UDC 616.716.4-001-06-036.1-092-085 https://doi.org/10.26641/2307-0404.2019.1.162299

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DELAYED UNION OF MANDIBLE: ANALYSIS OF GENERAL AND LOCAL FACTORS

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Цитування: Медичні перспективи. 2019. Т. 24, № 1. С. 50-61
Cited: Medicni perspektivi. 2019;24(1):50-61

Key words: *mandibular fracture, delayed union, risk factors, prognosis*
Ключові слова: *перелом нижньої щелепи, сповільнена консолідація, фактори ризику, прогнозування*
Ключевые слова: *перелом нижней челюсти, замедленная консолидация, факторы риска, прогнозирование*

Abstract. Delayed union of mandible: analysis of general and local factors. Idashkina N.G. *Objective – to evaluate the etiological significance of local and general factors in the occurrence of delayed union of bone tissue in patients with mandibular fractures. To determine the role of local and general factors in the occurrence of delayed union a personalized questionnaire was developed and filled in by 74 patients with fragment mobility that persisted 1 month after reposition and fixation of mandibular fracture. Thus, local and general factors that most closely correlate with the development of this complication were identified. The obtained data were compared with the results of a retrospective analysis of case histories of patients with mandibular fractures over a five-year period. The presence of a general somatic pathology, head injury and polytrauma, as well as such aggravating factors as alcohol and drug abuse should be considered as the general risk factors for the development of the delayed union of mandibular fractures. Among the local factors inflammation in the area of mandibular fracture takes the first place, the development of which is provoked by untimely treatment of patients, compound comminuted fractures, traumatic surgical interventions, etc. Among patients with delayed union of mandibular fractures, 86.5% received antibiotics for more than ten days. The risk group should also include patients with mandibular fractures of a young age (from 18 to 25 years) and those over 45 years. The problem areas for consolidation are mental part (31.1%) and the angle of the jaw (25.7%).*

Реферат. Замедленная консолидация нижней челюсти: анализ общих и местных факторов. Идашкина Н.Г. *Цель работы – оценить этиологическую значимость местных и общих факторов в возникновении замедленной консолидации костной ткани у больных с ПНЧ. Для определения роли местных и общих факторов в возникновении замедленной консолидации был разработан персонифицированный опросник, который заполнили 74 пациента с подвижностью отломков, сохраняющейся через 1 месяц после репозиции и фиксации ПНЧ. Таким образом, были выделены местные и общие факторы, максимально коррелирующие с развитием этого осложнения. Полученные данные были сопоставлены с результатами ретроспективного анализа историй болезней пациентов с ПНЧ за пятилетний период. Общими факторами риска развития ЗК ПНЧ следует считать наличие у пациентов общей соматической патологии, ЧМТ и политравмы, а также таких отягчающих факторов, как злоупотребление алкоголем и наркотическими веществами. Среди местных факторов первое место занимает воспаление в области ПНЧ, развитие которого провоцируют несвоевременное обращение пациентов, сложные оскольчатые переломы, травматические оперативные вмешательства и др. Среди пациентов с ЗК ПНЧ 86,5% получали антибиотики более десяти дней. К группе риска следует также отнести пациентов с ПНЧ молодого возраста (от 18 до 25 лет) и старше 45 лет. Проблемными зонами для консолидации является ментальный отдел (31,1%) и угол челюсти (25,7%).*

The most common noninflammatory complication of mandibular fractures (MF) is the delayed union (DU) of the bone fragements, which is observed in 8.7% of cases. Against the background of ever-increasing injuries in the maxillofacial area (MFA), the figures relating to the total number of patients with problem union is quite impressive [17].

Most authors separate local and general factors that lead to a delayed union.

Common factors are: the diseases of endocrine system, liver diseases, connective tissue diseases, pulmonary diseases, atherosclerosis, etc. [16].

It has been proved that in patients with polytrauma in the presence of moderate and severe

craniocerebral trauma, the DU develops in 46% of cases [10].

In the studies by Johanna Snäll, Satu Apajalahti and co-authors [18] 37 cases of DU in patients with MF were analyzed and it was found that its development is significantly influenced by an infectious postoperative process (p=0.027). The authors found a direct dependence as for the occurrence of DU in the operated patients with infected MFs on the background of a short-term course of dexamethasone use (p=0.019).

Also, there was established a high predictive value for the development of inflammatory complications and subsequent non-union, which depends on the patient's age. The authors pay attention to the need for pre- and postoperative anti-inflammatory therapy and mandatory antibiotics use in elderly patients to reduce the risk of post-operative complications.

By analyzing age and gender distribution of patients with union problems, attention is given to the contradictions and heterogeneity of available information. Delayed union in elderly patients who suffer from osteoporosis has been proven in numerous scientific studies [7]. However, subsequently data that were not explained by the previously proven correlation began to appear.

