



ORIGINAL RESEARCH

Study of Changes in the State of Local and General Nonspecific Resistance of the Organism in Patients with Odontogenic Maxillary Sinusitis at Galvanic Pathology in the Oral Cavity

Oleksii O. Tymofieiev^{a,*} & Andrii M. Cherednichenko^b

ABSTRACT

Purpose: To determine the state of local and general nonspecific resistance of the organism in the dynamics of surgical treatment of patients with odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity and to clarify the causes of development of postoperative inflammatory complications.

Methods: We examined 56 patients with odontogenic maxillary sinusitis in the dynamics of surgical treatment (sparing highmorotomy) in the presence of fixed metal dentures in the oral cavity. The age of the patients ranged from 29 to 58 years.

Results: In patients with odontogenic maxillary sinusitis with the presence of oral cavity galvanosis (atypical and typical forms), i.e. in the subjects of the II observation group, gingivitis was detected in almost 100% of cases, which were located in the area of fixed metal dental prostheses. The most pronounced inflammatory phenomena in the oral cavity were in subjects with stamped-soldered metal constructions, as well as in patients with chromium-cobalt (chromium-nickel) metal inclusions or in persons with defects in the metal-protective coating with titanium nitride (areas of damage and abrasion of titanium nitride metal-protective coating).

Conclusions: On the basis of the conducted examination of patients with odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity, it was found that in some forms of this pathology, i.e. galvanosis, there is a decrease in local and general nonspecific resistance of the body, which in turn leads to the development of inflammatory complications in the maxillary soft tissues (in 100%) and in the bone wound of the jaw, i.e. osteomyelitis (in 34.6%).

^a Doctor of Medical Sciences, Professor, Honored Science and Technology Worker of Ukraine, Head of the Maxillofacial Surgery Department, Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine.

^b PhD Researcher, Maxillofacial Surgery Department, Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine.

* **Correspondence:** Department of Maxillofacial Surgery of Shupyk National Healthcare University of Ukraine based on Kyiv City Clinical Hospital No. 12 Communal Non-profit Enterprise, 4A Profesora Pidvysotskoho Street, Kyiv 01103, Ukraine.
E-mail: tymofeev@gmail.com (Oleksii Tymofieiev)
ORCID: <https://orcid.org/0000-0002-3191-6025>

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KEY WORDS

Odontogenic maxillary sinusitis, maxillary sinus, galvanic pathology, galvanism, galvanosis, local nonspecific resistance, general nonspecific resistance, metal inclusions

INTRODUCTION

In recent years, we have noted that the number of patients with odontogenic maxillary sinusitis with galvanic pathology in the oral cavity has increased significantly; the severity of the clinical course of this disease, the number of recurrences and postoperative inflammatory complications has worsened.

It is noted that many of these patients have metal inclusions (fixed dentures, pins, inlays, etc.) of dissimilar metals in their mouths, which were installed many years ago. It is known that all these dissimilar metals and alloys in the human oral cavity cause the appearance of galvanic currents that leads to the development of galvanic pathology. And this, in turn, leads not only to an aggressive course of other somatic diseases in this person, but also to changes in nonspecific and specific resistance of the body, as well as the development of early and late postoperative inflammatory complications that are carried out in a patient with such galvanic pathology.

Therefore, the problem of decreasing local and general nonspecific resistance of the organism in patients with odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity is a difficult task in the treatment and for the prevention of inflammatory complications.

Thus, the treatment of patients with odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity is one of the most difficult and urgent problems in maxillofacial surgery. It is known that galvanic pathology is most often found in middle-aged people, i.e. in the most able-bodied age group of the population. Therefore, effective treatment of this pathology has not only economic but a social aspect as well.

The purpose of this study is to determine the state of local and general nonspecific resistance of the organism in the dynamics of surgical treatment of patients with odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity and to clarify the causes that cause

the development of postoperative inflammatory complications [1–7].

