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Analysis of quality of life and dental health criteria components within the structure of complex expert assessment of the prosthetic treatment among patients with maxillofacial trauma in anamnesis

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Lesions of the dento-alveolar system, which develop in cases of traffic accidents, domestic, industrial or other traumatic injuries, leads to a sharp decrease in dental health, and consequently to the decrease in quality of life associated with post-traumatic changes in dental status. Purpose of work - to analyze the indicators of the integrated quality of life criterion associated with the state of dental health among dental prosthetically-rehabilitated patients with a history of maxillofacial (MF) traumatic injuries. The study sample was formed on the basis of the University Dental Clinic from a cohort of patients who sought dental care with the need for comprehensive prosthetic rehabilitation. According to the analysis of medical records of dental patients, 66 persons with a history of maxillofacial traumatic injuries were selected. In order to assess the integrated criterion of quality of life associated with dental health, among dental patients with a history of maxillofacial traumatic injuries, who received appropriate prosthetic treatment, surveys were conducted taking into account all domains of OHIP-14 (abbreviated to 14 questions version of the Oral Health Impact Profile questionnaire). Mandibular fractures and traumatic injuries of individual teeth (dislocations, fractures) were the most prevalent among study sample and corresponded to 31.8 % and 27.3 %, respectively. The main causes of maxillofacial traumatic injuries were domestic injuries (43.9 %), road traffic accidents (RTA) (37.9 %), criminal injuries (10.6 %), industrial-associated (4.5 %) and sports-associated injuries (3.0 %). Prosthetic rehabilitation of the vast majority of patients, which correspond to 56 persons (84.8 %), was performed using different types of fixed prosthetic constructions, such as crowns, bridges supported by natural teeth, or installed dental implants. Majority of patients 84.9-95.5 % demonstrated high indicators of the integrated criterion of quality of life associated with changes in dental health, despite the fact of previous surgical treatment of maxillofacial traumatic lesions. Thus, in the absence of secondary deformities after surgical treatment of maxillofacial traumatic lesions, prosthetic rehabilitation of patients with the use of fixed types of prosthetic constructions supported by natural teeth or installed dental implants helps to achieve high quality of life associated with changes in dental health. The use of complete or partial removable dentures for a similar purpose provokes a relative decrease within the integral criterion of quality of life in the structure of such domains, as physical pain, psychological discomfort and social incapacity, which is due to the peculiarities of removable prosthetic construction exploitation, retention and functioning.

Keywords: trauma, maxillofacial region, treatment, quality of life.

Introduction

The integrated criterion of quality of life associated with changes in dental health (Oral Health-related Quality of Life - OHRQoL) reflects the main variations of physical, functional, social and emotional components arising from the influence of relevant physiological, pathological

(including traumatic), iatrogenic factors on the main morpho-functional elements of the dental-maxillary apparatus in each individual [6, 10, 11, 13, 16]. In essence, this indicator reflects the subjective interpretation of the patient or the victim in relation to his functional, physical

and socio-behavioral abilities, based on the impact on them of existing health or disease, as well as changes associated with the treatment process [6, 10, 11]. The value of the integrated criterion of quality of life associated with changes in dental health depends on the flow of experience available to the patient, subjective beliefs and compliance of treatment results with subjectively expected [6, 10, 11, 13, 16]. This criterion should be used in the structure of prognostic models to assess the effectiveness of dental treatment, because even when achieving a functional state of compensation for existing disorders of the dental apparatus, patient dissatisfaction with the result of rehabilitation precludes its categorization as absolutely successful [1, 14, 18]. In such cases, it is reasonable to differentiate the consequences of treatment by technically-oriented, functionally-oriented and patient-oriented categories.

Lesions of the dental and maxillary apparatus, which develop in cases of traffic accidents, domestic, industrial or other injuries, lead to a sharp decrease in dental health, and accordingly - to a decrease in quality of life associated with post-traumatic changes in dental status [1, 6, 7, 12, 13, 15, 16]. At the stage of forensic dental assessment of the severity of the lesion, it is advisable to conduct a comparative analysis of the integrated criterion of quality of life in terms of differences in its indicators before and after injury, which allows to predict the potential for recovery of levels of relevant physical, functional and social domains. complex dental treatment [7, 12, 15].

The data of meta-synthesis of qualitative evidence for the prevention of road-traffic accidents (RTA) injuries allow us to identify the following targets for study, promising in terms of their practical and theoretical feasibility, and relevant for other causes of MF injuries (maxillofacial): psychological and social patient-focused consequences of RTA, aspects of formulating comprehensive programs for RTA prevention, research of the features of providing quality medical care to road accident victims, qualitative assessment of consequences, risks, behavioral and preventive aspects of RTA development [4].

