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Clinical and potentiometric examinations of adolescent patients with chronic odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity

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Purpose – to determine the values of potentiometric parameters in the oral cavity present between metal inclusions, as well as between metal inclusions and the mucous membrane of the alveolar ridge in adolescent patients with chronic odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity

Materials and methods. 30 patients with chronic odontogenic maxillary which were subjected to potentiometric and general clinical examination methods. The control group consisted of 22 practically healthy people (without concomitant diseases) of the same age, but without metal inclusions in the oral cavity (amalgam fillings and metal fixed dentures) with obligatory sanitized oral cavity.

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. In 30 patients with chronic odontogenic maxillary sinusitis with the presence of galvanism (compensated and decompensated forms) in the oral cavity, chronic inflammation in the maxillary sinus occurred without pronounced clinical symptoms.

Conclusions. In adolescent patients with chronic odontogenic maxillary sinusitis with the presence of galvanism in the oral cavity (compensated and decompensated forms), chronic inflammation in the maxillary sinus occurred without pronounced clinical symptoms. Exacerbation of the inflammatory process was rare. Among the inflammatory complications in the postoperative period, we found only gingivitis in the oral cavity. We did not observe any other inflammatory complications in the area of the postoperative soft tissues of the postoperative wounds and recurrence of inflammatory disease of the maxillary sinus.

The research was carried out in accordance with the principles of the Helsinki Declaration. The study protocol was approved by the Local Ethics Committee of participating institution. The informed consent of the patient was obtained for conducting the studies.

No conflict of interest was declared by the authors.

Keywords: chronic maxillary sinusitis, maxillary sinus, galvanic pathology, potentiometry, galvanism, galvanosis, metal inclusions.

Клініко-потенціометричні обстеження пацієнтів підліткового віку з хронічним одонтогенним гайморитом за наявності в порожнині рота гальванічної патології

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Мета – визначити величини потенціометричних показників у порожнині рота, наявні між металевими включеннями, а також між металевими включеннями та слизовою оболонкою альвеолярного відростка у пацієнтів підліткового віку з хронічним одонтогенним гайморитом за наявності в порожнині рота гальванічної патології.

Матеріали та методи. Досліджено 30 підлітків із хронічним одонтогенним гайморитом. Контрольну групу становили 22 практично здорові особи (без супутніх захворювань) того ж віку, але без металевих включень у ротовій порожнині (амальгамових пломб і

металевих незнімних зубних протезів) з обов'язковою санацією ротової порожнини. Усі числові дані, отримані під час опитування, оброблено математичним методом з розрахунком критерію Стьюдента. Показники прийнято достовірними за p<0,05.
Результати. У 30 хворих на хронічний одонтогенний гайморит із наявністю в порожнині рота гальванізму (компенсованої та декомпенсованої форм) хронічне запалення у верхньощелепній пазусі перебігало без яскраво вираженої клінічної симптоматики.
Висновки. У хворих підліткового віку на хронічний одонтогенний гайморит із наявністю в порожнині рота гальванізму (компенсованої та декомпенсованої форм) хронічне запалення у верхньощелепній пазусі перебігало без яскраво вираженої клінічної симптоматики. З-поміж запальних ускладнень у післяопераційному періоді виявлено в порожнині рота тільки гінгівіти.
Дослідження виконано відповідно до принципів Гельсінської декларації. Протокол дослідження ухвалено Локальним етичним комітетом зазначеної в роботі установи. На проведення досліджень отримано інформовану згоду пацієнтів.
Автори заявляють про відсутність конфлікту інтересів.

Ключові слова: хронічний гайморит, верхньощелепна пазуха, гальванічна патологія, потенціометрія, гальванізм, гальваноз, металеві включення.

In order to treat and replace defects in particular teeth, dentistry uses amalgam fillings, post-and-pin teeth, dentures using base metal groups and their alloys (Fig. 1). The most commonly used alloys are those based on base metals: stainless steel, cobalt-chromium alloy, nickel-chromium and cobalt-chromium-molybdenum alloys, etc.

According to the literature in galvanic pathology (galvanism), inflammatory complications are observed after any oral surgery [1–5].

Purpose – to determine the values of potentiometric parameters in the oral cavity present between metal inclusions, as well as between metal inclusions and the mucous membrane of the alveolar ridge in adolescent patients with chronic odontogenic maxillary sinusitis in the presence of galvanic pathology in the oral cavity.