However, V.G. Klymovytsky and V.Yu. Chernish [5] paid attention to a high percentage of DU among young victims, in whom, according to traditional assumptions, indicators should be more favorable. Contradictions as for the impact on reparative ostogenesis, which depends on the terms of medical care delivery are absent.

Most authors insist on that repositioning and fixation should be carried out within 24 hours after the injury, and as the term grows, the risk for development of union complications increases [20].

With regard to the local conditions for DU development, there are some differences in the understanding of the priority of disease factors.

More often, this type of complication is observed in localization of the fracture in the mandibular body area, as well as in patients with secondary adentia and multiple fractures [19]. In studies of Li Z. et al. [13], it has been shown that in patients with diagnosed mandibular fractures in several areas, delayed union of more than one fracture occurred.

It is known that problems of union are observed much more often than malunion. According to most researchers, even 95-96% of failures in the fracture union are due to the local factors, namely, disorders of consolidation in the affected area [9].

Of course, the complexity and severity of injury plays a significant role in delayed union. In patients with open fractures, the highest risk of developing DU occurs in the presence of significant damage to the soft tissues (wounds greater than 3 cm) and accounts for up to 40% of cases [4].

It must be taken as proved that in some cases the severity of injury resulted in complication, despite all the efforts made during treatment, in other cases at various stages, made errors led to a delayed union [6].

It should be noted that the authors of numerous studies indicate precisely the traumatic nature of surgical intervention as the main factor in the occurrence of DU of fragments [2].

However, according to numerous studies aimed at establishing correlation of the DU and treatment modality, it should be noted that there is no single view on the state of the problem.

However, most authors point at the absense of correlation between the method of fixing fragments and DU [8].

Complete reposition and good fixation throughout the treatment period is an integral part in preventing the development of complications of union, but it should be noted that even in cases of satisfactory apposition and sufficient fixation in patients with MF, complications associated with malunion often develop [3].

However, the fact pvoved by Guerrissi J.O. [15], concerning the possibility of uncomplicated "spontaneous" union of jaw fragments is worthy. The author presented his own analysis of treatment results of 23 patients with MF without displacement of fragments, without any fixation whatsoever, but the union occurred without any complications and in normal terms.

According to some authors, an important local factor in disorders of the mandible union is the presense of teeth in the fracture gap [12]. However, other researchers did not determine the direct dependence of DU on the presence of teeth in the fracture gap [11].

Quite often, during such an analysis, the authors point to the presence of several factors that together affect the repair or aggravation of each other. Adell R. and Eriksson B. [14], analyzing the treatment data of 401 patients with MF, found absence of union in 38 patients (9.5%) in terms of more than 50 days. Absense of union in some cases was determined even on the day 116. According to the authors, the greatest importance in the development of this complication is due to alcoholism and psychosocial status of patients and local processes in the periapical tissues.

A number of authors point to the infectious-inflammatory process as a pathomorphologic factor of union disorders. However, the majority of authors

separate the problematic union against traumatic osteomyelitis of the jaw and the true delayed union. According to G.R. Bakhteyeva [1], in cases of MF accompanied by complications in the form of suppuration of bone wound or soft tissues, post-traumatic osteomyelitis developed in 15% of patients, DU was observed in 17% of cases, false joint - in 9%, while in patients with uncomplicated fractures – delyed union was detected in 2.5%.

In view of the above it should be emphasized that during diagnosis in most health facilities, all cases of delayed union against inflammatory processes are reflected neither in the medical records nor in the statistics of diseases. That is, such patients are predominantly diagnosed with post-traumatic osteomyelitis, which does not find further clinical and radiological confirmation.

Thus, there is an urgent need for a comprehensive analysis of the role of local and general factors in the development of DUMF for the further development of methods for prediction, prevention and correction of disorders of reparative osteogenesis.

The purpose of the work is to evaluate the etiological significance of local and general factors in the development of DU of osseous tissue in patients with MF.

MATERIALS AND METHODS OF RESEARCH

Clinical material is based on the study of 74 patients with the problem of DU of MF which was selected over the period from 2010 to 2016 at the admission unit of the dental department of the outpatient clinic of SE "DMA HM of Ukraine". The patients were referred from the local clinics after the course of MF treatment, that is, one month after the repositioning and fixation of the fragments carried out in the inpatient department, but with the preseerved mobility of the fragments in the fracture zone. In order to determine the role of local and general factors in the development of the DU, there was developed a personalized questionnaire, which reflected the probable factors established by analyzing numerous literary sources. We tried to reflect as much as possible all known predictors of the complications of reparative osteogenesis, which can be detected at the stage of history taking. This attitude gave a chance to detail the features of general and local state of all 74 patients with DU of MF. The questionnaire was filled in during the interview with the patient and by the data of the accompanying medical documentation (discharge summary, outpatient card of the patient, etc.). We compared the obtained data with statistical findings from a retrospective analysis of case histories over a five-year period.