Taking into account all the above aspects, it can be stated that the application of the integrated quality of life criterion associated with dental health is appropriate and justified in the structure of a comprehensive expert assessment of the consequences of traumatic injuries of the dental apparatus resulting from RTA and the influence of other traumatic factors of a similar mechanism of action.

The aim of the work is to analyze the indicators of the integrated quality of life criterion associated with the state of dental health among dental patients with a history of MF injuries.

Materials and methods

The design of the study involved a retrospective analysis of the indicators of the integrated criterion of quality of life associated with the state of dental health, among dental

patients with a history of MF injuries.

The formation of the study sample was carried out on the basis of the University Dental Clinic from a cohort of patients who sought dental care with the need for comprehensive orthopedic rehabilitation. According to the analysis of medical records of dental patients, 66 people were selected, in the anamnesis of which there was a MF traumatic lesion, and who after surgical treatment within the hospital (or without such depending on the nature of the injury) required further comprehensive orthopedic rehabilitation.

In order to assess the integrated criterion of quality of life associated with dental health, among dental patients with a history of MF injuries who received appropriate orthopedic treatment, surveys were conducted taking into account all domains of OHIP-14 (abbreviated to 14 questions version of the questionnaire Oral Health Impact Profile) [2, 17]. The questions were grouped into the corresponding 7 domains: 1-2 questions - the domain of functional limitations, 3-4 questions - the domain of physical pain, 5-6 questions - the domain of psychological discomfort, 7-8 questions - the domain of physical incapacity, 9-10 questions - the domain psychological insolvency, 11-12 - the domain of social insolvency, 13-14 - the domain of physical disability. The answer to each question provided 5 possible options depending on the frequency of the patient's occurrence of a particular type of restriction or insolvency: 0 - never, 1 - very rarely, 2 - from time to time, 3 - relatively often, 4 - very often [2, 17].

The rate of registration of different types of restrictions, or physical/psychological/social incapacity of each domain was summed and the value obtained was used to make a conclusion about the level of dental health of the patient and its impact on quality of life. Categorization of scores was interpreted as follows: 1-12 - good quality of life associated with dental health, 13-24 - satisfactory quality of life associated with dental health, 25-56 - unsatisfactory quality of life, associated with dental health [2, 3, 17].

Grouping, systematization and tabulation of numerical indicators was performed in the spreadsheet editor Microsoft Excel 2019 (Microsoft Office 2019, Microsoft). The indicators were processed using an additional plug-in UNISTAT® (Unistat Ltd) for statistical processing of data sets.

Results

The analysis of the conducted medical documentation allowed to establish the main types of MF traumatic lesions among the studied sample of 66 patients, the distribution of which is presented in table 1.

The most common among patients' sample in the study were mandibular fractures and traumatic injuries of individual teeth (dislocations, fractures) - 31.8 % and 27.3 %, respectively. The lowest prevalence was observed for fractures of the upper jaw (18.2 %). The main reasons for the development of traumatic injuries were household

Table 1. Distribution of traumatic lesions.

Type of lesion	Number of patients	Percentage
Damage to individual teeth (dislocation, fracture)	18	27.3 %
Fractures of the alveolar process	15	22.7 %
Jaw fractures:		
Maxilla	12	18.2 %
Mandible	21	31.8 %

injuries (43.9 %), RTA injuries (37.9 %), criminal injuries (10.6 %), industrial injuries (4.5 %) and sports injuries (3.0 %).

Peculiarities of previously performed surgical treatment of traumatic lesions among the studied sample of patients were not specified in connection with such within another clinical base, different from the base of this study, but no clinically pronounced secondary deformities that critically compromised the prognosis or results of orthopedic rehabilitation among patients of the sample was not observed.

Orthopedic rehabilitation of the vast majority of patients,

namely 56 people (84.8 %), was performed using different types of fixed orthopedic structures - crowns, bridges based on their own teeth, or on installed dental implants. In turn, orthopedic rehabilitation of 10 patients (15.2 %) was performed due to the construction of removable prostheses (partial and complete). The period from the end of the orthopedic rehabilitation phase to the assessment of the integrated quality of life criterion associated with dental health in dental patients ranged from 11 to 28 months.

