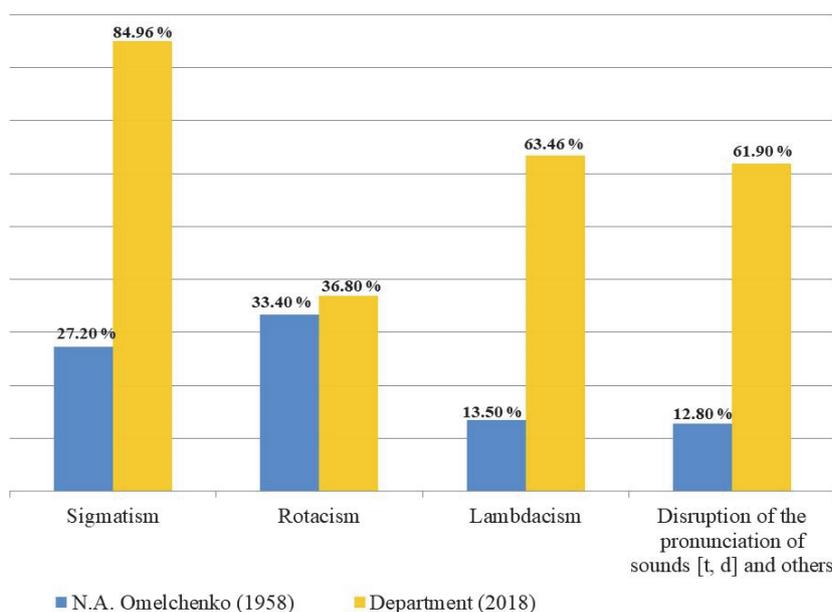


Fig. 2. Comparative characteristics of speech disorders in orthodontic patients

Thus, over the past half century, in the presence of malocclusions, lambdacism has increased by 4.7 times, sigmatism by 3.1 times, and pronunciation disorders [t], [d] and other sounds by 4.8 times.

Malocclusions and dysfunctions of the dentofacial system adaptively influence each other directly and in the form of “feedback” [7, 10]. Our studies confirm the data of other authors that articulation disorders are important local factors in the occurrence of dentofacial anomalies [3, 4].

Anomalies of the articulation apparatus sharply distort pronunciation, and speech therapy work without orthodontic correction turns out to be ineffective. According to some research scientists, only 24.3% of those examined with malocclusion have sound pronunciation that corresponds to generally accepted phonetic norms [8, 9]. Our studies differ from the results of previous authors and showed the absence of speech therapy deviations in more than 30% of cases in the mixed dentition and up to 50 % in the permanent dentition.

### Conclusion

In the 21st century, logopedic disorders become an important etiological factor in the occurrence of malocclusions. In the vast majority, malocclusions are combined with complex dyslalia, which significantly complicate orthodontic treatment and lead to the recurrence of bite anomalies. With various malocclusions, sigmatism occurs in 84.96 %; lambdacism – in 63.46 %; rotatism – in 36.88 %, impaired pronunciation of sounds [t], [d], etc. – in 51.3 %. The highest coefficient of logopedic pathology was found in progeny (III class according to Angle) – 2.54.

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