



ORIGINAL

Modern Methods of Patients' Examination with Traumatic Jaw Injuries

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ABSTRACT

Purpose: To determine the possibility of using cytological methods for examining prints taken from the mucous membrane of the alveolar process of a jaw in the area of the bone injury, to determine the effectiveness of the treatment of patients with jaw fractures.

Materials and Methods: We examined 43 patients with jaw fractures. All patients were divided into the following observation groups: group 1 – 19 patients with fractures of the maxilla; group 2 – 24 patients with fractures of the mandible. As a control group served 27 practically healthy people.

Results: For patients with post-traumatic complications, it was characteristic that on the 3-4th day after the injury (with early purulent complications) there was an increase in the studied parameters by 1.5-2 times, and similarly on the 7-8th day of treatment – with late purulent complications (post-traumatic osteomyelitis). The normalization of these indicators in patients with developed complications occurred only after the complete elimination of inflammatory phenomena both in the bone tissue and soft tissues.

Conclusions: The study of cytological and cytochemical parameters in prints taken from the mucous membrane of the alveolar process in the area of the fracture allows both to determine the effectiveness of the treatment and to predict the course of the disease.

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INTRODUCTION

Currently, much attention is paid to the search for affordable and objective methods of monitoring the effectiveness of medical and preventive measures. It is known that the assessment of general clinical blood tests (formulas, leukocyte number, erythrocyte sedimentation rate [ESR], indices, etc.) does not always reliably reflect the effectiveness of the measures taken in the early stages. Therefore, the problem is urgent of finding affordable, but at the same time, objective examination methods that could allow to determine reliably the effectiveness of the treatment being carried out and to correct it in the early stages for the secondary prevention of post-traumatic inflammatory complications.¹⁻⁵

The purpose of this study is to determine the possibility of using cytological methods for examining prints taken from the mucous membrane of the alveolar process of a jaw in the area of the bone injury, and besides to determine the effectiveness of the treatment of patients with jaw fractures.

MATERIALS AND METHODS

We examined 43 patients with jaw fractures. All patients were divided into the following observation groups: group 1 – 19 patients with fractures of the maxilla; group 2 – 24 patients with fractures of the mandible. 27 practically healthy people served as control group.

During hospitalization and in the dynamics of the treatment, a general clinical examination of patients was carried out, which included: clarification of complaints, collection of the anamnesis, examination, palpation, X-ray of the jaws (if necessary, computed tomography), contact thermometry, general blood and urine analysis, determination of the leukocyte formula. Of the special examination methods, we used the determination of the number of neutrophilic leukocytes and the content of the enzyme in them – alkaline phosphatase (per 100 counted cells) in prints made from the mucous membrane of the alveolar process in the area of the pathological focus.

The indicators obtained during cytological and cytochemical examination methods were processed by the method of variation statistics with the calculation of Student's *t*-test. 27 practically healthy people with a sanitized oral cavity served as control

group. Differences were considered as significant at $P < 0.05$.

RESULTS AND DISCUSSION

Examination of 19 patients with fractures of the maxilla (first group) allowed us to establish that in the prints made on the mucous membrane of the alveolar process from the fracture side a significant increase takes place both in the number of neutrophils – 26.4 ± 0.6 pieces (pcs) ($P < 0.001$), and in the activity of alkaline phosphatase in them – 76.7 ± 1.6 conventional units ($P < 0.001$). On the 3-4th day after hospitalization of the injured, on the maxilla injury side, the number of neutrophilic leukocytes that emigrated through the mucous membrane significantly increased to 42.7 ± 1.2 pcs ($P < 0.001$), which was also noted with the activity of alkaline phosphatase – 118.3 ± 2.7 conventional units ($P < 0.001$). On the 7-8th day, a slight decrease both in the number of emigrated neutrophils was revealed – to 33.0 ± 1.1 pcs ($P < 0.001$) and in the activity of alkaline phosphatase in them – up to 94.5 ± 3.1 conventional units ($P < 0.001$). When discharging the patients from the hospital after the completion of their treatment, we found that there was a significant decrease (in 2 times) in the studied analyzes, but they remained significantly increased compared to the norm: the number of neutrophils was 17.2 ± 0.9 pcs ($P < 0.001$) and alkaline phosphatase activity – 43.1 ± 2.0 conventional units ($P < 0.001$). The normalization of these indicators was noted only 2-3 days after the removal of the arch bars. We found that with a smooth course of the post-traumatic period, a sharp increase in the studied indicators was noted on 3-4 day, but no more than 1.5-1.7 times (compared to the previous period), and on the next day (on 7-8 day and beyond) – their gradual decrease. If the dynamic of changes in these indicators was disturbed, then this circumstance indicated the development of post-traumatic inflammatory complications.