During the research, the methods of descriptive statistics were used to evaluate and analyze the results obtained.

For correlation analysis, the rank method was used, correlation relationship estimate was based on the correlation coefficient, the error was calculated using the Spearman method, the reliability was determined according to the table of the standard correlation coefficients and it was considered reliable if, for a certain number of degrees of freedom (n-2), it was equal to or was higher than the table one, which corresponded to the degree of error-free prediction of $p \geq 95\%$.

The examination of all patients was in line with the ethical principles of conducting human medical research that is defined in the Declaration of the Helsinki World Medical Association (1964-2000). Voluntary written informed consent to participate in the survey was compulsory for all patients.

RESULTS AND DISCUSSION

The relationship between the established common factors in patients with DU of MF is given in table 1.

According to our observation, there were patients from three age groups and among the representatives of the first two groups (18-25 and 26-45 years), which belong to the most socially active population segments, traditionally maximum rates of maxilla-facial traumatism were observed. From the same position we can explain the absence of elderly patients in our study.

However, comparing the data obtained from patients with DUMF, with data from a retrospective analysis of case histories of MF patients over the period from 2008 to 2012, it is possible to emphasize the tendency for complications development in young people (age group from 18 to 25 years old) and in patients older than 45 years ($p \geq 95\%$).

Comparison of the distribution by age among patients with DUMF with the data obtained from the results of a retrospective analysis of case histories of patients with MF for a five-year period can be considered using figure 1.

In 56 (75.7%) patients, concomitant somatic pathology was observed: diseases of the gastrointestinal tract – 23%, cardiovascular diseases – 37.8%, chronic diseases of the ENT organs – 14.9%, respiratory diseases – in 9.5%, genitourinary system diseases – in 8.1%, connective tissue diseases (arthritis, arthrosis) – in 8.1%, endocrine system – in 2.7%. In 21 (28.4%) cases a comorbidity of two or more diseases in one patient was noted.

Table 1

The relationship between the established common factors and DU of FM

	Delayed union (n=74)	
	Number of patients	%
Gender		
Men	**71**	**96**
Women	**3**	**4**
Age group		
18-25 years	**29**	**39,2**
26-45 years	**33**	**44,6**
46-60 years	**12**	**16,2**
Oncomitant pathology		
Absent	**18**	**24,3**
GIT pathology	**17**	**23**
Cardion-vascular diseases	**28**	**37,8**
ENT organ diseases	**11**	**14,9**
Endocrine diseases	**2**	**2,7**
Respiratory diseases	**7**	**9,5**
Genitourinary diseases	**6**	**8,1**
Connective tissue diseases (arthrites, arthroses)	**6**	**8,1**
MF combined with CCT	**22**	**29,7**
MF combined with polytrauma	**8**	**10,8**
Bad habits		
Tobacco smoking	**44**	**59,5**
Alcohol abuse	**36**	**48,6**
Drug abuse	**2**	**2,7**
Term of antibiotic therapy (days)		
5	**3**	**4**
7	**7**	**9,5**
10-14	**16**	**21,6**
>14	**48**	**64,9**
Medication		
NSAIDs	**26**	**35,1**
Hypotensive	**18**	**24,3**
Glucocorticoids	**21**	**28,4**
Nootropin	**22**	**29,7**
Anticoagulants	**4**	**5,4**

Note: * - correlation coefficient <95%, i.e. unreliable.

Comparing these findings with the results obtained during a five-year retrospective analysis among patients with MF, concomitant pathology was found in 54.3% of cases, that is, the presence of concomitant pathology correlates with the subsequent development of DU (p≥95%).