In the vast majority of patients, 84.9-95.5 %, there were high indicators of the integrated criterion of quality of life associated with changes in dental health, despite the fact of previous surgical treatment of MF traumatic lesions (Table 2). The high level of success of the orthopedic rehabilitation, based on the data of stratification of the obtained results, was associated with the use of mostly fixed types of orthopedic structures based on their own teeth and titanium dental implants. The reduction in the indicators of quality of life associated with changes in dental health, in particular in the domains of functional limitations, psychological discomfort, physical pain and social incapacity in the study sample of patients, was largely due

Table 2. Distribution of answers to the questionnaire OHIP-14.

Research domains	Question	Answers to questions				
		0	1	2	3	4
Domain of functional limitations	Do you notice problems with the pronunciation of individual words related to violations/changes in your dental status?	60 (90.9%)	3 (4.6%)	2 (3.0%)	1 (1.5%)	0 (0%)
	Do you notice a deterioration in taste sensations due to disturbances/changes in your dental status?	63 (95.5%)	2 (3.0%)	1 (1.5%)	0 (0%)	0 (0%)
The domain of physical pain	Do you notice the appearance of pain in the mouth?	59 (89.4%)	3 (4.6%)	2 (3.0%)	1 (1.5%)	1 (1.5%)
	Do you notice any discomfort when eating any food related to disorders/changes in your dental status?	56 (84.6%)	4 (6.1%)	4 (6.1%)	2 (3.0%)	0 (0%)
The domain of psychological discomfort	Do you feel a certain uncertainty related to violations/changes in your dental status?	57 (86.4%)	5 (7.6%)	3 (4.6%)	1 (1.5%)	0 (0%)
	Do you feel a certain psychological stress associated with violations/changes in your dental status?	57 (86.4%)	5 (7.6%)	3 (4.6%)	1 (1.5%)	0 (0%)
Domain of physical insolvency	Can your current diet be described as unsatisfactory due to violations/changes in your dental status?	60 (90.9%)	4 (6.1%)	2 (3.0%)	0 (0%)	0 (0%)
	Have you noted any need to stop eating that was forced due to violations/changes in your dental status?	60 (90.9%)	3 (4.6%)	2 (3.0%)	1 (1.5%)	0 (0%)
The domain of psychological insolvency	Is it difficult for you to relax due to violations/changes in your dental status?	58 (87.9%)	6 (9.1%)	2 (3.0%)	0 (0%)	0 (0%)
	Have you ever been ashamed of problems related to violations/changes in your dental status?	59 (89.4%)	4 (6.1%)	2 (3.0%)	1 (1.5%)	0 (0%)
Domain of social insolvency	Have you noticed excessive irritability due to problems related to violations/changes in your dental status?	56 (84.9%)	4 (6.1%)	4 (6.1%)	2 (3.0%)	0 (0%)
	Have you noticed any difficulties in performing your usual tasks related to violations/changes in your dental status?	56 (84.9%)	4 (6.1%)	3 (4.6%)	3 (4.6%)	0 (0%)
Domain of physical limitations	Have you noticed less life satisfaction associated with disturbances/changes in your dental status?	58 (87.9%)	6 (9.1%)	2 (3.0%)	0 (0%)	0 (0%)
	Have you noticed the inability to function properly due to disorders/changes in your dental status?	59 (89.4%)	4 (6.1%)	2 (3.0%)	1 (1.5%)	0 (0%)

Fig. 1. Arithmetic mean scores for answering domain questions OHIP-14.

to the corresponding changes in the dental apparatus registered specifically among individuals with the use of complete and partial removable dentures.

The arithmetic mean scores, which reflect the frequency of the patient's occurrence of a particular type of limitation or inability, also indicate a general high level of quality of life associated with changes in dental health: in all domains studied and analyzed issues included in their structure, the average score did not exceed 1 (very rare).

During the comparative analysis it was found that among patients with previous surgical treatment of MF traumatic lesions, after the completion of comprehensive orthopedic rehabilitation relatively more often (but in absolute terms - quite rarely) there were difficulties associated with the usual tasks (frequency according to OHIP-14=0.29), discomfort when eating (frequency of occurrence according to OHIP-14=0.27), excessive irritability due to problems associated with disorders/changes in dental health (rate of occurrence according to OHIP-14=0.27), pain (rate of occurrence according to OHIP-14=0.21), uncertainty (rate of occurrence according to OHIP-14=0.21) and psychological stress (rate of occurrence according to OHIP-14=0.21) (Fig. 1).