MATERIALS AND METHODS

We examined 56 patients with odontogenic maxillary sinusitis in the dynamics of surgical treatment (sparing highmorotomy) in the presence of fixed metal dentures in the oral cavity. The age of the patients ranged from 29 to 58 years. Depending on the presence or absence of plating pathology in their mouths, the subjects with odontogenic maxillary sinusitis were divided into two observation groups. The first observation group included subjects with galvanism (compensated and decompensated), and the second group included subjects with galvanosis (atypical and typical forms). Since the cause of odontogenic maxillary sinusitis was a tooth (chronic periodontitis, granuloma, radicular cyst, etc.), the removal of the etiologic factor that caused the maxillary sinusitis was performed simultaneously with the highmorotomy performed.

Thus, all patients with odontogenic maxillary sinusitis, depending on their concomitant galvanic pathology, were divided into two studied groups of observation: group I - 30 patients with the presence of galvanism in the oral cavity (compensated and decompensated forms); group II - 26 patients with the presence of galvanosis in the oral cavity (atypical and typical forms). The control group consisted of 28 practically healthy people of the same age as the examined patients.

Samples for the examination of local and general nonspecific resistance of the organism were taken when patients were hospitalized, on the 3-4th day of surgical treatment, as well as when patients were discharged from the hospital. The control group consisted of 28 practically healthy people (without concomitant diseases) of the same age.

To study the local nonspecific resistance of the organism, we determined the functional activity of neutrophils that emigrated into the oral cavity through the cheek mucosa. The material was

selected in accordance with the method proposed by V.D. Dyshlov. To detect alkaline phosphatase in neutrophilic leukocytes we used the most common method of its determination - the method of azo-combination (modified by M.G. Shubich, 1980). The number of emigrated leukocytes and the activity of alkaline phosphatase in them were determined in the prints obtained from the cheek mucosa on the side of odontogenic maxillary sinusitis.

The Kaplow L.S. method was used for objective assessment of cytochemical reaction to alkaline phosphatase. Depending on the enzymatic activity of neutrophils according to their degree of dye staining, they were divided into 5 types: zero (unstained), the first (with weak cytoplasm staining), the second (with moderate cytoplasm staining), the third (with strong cytoplasm staining) and the fourth (with very strong cytoplasm staining and dye diffusion into the nucleus area). 100 neutrophils were counted in the smear and the number of cells belonging to each type was determined. This number was multiplied by the type number and the product was summarized. The sum was expressed in conventional units.

To determine the state of general nonspecific resistance of the organism we studied phagocytic activity of peripheral blood leukocytes according to the method of V.F. Chernushenko and L.S. Kogosova (1978).

To detect the presence of inflammation of the alveolar mucosa, Schiller-Pisarev's test was performed. The mucous membrane of the alveolar processes was treated with Lugol's solution. The intensity of staining was evaluated in points: 1 point – no staining, 2 points – weak staining, 3 points – intense staining. The average value for the upper and lower jaw parameters was calculated.

To objectivize the Schiller-Pisarev test was expressed in numbers (points).

Estimation of Svrakov's iodine number values:

- weakly expressed inflammation process – up to 2.3 points.
- moderately pronounced inflammation process – 2.67-5.0 points.
- intense inflammation process – 5.33-8.0 points.

Contact thermometry was carried out with an electrothermometer TPM-1, which has point thermocouples (sensors) with a measuring range

from 16 to 42°C. The accuracy of registration is 0.2°C. By touching the end section of this sensor to the surface of the mucous membrane of the alveolar process, we determined the temperature in the examined area, i.e. we performed contact thermometry. The time of contact of the sensor with the oral mucosa was 20 seconds, the intervals between repeated examinations were from 2 to 5 seconds. Touching with the sensor was done with approximately the same pressure force. Local temperature was measured three times, and the arithmetic mean was calculated. The temperature was measured on the investigated and healthy side. The basis of contact thermometry is not the measurement of absolute temperatures above the pathologic focus, but the detection of temperature differences in symmetric areas (ΔT). The thermoasymmetry (ΔT) on symmetrical areas, detected in practically healthy people of the same age and sex, served as a control.

All numerical data obtained during the survey were processed by mathematical method with calculation of Student's criterion. The indicators were considered reliable at $p < 0.05$.