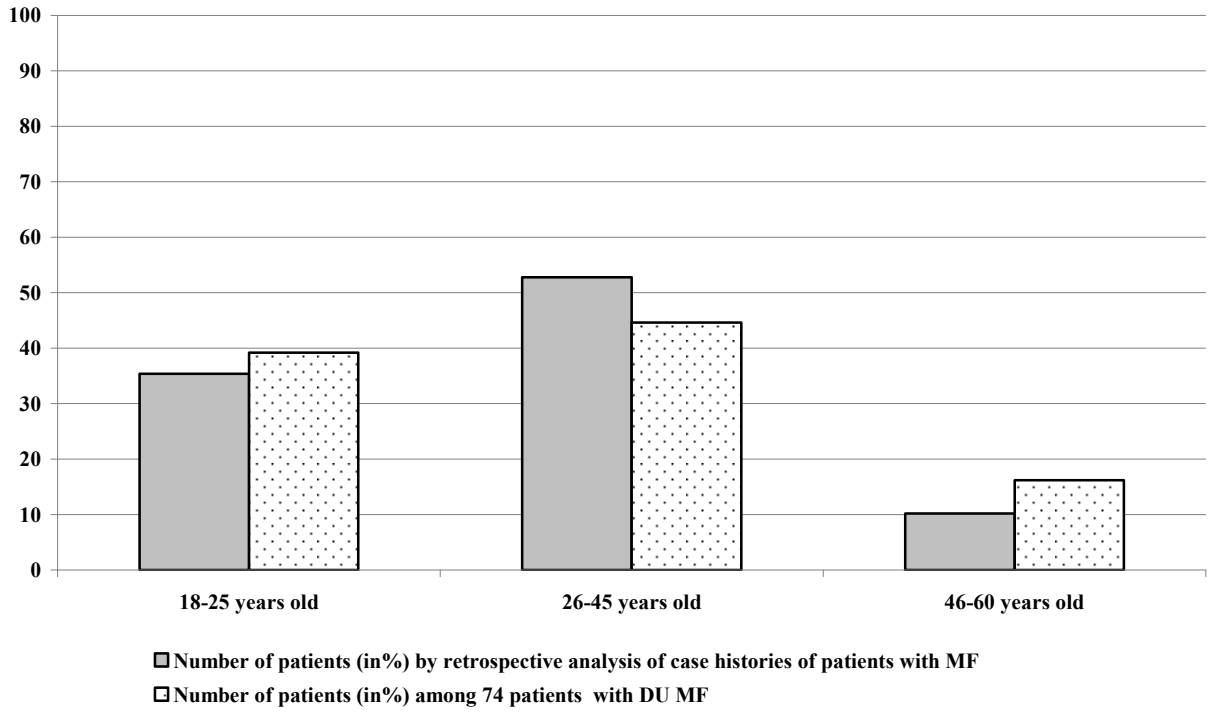

Fig. 1. Graphical comparison of the distribution by age category among patients with DU of MF with the data obtained from the results of a retrospective analysis of case histories of patients with MF for a five-year period

In 29.7% of cases MF were combined with craniocerebral trauma (CCT) and in 10.8% – with polytrauma, compared with 4.1% and 3.3%, according to the five-year sample. When comparing these indices with the data of the retrospective analysis among patients with MF for a five years' period, the statistical significance of acute CCT (p≥95%) and polytrauma (p≥95%) in the development of DU of FM (fig. 2) was established.

Only 18 (24.3%) patients with DU did not suffer from concomitant pathology, but only 12 (16.2%) among them did not have bad habits. Our attention was drawn to the fact that the documented use of alcohol, narcotic substances and tobacco smoking in the group with DU of MF was somewhat different from the figures set out in the retrospective analysis of case histories over the period from 2008 to 2012. Thus, alcohol abuse was noted in 48.6% of patients with DU vs. 10.1% of patients with MF in the general sampling, drug use – in 2.7% of patients compared with 0.8% among all injured. That is, the statistical significance of dependence of the complication development of DUMF from alcohol abuse (p≥95%) or narcotic substances (p≥95%) was found. On the other hand, there is a likelihood of underestimating the baseline data based on retrospective analysis, as in the case histories the fact of alcohol abuse and tobacco smoking are sometimes not documented by the physicians. However, to our opinion, such statistical conclusions are objective and should be taken into account as a factor that negatively affects reparative osteogenesis, since these patients are at risk of complications, not only due to the existing imbalance of the work of organs and systems against the background of alcohol abuse or drug abuse, but also from the decrease in the quality of treatment due to untimely provision of medical care, regime violations, patient non-compliance that are more common among such patients.

Data on the intake of other drugs during the period after the injury were limited by a small amount of accompanying documentation, but during 7-14 days NSADs were taken by more than one-

third of patients with DUMF (35.1%), regular use of antihypertensive drugs was noted in 24.3%. According to discharge summaries made by related specialists (neurosurgeons, neuropathologists), in the acute period of CCT (usually during admission to the hospital), 28.4% of patients received glucocorticoids and in the future almost all of them were prescribed a long-term (over 1 month) course of nootropics (29.7% of patients), daily use of anticoagulants was observed in 5.4% of patients only in the elderly (46-60 years). But, to our opinion, to draw univocal conclusions about the dependence of development of complications of union due to the above-mentioned drugs use, unfortunately is impossible, as usually they were administered for the treatment of concomitant pathology.