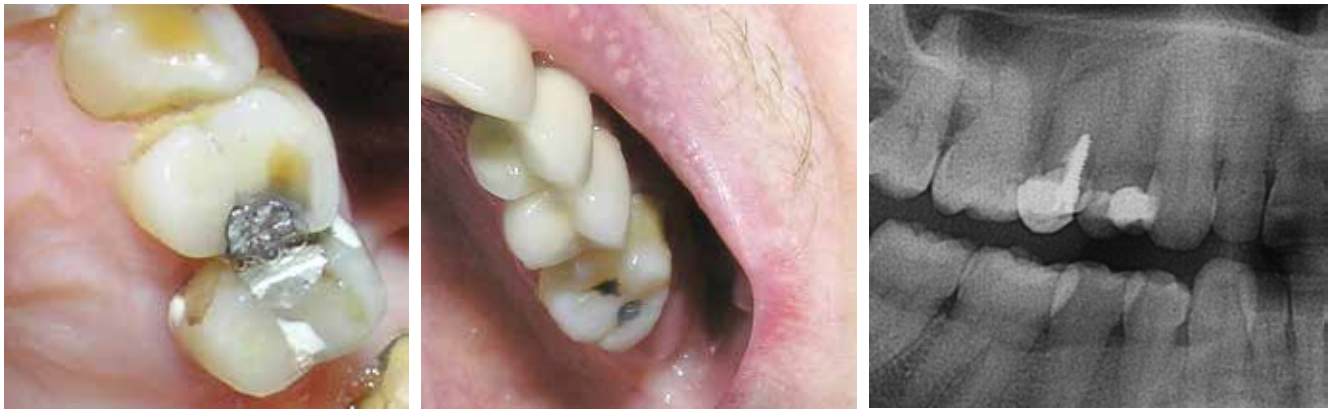
Materials and methods of the research

We examined 30 patients with chronic odontogenic maxillary sinusitis who had fixed metal dentures in the oral cavity. Of 30 patients with galvanic pathology in the oral cavity in the form of galvanism (compensated and decompensated form). The control group consisted of 22 practically healthy people (without concomitant diseases) of the same age, but without metal inclusions in the oral cavity (amalgam fillings and metal fixed dentures) with obligatory sanitized oral cavity.

All patients underwent general clinical examination, which included examination, palpation, percussion of teeth, radiography, general blood analysis and other methods. To determine the pH of oral fluid we used a standard pH-meter.

For the potentiometric method of examination we used an automatic digital potentiometer Pitterling Electronic (Fig. 2, 3). The device automatically determines the potential difference in the range from 0 to 999 mV, current strength in the range from 0 to 99 μA and electrical conductivity of oral fluid in the oral cavity in microsiemens (μSm). All subjects were measured potentiometric parameters in the following areas (points) of the oral cavity: between metal inclusions (M-M), as well as between metal inclusions and the mucous membrane of the alveolar processes of the jaws (M-SOAO).

Potentiometric indices in each subject were measured twice (during their hospitalization and after surgical intervention). Repeated measurement of potentiometric indices was justified by the fact that when galvanic pathology was detected in a patient with chronic maxillary



a *b* *c*

Fig. 1. Amalgam fillings (a, b) and post tooth (c) in adolescent patients with chronic odontogenic maxillary sinusitis, which are the cause of galvanic pathology

sinusitis, it was necessary to remove metal inclusions that were the cause of the development of this pathology.

The research was carried out in accordance with the principles of the Helsinki Declaration. The study protocol was approved by the Local Ethics Committee of participating institution. The informed consent of the patient was obtained for conducting the studies.

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 of the research and discussion

The analysis of clinical and potentiometric 30 adolescent patients with chronic odontogenic maxillary sinusitis with the presence of galvanism (compensated and decompensated forms) in the oral cavity was carried out.

The patients had the following complaints: unilateral headaches were detected in 12 (40.0%) patients, nasal congestion on the side of maxillary sinusitis – in 18 (60.0%) patients, nasal breathing disorders – in 18 (60.0%) patients, decreased sense of smell – in 22 (73.3%) patients, decreased sense of smell – in 22 (73.3%) people, in the history of periodic 2 or more times) appearance of facial swelling, i.e. presence of exacerbations of chronic inflammatory process in the maxillary sinus – in 1 (3.3%) person. When patients were hospitalized, swelling in the suborbital and cheek areas was present in 4 (13.3%) people, and discharge of stinky mucus from the corresponding half of the nose – in 21 (70.0%) people.