RESULTS AND DISCUSSION

The results of examination of patients with odontogenic maxillary sinusitis in the first observation group showed that local nonspecific resistance of the organism in the subjects changed in the dynamics of the treatment as follows (Table 1). At hospitalization of the subjects the number of neutrophils that emigrated through the mucous membrane of the neck unreliably increased in comparison with healthy people up to 20.0 ± 4.7 ($p > 0.05$), that was also noted with the activity of alkaline phosphatase in them, which was 44.2 ± 2.2 units ($p > 0.05$). In 3-4 days after the operation (sparing highmorotomy) the number of neutrophils that emigrated through the cheek mucosa significantly increased compared to healthy people to 33.7 ± 0.9 units ($p < 0.01$), and the activity of alkaline phosphatase in them amounted to 72.9 ± 6.9 units ($p < 0.001$). At the discharge of the patients of the I study group from the hospital, the number of neutrophils that emigrated through the cheek mucosa decreased and already corresponded to the norm – 17.9 ± 0.5 units ($p > 0.05$), which was also noted in relation to the activity of alkaline phosphatase in them – 40.3 ± 1.9 units ($p > 0.05$).

TABLE 1. Cytologic and Cytochemical Indices in the Prints Taken from the Cheek Mucosa of Patients with Odontogenic Maxillary Sinusitis of the First Observation Group in the Dynamics of the Conducted Treatment.

Groups Under Study	Number of Persons	Examination Period	Number of Neutrophils (per 100 cells) that Emigrated Through the Cheek Mucosa	Activity of Alkaline Phosphatase in Neutrophils that Emigrated Through the Mucosa Cheek (in Units)
			M ± m	M ± m
I observation group	30	Hospitalization	20.0 ± 4.7 p > 0.05	44.2 ± 2.2 p > 0.05
		Day 3 to 4	33.7 ± 0.9 p < 0.001 p ₁ < 0.001	72.7 ± 6.9 p < 0.001 p ₁ < 0.001
		Extract	17.9 ± 0.5 p > 0.05 p ₁ < 0.001	40.3 ± 1.9 p > 0.05 p ₁ < 0.001
Control group (healthy people)	28		16.6 ± 1.4	40.9 ± 2.2

Note: p – reliability of differences compared to the control group (healthy people), p₁ – reliability of differences compared to the previous period of examination.

Thus, based on the analysis of the previously conducted examination and the obtained indicators, we concluded that in patients with odontogenic maxillary sinusitis in the presence of galvanism in the oral cavity (compensated and decompensated forms) local nonspecific resistance of the organism at the discharge of patients from the hospital is within normal limits. The increase in the number of neutrophils emigrated through the cheek mucosa, as well as the activity of alkaline phosphatase in them in the dynamics of the surgical treatment (on the 3-4 day) shows the body's response to the surgical intervention (strain of local immunity). At discharge of the patients of the first observation group from the hospital, normalization of local immunity was observed.

The results of examination of patients with odontogenic maxillary sinusitis with the presence of galvanosis (atypical and typical forms) in the oral cavity, i.e. II observation group are presented in [Table 2](#). It was found that in the first days of hospitalization of patients of the II observation group the number of neutrophils that emigrated through the mucous membrane of the neck was unreliably increased compared to healthy people and amounted to 24.4 ± 3.6 ($p > 0.05$) and the activity of alkaline phosphatase in them was also significantly increased to 64.4 ± 5.0 units ($p < 0.001$). In 3-4 days after the operation the number of neutrophils, which emigrated through the cheek mucosa, significantly increased in comparison with healthy people and the previous period of examination and amounted to 47.9 ± 3.3 units ($p < 0.001$), and the activity of alkaline phosphatase

in them was equal to 86.3 ± 11.2 units ($p < 0.001$). At discharge of patients with odontogenic maxillary sinusitis of the II observation group from the hospital the number of neutrophils that emigrated through the cheek mucosa remained at reliably high figures and amounted to 45.7 ± 5.6 units ($p < 0.001$), which was also noted in relation to the activity of alkaline phosphatase in them – 77.4 ± 9.9 units ($p < 0.001$).