Examining 24 patients with mandibular fractures (second observation group), we found that they had a significant increase in these indicators during hospitalization: the number of neutrophils was 27.4 ± 1.0 pcs ($P < 0.001$) and the activity of alkaline phosphatase in them – 81.8 ± 2.0 conventional units ($P < 0.001$). It should be noted that for this group we selected patients who were hospitalized in the

first few days after the injury. After the reposition and fixation of the fragments of the mandible with intermaxillary fixation using arch bars and rubber traction, these indicators increased being on the 3-4th day of treatment: the number of neutrophils that emigrated through the mucous membrane of the alveolar ridge at the bone injury area – 42.0 ± 1.4 pcs ($P < 0.001$) and the activity of alkaline phosphatase in them – 121.4 ± 3.7 conventional units ($P < 0.001$). On the 7-8th day of the treatment, the number of neutrophils that emigrated through the mucous membrane slightly decreased to 34.7 ± 1.3 pcs ($P < 0.001$), and alkaline phosphatase – to 112.3 ± 2.7 conventional units ($P < 0.001$).

Although when the patients have been discharged from the hospital, i.e., on the 22-26th day of the treatment (depending on the location of the fracture and other factors), we revealed a significant decrease in the above mentioned indicators, however, we did not notice their normalization (the number of neutrophils – 18.2 ± 1.3 pcs, $P < 0.001$ and activity of alkaline phosphatase in them – 41.4 ± 2.1 conventional units, $P < 0.001$). The normalization of the studied parameters was observed on 6-7 day after the removal of the arch bars. We found that a certain dynamic of changes in the number of neutrophils and the content of alkaline phosphatase in them was characteristic both for patients with a favorable course of the postoperative period and for patients with the development of post-traumatic complications. The latter was characterized by the fact that on the 3-4th day after the injury (with early purulent complications) there was an increase in the studied parameters by 1.5-2 times, and similarly on the 7-8th day of treatment – with late purulent complications (post-traumatic osteomyelitis).^{1,6-11}

The normalization of these indicators in patients with developed complications occurred only after the complete elimination of inflammatory phenomena in the bone tissue and peri-maxillary soft tissues. For patients with post-traumatic complications, it was characteristic that on the 3-4th day after the injury (with early purulent complications) there was an increase in the studied parameters by 1.5-2 times, and similarly on the 7-8th day of treatment – with late purulent complications (post-traumatic osteomyelitis). The normalization of these indicators in patients with developed complications occurred only after complete elimination of inflammatory phenomena both in the bone tissue and soft tissues.

CONCLUSIONS

Based on the examination of patients with jaw fractures, we found that cytological and cytochemical indicators are objective criteria for the effectiveness of the treatment and the prognosis of its course. With a smooth course of the post-traumatic period in patients with jaw fractures, there is a decrease and normalization of cytological and cytochemical parameters of neutrophils that have emigrated through the mucous membrane of the alveolar process in the area of the injured bone. In case of inflammatory complications, there is a characteristic dynamic of changes in these indicators, which makes possible in the early stages to recognize the development of purulent complications in the bone and surrounding soft tissues and to correct the treatment.

The study of cytological and cytochemical parameters in prints taken from the mucous membrane of the alveolar process in the area of the fracture allows determining the effectiveness of the treatment and predicting the course of the disease.

AUTHOR CONTRIBUTION

Conceptualization: Tymofieiev OO, Havlytiuk DS. Data and interpretation acquisition: Tymofieiev OO, Ripa VM, Havlytiuk DS, Sokoliuk MA, Kolisnichenko LA. Drafting of the manuscript: Havlytiuk DS, Ripa VM. Critical revision of the manuscript: Tymofieiev OO. Approval of the final version of the manuscript: all authors.

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