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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

SELECTION OF AN EFFECTIVE RECONSTRUCTION METHOD FOR REPAIRING DEFECTS AFTER REMOVAL OF LOCALLY ADVANCED TUMORS IN THE MAXILLOFACIAL REGION

Specialty: 3226.01 – Dentistry

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URGENCY OF THE PROBLEM AND DEGREE OF DEVELOPMENT

Relevance of the topic and degree of development. The frequency of occurrence of malignant tumors of the maxillofacial region in the general structure of oncological diseases is 15-20%, and in up to 90.0% of cases it consists of squamous cell cancer according to its histological structure. Regardless of having visual localization and clear symptoms, up to 60-70% of patients refer to a specialized clinic in the delayed stages of the tumor process [1].

The treatment of locally advanced tumors of the maxillofacial area is a multimodal problem, it involves the use of surgery, radiotherapy and drug therapy in various combinations, and the modern standard of treatment is the tactic of performing resective operations at the first stage [2].

Radical (ablastic) elimination of LATMF leads to the formation of extensive tumor defects, which, along with aesthetic changes, causes disruption of the body's vital functions such as breathing, chewing, speech, and swallowing[3-4]. Therefore, in this group of patients, it is imperative to perform reconstructive plastic surgery to restore the defects formed after radical resection of the tumor [5-6].

Currently, two main types of flaps are proposed for the

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reconstruction of large defects created after radical operations in the maxillofacial area: pedicled flaps and free flaps [7-8].

According to the time of execution, reconstructive operations are primary and delayed. Primary restoration of defects is preferred in leading clinics of the world. Such treatment tactics significantly shorten the rehabilitation period of patients and expand the indications for radical operations [9-10].

However, depending on the localization of the defect formed after resective operations and the variety of its tissue composition, there is a problem of choosing an effective reconstruction option, and the indications for their use have not been fully defined [11]. On the other hand, in reconstructive-plastic surgery of the LATMF, it is important to plan the reconstruction methods using digital technologies [12].

One of the ways to solve the problem mentioned above is the systematization of the flaps used in the reconstruction operations, the comparative evaluation of their effectiveness and the planning of restoration methods. Teaching-Surgery and Oncology Clinics of Azerbaijan Medical University have extensive experience in the field of reconstruction of defects formed after resective operations for locally advanced tumors in the maxillofacial area. The obtained

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clinical materials and sufficient observation period on patients enable the research to be carried out.

The object of the study. The object of the study was 150 patients who underwent reconstructive surgery of tumor defects formed after the removal of local-spread tumors in the maxillofacial region during the years 2014-2023 in the Departments of Oral and Maxillofacial Surgery of the Teaching-Surgery Clinic and Head and Neck Tumor Surgery of the Oncology Clinic of Azerbaijan Medical University.

Patients were divided into 2 groups depending on the location of defects in the maxillofacial region: Group I - defects in the oral cavity, Group II - soft tissue defects of the face and neck.

Depending on the tissue composition of the defects, the patients were divided into 3 groups: Group 1 - defects of the mucous membrane and muscle not connected to the skin, Group 2 - defects of the skin and muscle not connected to natural cavities, Group 3 – full-thickness defects.

The following groups are distinguished depending on the type of reconstructive flap used for the restoration of defects: 1 – reconstruction with cutaneous flaps, 2 – reconstruction with fasciocutaneous flaps, 3 – reconstruction with myocutaneous flaps.

The aim of the study. The purpose of the study was to improve the rehabilitation results of patients by choosing an effective reconstruction method to eliminate the defects formed after the removal of LATMF.

The study objectives. To achieve the specified goal, the following tasks were required to be solved:

1. Determining the indications for the method of reconstruction depending on the location, size and tissue composition of the defects formed after the removal of LATMF.
2. The use of digital technologies for planning of reconstruction methods with cutaneous, fasciocutaneous and myocutaneous flaps after the removal of LATMF.
3. Study of local complications after the removal of LATMF and development of preventive measures for their prevention.
4. Comparative assessment of the methods of removing the

defects formed after the removal of the LATMF, taking into account FR and ER in terms of the quality of life of patients.

Research methods. In the study, various reconstructive flaps were used for the reconstruction of large defects formed after radical operations in the maxillofacial region. In order to interpret and evaluate the obtained results, the method of statistical data processing was used.

Compliance with the criteria for inclusion and exclusion of patients in the study protocol, their randomization, primary and secondary evaluation criteria, timing of comparative assessment of results, as well as reconstructive surgery protocols have a high degree of reliability.

Sufficient volume of observations (150 patients with large tumor defects of the maxillofacial area after radical resection), appropriate distribution of patients to the studied groups (location of the defect, tissue composition, type of flap used for the reconstruction of the defect), planning reconstruction methods using digital technology, comparative evaluation has enabled the selection of an efficient reconstruction method.