Based on the analysis of the data of the obtained laboratory parameters, which are presented in [Table 2](#), we came to the conclusion that in patients with odontogenic maxillary sinusitis in the presence of galvanosis in the oral cavity (atypical and typical forms), i.e. in group II of observation during the surgical treatment the local nonspecific resistance of the organism decreased, which was noted in the increase of the number of neutrophils that emigrated through the cheek mucosa and a high activity of alkaline phosphatase in them on the 3-4 day of the examination. At discharge of the subjects from the hospital these indices did not normalize (remained elevated) and significantly differed from the norm, indicating a significant decrease in local immunity in these subjects. The presence of an increased number of neutrophils emigrating through the cheek mucosa, as well as increased activity of alkaline phosphatase in them at discharge from the hospital indicated not only a decrease in the factors of local nonspecific resistance of the organism in this group of subjects, but also the presence of early inflammatory complications in the maxillary soft tissues around the postoperative wound in most of them.

TABLE 2. Cytologic and Cytochemical Indices in the Prints Taken from the Cheek Mucosa of Patients of the II Observation Group in the Dynamics of the Conducted Treatment.

Groups Under Study	Number of Persons	Examination Period	Number of Neutrophils (per 100 cells) that Emigrated through the Cheek Mucosa	Activity of Alkaline Phosphatase in Neutrophils that Emigrated Through the Mucosa Cheek (in units)
			M ± m	M ± m
II observation group	26	Hospitalization	24.4 ± 3.6 p > 0.05	64.4 ± 5.0 p < 0.001
		Day 3 to 4	47.9 ± 3.3 p < 0.001 p ₁ < 0.001	86.3 ± 11.2 p < 0.001 p ₁ < 0.001
		Extract	45.7 ± 5.6 p < 0.001 p ₁ > 0.05	77.4 ± 9.9 p < 0.001 p ₁ > 0.05
Control group (healthy people)	28		16.8 ± 1.4	40.9 ± 2.2

Note: p – reliability of differences compared to the control group (healthy people), p₁ – reliability of differences compared to the previous period of examination.

The indices of general nonspecific resistance of the organism in patients with odontogenic maxillary sinusitis in I and II observation groups were studied (Table 3). The indices of phagocytic activity of peripheral blood neutrophils in the subjects of the I observation group (in the presence of galvanism in the oral cavity) during hospitalization did not change significantly in comparison with healthy people and were as follows: 72.9 ± 3.0 % and 6.3 ± 0.5 (p > 0.05), at discharge: 73.7 ± 1.8 % and 6.5 ± 0.4 (p > 0.05). Indicators of phagocytic activity of

peripheral blood neutrophils in the subjects of the II observation group (with the presence of galvanosis in the oral cavity) at hospitalization significantly and reliably decreased in comparison with healthy people (control group) and were as follows: 57.0 ± 3.3% (p < 0.001) and 5.4 ± 0.3 (p < 0.02). At discharge of patients of the II observation group from the hospital the indices of phagocytic activity of leukocytes significantly remained reduced and were: 58.2 ± 3.2% (p < 0.001) and 5.6 ± 0.3 (p < 0.05).

TABLE 3. Dynamics of Changes in Phagocytic Activity of Peripheral Blood Leukocytes in Subjects of I and II Observation Groups.

Groups Under Study	Number of Persons	Examination Period	Indicators of Phagocytic Activity of Peripheral Blood Leukocytes	
			Percentage of Phagocytosis	Phagocytic Number
			M ± m	M ± m
Subjects of group I	30	Hospitalization	72.9 ± 3.0 p > 0.05	6.3 ± 0.5 p > 0.05
		Extract	73.7 ± 1.8 p > 0.05	6.5 ± 0.4 p > 0.05
Subjects of group II	26	Hospitalization	57.0 ± 3.3 p < 0.001	5.4 ± 0.3 p < 0.02
		Extract	58.2 ± 3.2 p < 0.001	5.6 ± 0.3 p < 0.05
Healthy people	28		74.5 ± 1.6	6.4 ± 0.

Note: p - reliability of differences compared to healthy people.