During visual examination of the patients, 8 (26.7%) patients (had facial asymmetry in the suborbital and cheek areas on the affected side. Skin hyperemia was absent in all subjects, the skin was collected in a fold and opening of the mouth was not difficult. Of the 30 subjects, the causative teeth had been extracted in 10 (33.3%) before their hospitalization. In 9 out of 10 (90.0%) of them, an oro-antral union with the maxillary sinus appeared after the extraction of the causative teeth, and 1 (10.0%) had an oro-antral (primary) fistula (this patient applied for hospitalization three weeks after the extraction of the causative tooth). In the area of the cavities of previously extracted causative teeth in 10 (33.3%) people, the mucosa was gaping and there was a communication with the maxillary sinus, from which purulent contents were released. The mucous membrane of the alveolar process on the maxillary side was edematous and hyperemic in all (100%) patients.

On radiographs and computed tomograms of the nasal cavities in observation group of patients there was darkening of the maxillary sinuses in all subjects, which was limited in nature with predominant lesion of its inferior and external

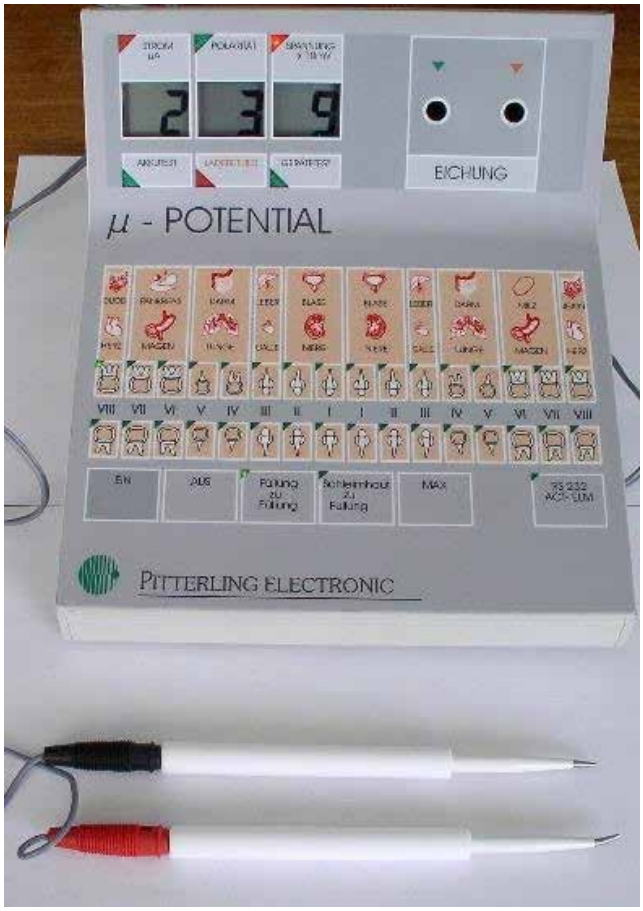


Fig. 2. External view of the automatic digital potentiometer Pitterling Electronic

Fig. 3. Potentiometric indices of healthy people (indicated by arrows: 1 – current strength, 2 – electrical conductivity of oral fluid; 3 – potential difference, the last index should be multiplied by 10)

walls. The predominant lesion of the lower and external walls is explained by the localization of odontogenic focus of infection – the source of chronic maxillary sinusitis.

Out of 30 patients with chronic odontogenic maxillary sinusitis the foci of infection, which in observation group were the etiologic factor of inflammation development in the chronic inflammation in the maxillary

Fig. 4. Gingivitis seen in the postoperative period

sinus, were as follows: chronic granulomatous periodontitis in 7 (23.3%) patients, chronic granulomatous periodontitis in 18 (60.0%) patients, radicular cysts in 5 (16.7%) patients.

Analysis of laboratory examination of patients. During the examination of oral fluid pH in the patients of the observation group this index was 6.7±0.2 units (with fluctuations from 6.2 to 7.8). In the control group (22 practically healthy people) the oral fluid pH values amounted to 7.2±0.2 units (with fluctuations from 6.1 to 8.2). Comparing the pH changes in the subjects of the observation group with the control group, it should be noted that in this group of observation we did not find significant changes in pH (p>0.05) compared to the norm.

Potentiometric indices of healthy people (without the presence of metal inclusions in the oral cavity) were as follows: potential difference – 32.6±2.9 mV; current strength – 2.9±0.2 μA; electrical conductivity of oral fluid – 2.7±0.2 μSm.