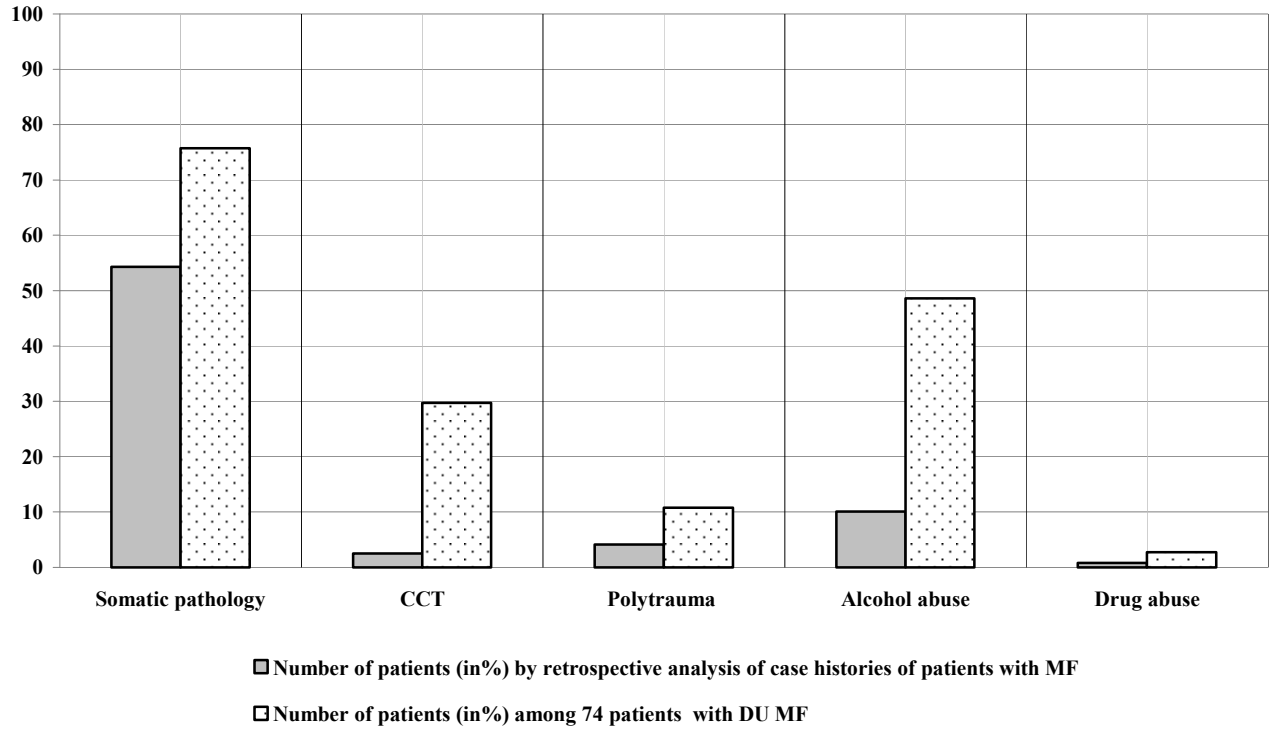

Fig. 2. Graphic representation of correlation of the number of concomitant pathology cases in patients with DU of MF and in patients with MF by the results of a retrospective analysis of case histories for five years

Attention is paid to the fact that in the vast majority of cases in patients with DU, long-term courses (more than two weeks) of antibiotic therapy were documented. Among the most commonly prescribed antibiotics are lincomycin hydrochloride, ceftriaxone, cefazolin, metronidazole and others. Such a prolongation of treatment terms was an indirect proof of presence of a long-term inflammatory process, which persisted after bone fragment reposition and fixation. On the other hand, the increase in antibiotic loading, of course, led to inhibition of the immune system and to dysbiotic shifts, which further significantly inhibited control of inflammation and osteo-reparative processes.

Further analysis of the influence of local factors on delayed union of MF is presented in table 2.

The majority of patients were treated by the method of double-jaw splinting (73%), but, as it is known, this method dominates in the treatment of MF and according to the data of retrospective analysis over a five years' period it was used in 70.2%, while osteosynthesis was used in 27% (relative to 28.2% according to retrospective data). It should be noted that the synthesis operation is usually performed in case of a more complex pathology (significant displacement of fragments, interposition of soft tissues, the inability to perform nasal-labial splinting due to the absence or mobility of teeth, etc.), this state theoretically can increase the number of complications, but in our study we did not observe this tendency (fig. 3).