To detect inflammatory changes in the peri-mandibular soft tissues of the alveolar processes in the dynamics of treatment, we performed Schiller-Pisarev's test. Svrakov iodine number at hospitalization of maxillary sinusitis patients of the I observation group (patients with galvanism) was 4.4 ± 0.7 points (moderately expressed process of inflammation), and in the II group (patients with galvanism) – 7.5 ± 0.6 points (intensive process of inflammation). On the 3-4 day after the operation in the I group the index decreased and was equal to 3.6 ± 0.4 points (moderately expressed process of inflammation), and in the II group it remained at high figures and amounted to 6.5 ± 0.3 points (intensive process of inflammation). On the 3rd - 4th day after the operation in the I observation group the index was as follows 2.4 ± 0.7 points (weakly expressed process of inflammation), and in the II group it remained on high figures and made 5.9 ± 0.8 points (intensive process of inflammation). On the 7th-9th day of the conducted treatment in the I observation group (patients with galvanism) the index of Schiller-Pisarev's test was 2.1 ± 0.6 points (weakly expressed process of inflammation), and in the II group (patients with galvanosis) it was equal to $5.2 \pm$

0.5 points (intensive process of inflammation).

The indicators of thermoasymmetry of the jaw alveolar mucosa in the area of the postoperative bone wound and the opposite side in the I and II observation groups are presented in Table 4. When the subjects of the I observation group were hospitalized, the thermoasymmetry was significantly increased and amounted to $1.6 \pm 0.1^\circ\text{C}$ ($p < 0.001$), which was also noted in the patients of the II group – $1.7 \pm 0.2^\circ\text{C}$ ($p < 0.001$). In 3-4 days of the conducted treatment thermoasymmetry in the patients of the I group of observation remained significantly increased and amounted to $1.2 \pm 0.2^\circ\text{C}$ ($p < 0.001$), which was also noted in the patients of the II group – $1.5 \pm 0.1^\circ\text{C}$ ($p < 0.01$). In 5-6 days after the operation thermoasymmetry in the patients of the I observation group remained significantly increased and amounted to $0.9 \pm 0.1^\circ\text{C}$ ($p < 0.01$), and in the patients of the II group – $1.3 \pm 0.2^\circ\text{C}$ ($p < 0.001$). In 7-9 days after the operation the thermoasymmetry in patients of the I group of observation normalized and amounted to $0.6 \pm 0.2^\circ\text{C}$ ($p > 0.05$), and in patients of the II group of observation remained significantly increased – $1.0 \pm 0.2^\circ\text{C}$ ($p < 0.01$).

TABLE 4. Indices of Thermoasymmetry of the Mucous Membrane of the Alveolar Process.

Group Under Study	Number of Persons	Examination Day	ΔT - Thermoasymmetry (in $^\circ\text{C}$)	
			$M \pm m$	p
Subjects of group I	26	Hospitalization	1.6 ± 0.1	< 0.001
		Day 3 to 4	1.2 ± 0.2	< 0.001
		Day 5 to 6	0.9 ± 0.1	< 0.01
		Day 7 to 9	0.6 ± 0.2	> 0.05
Subjects of group II	24	Hospitalization	1.7 ± 0.2	< 0.001
		Day 3 to 4	1.5 ± 0.1	< 0.001
		Day 5 to 6	1.3 ± 0.2	< 0.001
		Day 7 to 9	1.0 ± 0.2	< 0.01
Healthy people	28		0.5 ± 0.1	

Note: p - reliability of differences compared to healthy people.

Thus, summarizing the conducted examinations of patients with odontogenic maxillary sinusitis with the presence of galvanism in the oral cavity (compensated and decompensated forms), i.e. in the subjects of the I observation group, we found only gingivitis (in 63.3%) among inflammatory complications, which, in our opinion, were the result of the presence of galvanic pathology – galvanism

in the oral cavity. We did not detect any other complications in the area of peri-mandibular soft tissues of postoperative wounds in this observation group.

In patients with odontogenic maxillary sinusitis with the presence of oral cavity galvanosis (atypical and typical forms), i.e. in the subjects of the II observation group, gingivitis was detected in

almost 100% of cases, which were located in the area of fixed metal dental prostheses. The most pronounced inflammatory phenomena in the oral cavity were in subjects with stamped-soldered metal constructions, as well as in patients with chromium-cobalt (chromium-nickel) metal inclusions or in persons with defects in the metal-protective coating with titanium nitride (areas of damage and abrasion of titanium nitride metal-protective coating with).