Analyzing the obtained potentiometric indices between metal inclusions (M-M) during hospitalization of patients we found the following values: potential difference was 71.5±5.5 mV; current strength – 7.6±0.8 μA; electrical conductivity of oral fluid – 9.9±1.2 μSm. The analysis of potentiometric indices between metal and alveolar mucosa (M-SOAO) during hospitalization was as follows: potential difference – 65.3±4.4 mV; current strength – 6.5±0.6 μA; electrical conductivity of oral fluid – 8.5±0.9 μSm. All these indices were significantly higher than normal (p<0.001) compared to healthy subjects. After the operation (sparing maxillary sinus surgery with local plasty of oro-antral communication) potentiometric parameters between metals (M-M) changed unreliably (p>0,05) and amounted to: potential difference – 77.9±6.7 mV; current strength – 8.8±1.0 μA; electrical conductivity of oral fluid – 10.5±1.3 μSm. Potentiometric parameters between the metal and the mucous membrane of the alveolar outgrowth (M-SOAO) after the operation also changed unreliably (p>0,05): potential difference was 53.8±2.8 mV; current strength – 5.7±0.5 μA; electrical conductivity of the oral fluid – 7.7±0.8 μSm. Thus, all previously listed potentiometric parameters before and after the performed operation did not differ significantly (p>0.05).

According to the obtained potentiometry data, it should be noted that in patients with chronic odontogenic maxillary sinusitis, in whom galvanism (compensated and decompensated forms) was detected in the oral cavity, i.e. in the subjects of the observation group, the clinical symptomatology of inflammation in the maxillary sinus (chronic maxillary sinusitis) was not pronounced and without aggressive course.

During the first 3–4 days after the operation in 7 (23.3%) out of 30 patients of this group the postoperative period passed with high temperature (from 37.7° to 39.0° C).

Clinically, postoperative edema of soft tissues (subglabellar, cheek, zygomatic areas and upper lip) of the middle zone of the face in these terms was low expressed, which was accompanied by its insignificant asymmetry. Skin hyperemia was absent in all operated patients. In 16 (53.3%) out of 30 patients after the operation, within 5–6 days, there was pain of medium severity in the area of the maxillary bone, as well as in the area of the postoperative wound along the transitional fold and the alveolar process, as well as there was a slight discharge of blood from the corresponding half of the nose. The general condition of all patients in this group in the postoperative period was satisfactory. Three (10.0%) patients had weakness, 2 (6.7%) patients – malaise, and 3 (10.0%) patients – dizziness.

During 3–4 days after the operation, the mucosa in the area of the postoperative wound (along the transitional fold and alveolar process) was moderately edematous and slightly hyperemic in all subjects; during this period, mucosal infiltration was poorly expressed and superficial. On the 6^{th}-7^{th} day after the operation the hyperemia of the edges of postoperative wounds was absent and there was no infiltration of its walls. Only in 4 (13.3%) patients on the 2^{nd}-4^{th} day after the operation the walls of the postoperative wound were slightly covered with fibrin plaque, but on the 5^{th}-6^{th} day the fibrin plaque on the wound walls was absent in all the patients. The sutures after the operation were fixed in all patients.

As a result, summarizing the previously conducted examination of patients with chronic odontogenic maxillary sinusitis with the presence of galvanism in the oral cavity (compensated and decompensated forms), i.e. the subjects of the observation group, chronic in-

flammation in the maxillary sinus proceeded without pronounced clinical symptoms. The exacerbation of the inflammatory process was rare – in 1 (3.3%) subject. Among the inflammatory complications in the postoperative period we found only gingivitis in the oral cavity in 19 (63.3%) people, which were located in the area of existing fixed metal dentures, which in our opinion is the result of galvanic pathology – galvanism in the oral cavity of these subjects (Fig. 4).

We did not observe any other inflammatory complications in the area of peri-mandibular soft tissues of postoperative wounds and recurrences of inflammatory disease of the maxillary sinus in this observation group.

Conclusions

In adolescent patients with chronic odontogenic maxillary sinusitis with the presence of galvanism in the oral cavity (compensated and decompensated forms), chronic inflammation in the maxillary sinus occurred without pronounced clinical symptoms. Exacerbation of the inflammatory process was rare. Among the inflammatory complications in the postoperative period, we found only gingivitis in the oral cavity. We did not observe any other inflammatory complications in the area of the postoperative soft tissues of the postoperative wounds and recurrence of inflammatory disease of the maxillary sinus.

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