Table 2

Interrelation between local factors and DU of MF

	Delayed union (n=74)	
	Number of patients	%
Treatment delay (days)		
0	**11**	**14,9**
1	**29**	**39,2**
2-3	**14**	**18,9**
4-5	**16**	**21,6**
>5	**4**	**5,4**
Localization of MF		
Unilateral	**59**	**79,7**
Bilateral	**15**	**20,3**
Treatment		
Double-jaw splinting	**54**	**73**
Osteosynthesis	**20**	**27**
Complications of MF before surgery		
Absent	**7**	**9,5**
Significant oedema or hematoma of soft tissues	**64**	**86,5**
Contused wounds of skin, ruptures of oral mucosa	**36**	**48,6**
Sensory disorders of the alveolar nerve (atypical pain, paresthesia, etc.)	**16**	**21,6**
Abscesses and phlegmons of soft tissues	**5**	**6,8**
Suppuration of bone tissue	**24**	**32,4**
Post-traumatic osteomyelitis	**0**	**-**
Significant displacement of fragments (D>5 см)	**32**	**43,2**
Complications in postoperation period		
Absent	**2**	**2,7**
Significant oedema or hematoma of soft tissues lasting more than 7 days	**69**	**93,2**
Sensory disorders of the alveolar nerve (atypical pain, paresthesia, etc.)	**16**	**21,6**
Abscesses and phlegmons of soft tissues	**6**	**8,1**
Suppuration of bone tissue	**8**	**10,8**
Post-traumatic osteomyelitis	**7**	**9,5**
Imperfected reposition (D>2 см)	**16**	**21,6**
Local factors		
Compound comminuted fracture	**14**	**18,9**
Tooth in the fracture gap	**17**	**23**
Exacerbation of periodontal diseases	**53**	**71,6**
Chronic periodontal diseases	**34**	**46**
Partial adentia	**18**	**24,3**

In the majority of patients with DUMF the basis for its development was the marked inflammation in the fracture site (p≥95%). In 32.4% of patients, it began with suppuration of bone wound, which developed before the admission to the hospital and resulted from absence of primary fixation of fragments and late health care delivery. In 5 of these patients (6.8% of the total number of patients), the inflammatory process involved soft tissues, mandibular abscesses and phlegmons which required additional treatment were diagnosed.

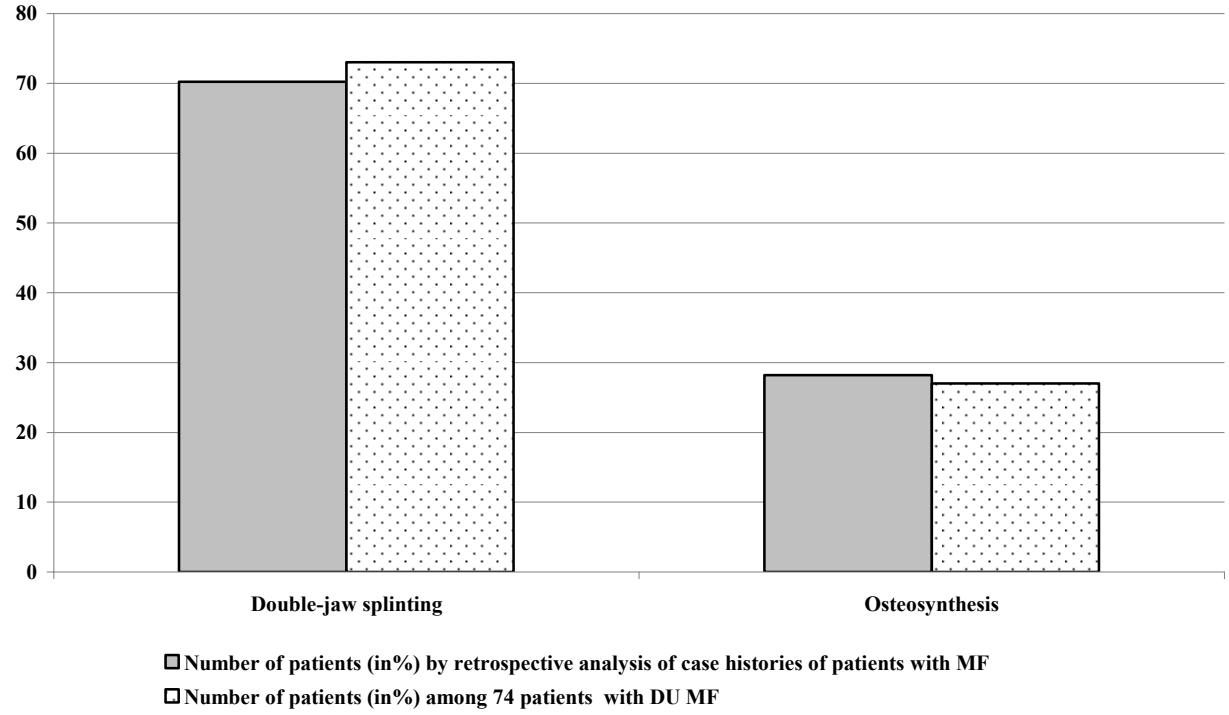

Fig. 3. A graphic representation of correlation of treatment methods used in patients with DU of MF and in patients with MF after the results of a retrospective analysis of case histories for five years

In 86.5% of patients, after the injury, significant edema and hematomas of soft tissue were observed for 7 days or more. 48.6% of patients had contused skin wounds, rhexis of the oral mucosa which required suturing, but in 5 (6.8%) patients, late reference to a doctor and presence of exudation caused refusal from delayed surgical treatment.