Discussion

During the monitoring study among patients with MF injuries on average 8 months after treatment in the structure of the study sample were registered relatively lower rates of psychological discomfort (associated with awareness of changes in dental status) (23.8 %), physical pain (16.6 %) and dissatisfaction with the need to change the diet (14.3 %) [12]. The results show that even 8 months after treatment, some aspects of rehabilitation of patients with traumatic lesions of the lower third of the face remain unresolved, despite the fact that compared to baseline, OHIP-14 statistically improved by 11.9 ± 11.7 [12]. Similar results were obtained in the course of our study, except for the lower indicators of the

domain of physical incapacity, which were observed in the work of Lewandoski B. and colleagues [12]. The difference between the obtained results can be justified by the fact of the predominant rehabilitation of our sample of patients with fixed orthopedic structures based on their own teeth or dental implants, which provides sufficient restoration of the functionality of the dental apparatus to maintain a normal diet. In addition, differences in the results obtained can also be

argued due to the different number of studied samples, the heterogeneity of the latter, differences in the applied rehabilitation protocols, and differences in the duration of monitoring.

Data from a prospective study suggest that the effects of MF trauma reduce the patient's self-esteem to a greater extent than the consequences that develop at the level of occlusive post-traumatic changes, both at the time of injury and 10-12 months after treatment [8]. Therefore, to prevent the deterioration of quality of life, it is recommended to pay special attention to the possibility of avoiding the risk of scarification changes in the face [8]. There was no detailed analysis of the used methods of surgical treatment of MF injuries among the sample of studied patients, but at the beginning of orthopedic treatment none of the patients had pronounced secondary deformities or disorders associated with critical changes in the facial profile.

When adjusting the various studied models, it was found that the OHRQoL criterion among persons with MF trauma is statistically significantly lower than among persons without traumatic lesions of the dental-maxillary apparatus (BP=1.10; 95 %; CI=1.05-1.16) [9]. This specificity of differences is provoked primarily by negative changes in the structure of the domains of psychological limitations, social limitations and physical limitations [9]. In addition, a significant proportion of RTA victims showed post-traumatic stress disorder, the adjusted risk of which was statistically related to such determinants as the length of time since the accident, the presence of a history of accidents, the presence of depressive symptoms and general psychological disorders [5]. The study did not show significant post-traumatic stress disorders in the sample of patients, but the quality of life in cases of rehabilitation with full and partial removable structures was slightly underestimated in the structure of the domains of physical pain, psychological discomfort and social incapacity.

Taking into account the criterion of quality of life associated with changes in dental health, complements the protocol of forensic dental examination of the consequences of relevant traumatic injuries and iatrogenic manipulations. The latter, despite the fact that they are focused on restoring the functionality of the dental-maxillary apparatus, but may not meet the initial needs or do not meet the specific indications for a particular algorithm of rehabilitation in different clinical situations, and may be characterized by insufficient patient orientation. In such cases, the severity of changes in the dental-maxillary apparatus, provoked by the fact of injury as a result of an accident, may be exacerbated by subsequent patient-unorientated set of dental interventions, which may lead to secondary functional deformities, narrowing the range of compensation and the need for carrying out of additional therapeutic actions directed both on treatment of initial pathological changes, and on correction of those which developed during rehabilitation.

The prospect of further research is to study changes in the OHRQoL criterion immediately after the injury, after the stage of surgical treatment and after the stage of orthopedic rehabilitation, thus contributing to the stratification of the impact of trauma and approaches to their correction on the incidence of a functional type/physical/social limitations. The implementation of the algorithm for studying the integrated criterion of quality of life associated with changes

in dental health is possible through the use of a simplified form of the questionnaire as an additional component of the medical documentation of the dental patient.

Conclusions

1. In the cases of absence of secondary deformities after surgical treatment of MF traumatic lesions, orthopedic rehabilitation using fixed types of structures based on their own teeth or on dental implants contributes to the achievement of high standards of quality of life associated with changes in dental health. The use of complete or partial removable prostheses for a similar purpose provokes a relative underestimation of the integral criterion of quality of life in the structure of domains of physical pain, psychological discomfort and social incapacity, which is due to the operation of removable orthopedic structures, their specific retention and functioning.

2. The inclusion of the quality of life criterion associated with changes in dental status in the protocol of forensic dental examination of the consequences of relevant traumatic injuries and dental manipulations contributes to a more comprehensive assessment of the effectiveness of dental treatment, expanding opportunities for objective and subjective interpretation of dental health loss as a result of MF injury and the level of its recovery after iatrogenic interventions.

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