In the same observation group, all the operated patients (100%) were found to have such a complication as the presence of inflammatory infiltrate of soft tissues in the area of the postoperative wound. At repeated visits of these patients to the clinic (in 10-15 days) inflammatory infiltration of peri-mandibular tissues slightly decreased but remained in 22 patients (84.6%). In 3-4 weeks after the performed surgery, osteomyelitis process of the maxillary bone developed in 9 patients (34.6%).

Based on our examination, we proved that the use of this laboratory test such as determination of the number of neutrophils emigrated from the oral cavity through the cheek mucosa and the activity of alkaline phosphatase in them is a prognostic test. It was also proved that the use of such an examination method as thermoasymmetry of the mucous membranes of the alveolar process in the dynamics of the postoperative period can also be a prognostic test, which indicates the development of the inflammatory process in the peri-maxillary soft tissues after the operation performed.

CONCLUSIONS

On the basis of the conducted examination of patients with odontogenic maxillary sinusitis in the

presence of galvanic pathology in the oral cavity, it was found that in some forms of this pathology, i.e. galvanosis, there is a decrease in local and general nonspecific resistance of the body, which in turn leads to the development of inflammatory complications in the maxillary soft tissues (in 100%) and in the bone wound of the jaw, i.e. osteomyelitis (in 34.6%).

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ОРИГІНАЛЬНЕ ДОСЛІДЖЕННЯ

UKRAINIAN LANGUAGE

Вивчення змін стану місцевої та загальної неспецифічної резистентності організму у хворих на одонтогенний верхньощелепний синусит при гальванічній патології в порожнині рота

Олексій Тимофєєв^{a,*} та Андрій Чередніченко^b

АНОТАЦІЯ

Мета. Визначити стан місцевої та загальної неспецифічної резистентності організму в динаміці хірургічного лікування хворих на одонтогенний гайморит за наявності гальванічної патології в ротовій порожнині та з'ясувати причини, що зумовлюють розвиток післяопераційних запальних ускладнень.

Матеріали і методи. Обстежено 56 хворих на одонтогенний гайморит в динаміці оперативного лікування (щадна гайморотомія) за наявності в порожнині рота незнімних металевих зубних протезів. Вік хворих коливався від 29 до 58 років.

Результати. У хворих на одонтогенний гайморит з наявністю гальванозу ротової порожнини (атипова та типова форми), тобто у обстежених II групи спостереження, майже у 100% випадків виявляли гінгівіти, які локалізувалися в ділянці фіксованих металевих зубних протезів. Найбільш виражені запальні явища в порожнині рота були у обстежених зі штамповано-паяними металевими конструкціями, а також у хворих з хромокобальтовими (хромонікелевими) металевими включеннями або в осіб з дефектами металозахисного покриття нітриду титану (зони пошкодження та стирання металозахисного покриття нітриду титану).

Висновки. На підставі проведеного обстеження хворих на одонтогенний верхньощелепний гайморит за наявності гальванічної патології в ротовій порожнині встановлено, що при деяких формах цієї патології, тобто гальванозах, спостерігається зниження місцевої та загальної неспецифічної резистентності організму, що в свою чергу призводить до розвитку запальних ускладнень у м'яких тканинах верхньої щелепи (у 100%) та в кістковій рані щелепи, тобто остеомієліту (у 34,6%).

^a Тимофєєв Олексій Олександрович – д. мед. н., професор, заслужений діяч науки і техніки України, завідувач кафедри щелепно-лицевої хірургії Національного університету охорони здоров'я України імені П. Л. Шупика.

^b Чередніченко Андрій Миколайович – аспірант кафедри щелепно-лицевої хірургії Національного університету охорони здоров'я України імені П. Л. Шупика.

* **Кореспонденція:** Department of Maxillofacial Surgery of Shupyk National Healthcare University of Ukraine based on Kyiv City Clinical Hospital No. 12 Communal Non-profit Enterprise, 4A Profesora Pidvysotskoho Street, Kyiv 01103, Ukraine.
E-mail: tymofeev@gmail.com (Oleksii Tymofieiev)
ORCID: <https://orcid.org/0000-0002-3191-6025>

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КЛЮЧОВІ СЛОВА

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