It should be noted that in our study there were no patients who would refer to a medical institution with an initial diagnosis of post-traumatic osteomyelitis. To some extent this is due to the fact that among all 74 patients with DUMF there were no references for primary care for more than 8 days. It is clear that such patients exist, but due to psychosocial peculiarities, they rarely refer to specialists in case of delayed union.

Comparing the data of analytical study with retrospective one, we established that namely clinical signs of inflammation identified in the case history against adverse local situation (significant displacement of fragments, presence of teeth in the fracture gap, etc.) should be considered as a risk factor for DUMF, in while in the presence of local factors, uncomplicated by the inflammatory process, the repair terms usually do not suffer, so union takes place in the irregular position. The above is a good illustration of such a clinical case: patient S., d.o.b. - January 3, 1979, case history N1226, injury resulted from a blow on the jaw during quarrel on 2.07.2018. Conscious. Did not seek medical advice. However, just after the injury, pain and swelling in the mandibular area developed, complicated opening of mouth, irregular occlusion, inability to chew. Gradually, the above symptoms disappeared, only the opening of mouth remained complicated and irregular occlusion intensified and became steady. In September 4, 2018, he applied to maxilla-facial surgery unit of the Dnipropetrovsk Regional Hospital named after Mechnikov. At the time of seeking medical advice: the face is asymmetric as a

result of post-traumatic deformation of the mandibular body on the left side. Opening of the mouth is complicated to 2.5 cm. The symptom of the indirect load is negative. Oral mucosa is pale pink, moist, transitional fold in the area of 34, 35, 37 teeth is slightly smoothed, weakly painful on palpation. Bite – posttraumatic occlusion (supracontacts on the 37-th, 38-th teeth and open in the frontal area). Along the lower edge of the jaw in the area of the mandibular body on the left side muff-like thickening is determined. During bimanual palpation, mandible is stable, fragments of the jaw are fixed. On the orthopantogram from 2.09.2018, the line of consolidated fracture of the mandibular body between 35-th and 36-th teeth with the displacement of fragments in the vertical plane up to 4 mm is visualized, in the area of 34-th, 35-th , absent 36-th, 37-th teeth – destruction of the bone tissue with a clear contour, round form, diameter up to 4 cm, which is characteristic for cyst by radiographic signs (fig. 4). The patient is hospitalized to the maxilla-facial unit. Diagnosis on hospitalization: incorrect union of the mandibular body fracture in the area of 35-th, 36-th teeth, residual cyst of the mandible from the removed 36-th tooth.

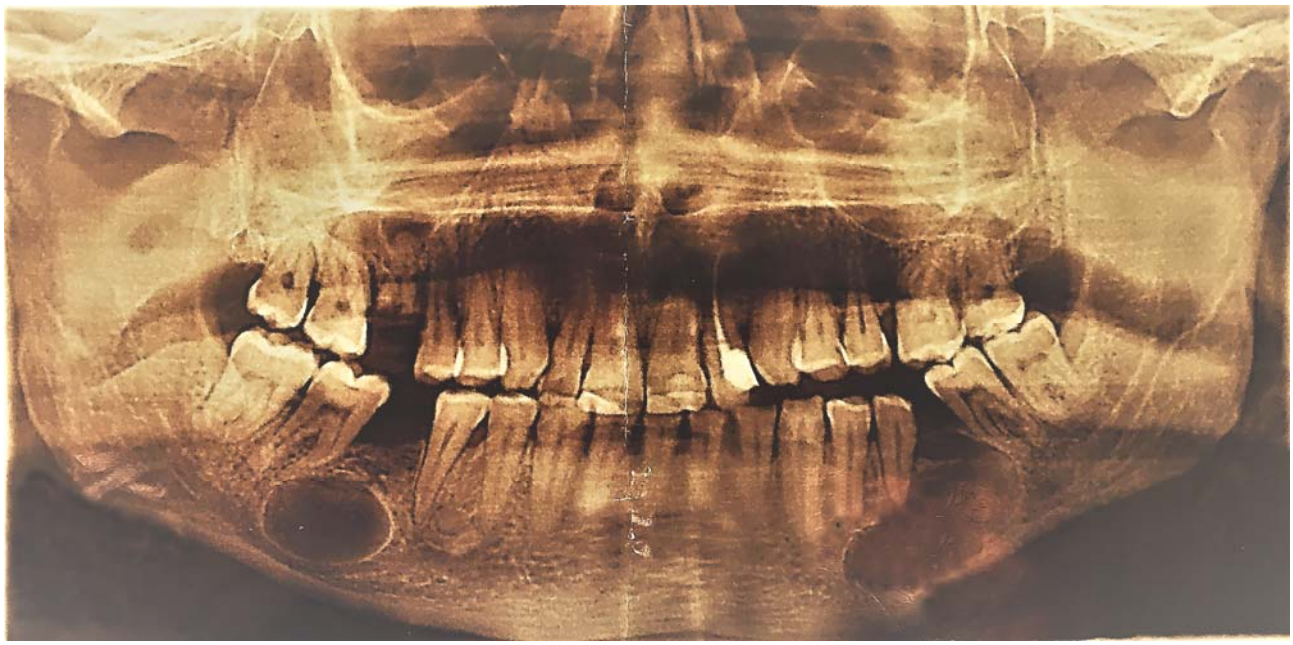

Fig. 4. Photo of the patient S., born in 1979, case history No.1226, diagnosis: malunion of the mandibular body fracture in the area of 35-th, 36-th teeth, residual cyst of the mandible from the removed 36 tooth. Improper union of fragments with the displacement of a large fragment down and formation of post-traumatic occlusion with contacts only on 37-th, 38-th teeth

Thus, in spite of significant destruction of bone tissue due to cystic mass and pronounced displacement of fragments, their union occurred though in the wrong position, but in the appropriate physiological terms (up to 50 days). Later, in September the 3-d, 2018, cystectomy and refracture of the mandible with manual repositioning and splinting with Tigerstedt's splints with inter-maxillary rubber fixation was performed.

This clinical case is not alone and illustrates that only local factors do not play a prominent role in the development of DUMF, certain pathogenetic prerequisites are needed for this.

The relationship between the localization of MF and DU of fragments is given in table 3.

Significantly more often, DU was observed in case of unilateral MFs – in 59 (79.7%) of cases, the remaining 15 (20.3%) patients had bilateral ones, with the delayed terms of union of fractures on both sides of the jaw. The most problematic zones of union - the mental part (31.1%), the angle (25.7%) and the body of the jaw in the lateral part (14.9%).

Thus, based on the results of the interview of patients with DUMF, we have isolated local and general factors that most closely correlate with the development of this complication. The obtained data were compared with the results of a retrospective analysis of case histories of patients with MF for a five-years' period.

Table 3

The relationship between the localization of MF and DU of fragments

	Delayed union (n=74)	
	Number of cases (abs.)	Number of cases (%)
Localization of unilateral fracture		
Mental part of the jaw	**23**	**31,1**
Mandibular angle	**19**	**25,7**
Mandibular body in the lateral part	**11**	**14,9**
Mandibular body in the anterior part	**6**	**8,1**
Localization of bilateral fracture		
Mental part of the jaw + mental part of the jaw	**3**	**4**
Mandibular angle + mental part of the jaw	**7**	**9,5**
Mandibular angle + mandibular body in the lateral part	**3**	**4**
Mandibular angle + mandibular body in the anterior part	**2**	**2,7**

CONCLUSIONS

1. It should be reckoned that general risk factors for the development of DU MF are: presence of general somatic pathology, CCT and polytrauma, as well as aggravating factors such as alcohol and narcotic substances abuse.
2. Among the local factors, inflammation in the MF area occupies the first place, its development is provoked by untimely seeking for medical advice, complicated comminuted fractures, traumatic surgical interventions, etc.
3. The increase in the terms of antibiotic treatment for more than 10 days should be considered as an alarming factor for the risk of DU developing. Among patients with DU MF, 86.5% received antibiotics more than ten days.
4. The risk group should also include young patients (aged from 18 to 25 years) and over 45 years of age.
5. The problem areas for consolidation is the mental part (31.1%) and angle (25.7%) of the jaw.

Prospects for further research: the performed assessment of etiological significance of local and general factors in the occurrence of DU of bone tissue in patients with MF promotes further development and implementation of pathogenetically grounded approaches to the selection of methods of prevention and treatment of traumatic maxilla-facial lesions, which will allow in the early stages to identify risk groups for development of union complications, to make a prediction and to provide adequate and timely personalized integrated therapy.

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The article was received
2019.01.28

UDC 616.314.21-77-049.32-047.44 https://doi.org/10.26641/2307-0404.2019.1.162302

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STATISTICAL ANALYSIS OF REPAIR OF COMPLETE REMOVABLE DENTURES ON THE UPPER JAW FOR A THREE-YEAR PERIOD OF USE

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Цитування: Медичні перспективи. 2019. Т. 24, № 1. С. 61-65
Cited: Medicni perspektivi. 2019;24(1):61-65

Key words: *maxilla, complete adentia, complete removable denture, base, denture repaire, life time*
Ключові слова: *верхня щелепа, повна адентія, повний знімний протез, базис, лагодженння протеза, термін користування*
Ключевые слова: *верхняя челюсть, полная адентия, полный съемный протез, базис, лагодженння протеза, срок пользования*

Abstract. Statistical analysis of repair of complete removable dentures on the upper jaw for a three-year period of use. Vasilenko R.E. *The aim of the study is to analyze the use of full dentures on the upper jaw and the number of repeated visits of patients who received treatment at the dental offices in the Dnepr city. Materials and methods:*