The main provisions defended:

- The leading method of treatment for LATMF is radical surgery and reconstructive-plastic surgery of the formed defects. The most optimal time for the restoration of defects is its execution in one stage with the radical surgery surgery.
- Between different types of flaps (cutaneous, fasciocutaneous and musculocutaneous) taking into account its localization (oral cavity or soft tissues of the face and neck), tissue composition (closed or open) in the reconstruction of defects formed after radical operations a choice must be made.
- Virtual planning of the method of reconstruction of the defects formed after radical operations with different flaps and the use of digital technologies should be considered.
- Preventive and therapeutic measures carried out before and after reconstructive operations should be aimed at reducing the frequency of local complications.

– The choice of an effective method of reconstruction of defects formed after radical operations should increase the possibilities of early surgical rehabilitation of patients by improving the FR and ER of treatment in terms of quality of life.

Scientific novelty of the research. In the study, a complex comparative study of the results of reconstruction was conducted, depending on the location, tissue composition, and the type of flaps used for their reconstruction in 150 patients with LATMF after radical surgeries.

The reconstruction of soft tissue defects formed after the removal of LATMF using cutaneous, fasciocutaneous or musculocutaneous flaps has been justified by the use of digital technologies.

Virtual planning of the surgical operation performed using digital technologies made it possible to determine the complete description of the defects, made it possible to choose an effective reconstruction method based on an individual basis for each patient in the pre-operative period, and ensured early surgical rehabilitation of patients.

Practical significance of research. The choice of an effective reconstruction method for the reconstruction of defects formed after radical operations performed according to LATMF improves the FR and ER of the treatment from the criteria of the quality of life of the patients and shortens the surgical rehabilitation period of the patients.

For the scientific investigation of the criteria for the use of various types of reconstructive flaps, the virtual planning of defect recomstruction methods using digital technologies allows the implementation of the optimal reconstruction option.

The application of digital technologies for the use of flaps of various composition in the reconstruction of defects leads to a shortening of the operation time, an increase in its accuracy, a decrease in the frequency of local postoperative complications, and early surgical rehabilitation.

Aprobation of the study results. The main materials of the

dissertation work were presented at the 1st and 2nd International Conferences of the Society of Oral and Maxillofacial Surgeons of Azerbaijan (Baku, 14-16 October 2019, Baku, 12-14 October 2023), at the XVIV Republican Conference of Doctoral Students and Young Researchers (Baku, November 23 2021), at the international scientific-practical conference "Actual problems of medicine" dedicated to the 270th anniversary of Shusha (Baku, May 24-25, 2022), at the joint meeting of the Department of Oral and Maxillofacial Surgery of the Azerbaijan Medical University with other departments (07.06.2023; protocol No. 9) and at the scientific seminar of the ED 2.50 Dissertation Council operating under the Azerbaijan Medical University (30.01.2024; protocol No. 8)

Application of research results to practice. The results of the research are applied in the practical work of the Teaching Surgery and Oncology Clinics of the Azerbaijan Medical University of the Ministry of Health of the Republic of Azerbaijan. The choice of the effective method of reconstruction of the defects proposed in the study increases the possibilities of early surgical rehabilitation of patients, improves the quality of life of patients and the functional and aesthetic results of treatment. At the same time, the provisions stated in the dissertation are implemented in the teaching process and lectures of the Departments of Oral and Maxillofacial Surgery and Oncology of the Azerbaijan Medical University.

The organization where the dissertation work was performed. The research work was performed at the department of Oral and Maxillofacial surgery and at the departament of Oncology of Azerbaijan Medical University.

Publications. Topic of dissertation is reflected in 24 (14 articles and 10 theses) scientific works published on the topic of the dissertation. Scientific works on the topic of the work were published in Azerbaijan (6 articles and 6 theses) and foreign scientific journals (8 articles and 4 theses). Of these, 5 articles were included in international summarizing and indexing databases.

The structure and scope of the dissertation. The dissertation consists of an introduction (12567 characters), a chapter “Literature review” (58207 characters), a chapter “Materials and methods of

research" (39769 characters), 3 chapters devoted to personal research (79133 characters), a discussion of the results (35859 characters), conclusion (1873 characters) , practical recommendations (1652 characters), reference list (19 pages) and a list of abbreviations (1041 characters). The total volume of the dissertation is 176 pages and 232944 characters with computer printing. The reference list includes 177 sources. There are 33 tables, 22 pictures and 9 charts in the dissertation.

MATERIALS AND METHODS OF RESEARCH

Mterial was collected in the departments of oral and maxillofacial surgery and head and neck tumor surgery of the Teaching Surgery Clinic of Azerbaijan Medical University in 2014-2023 . 150 patients underwent defect reconstruction. 87 of the patients included in the study were men (58.0±4.03%), 63 were women (42.0±4.03%), the average age of the patients was 58.9.

As a result of the complex diagnostic examinations, the spread rate of the tumor process was as follows (Table 1).

Table 1

Division of patients according to the international classification according to the TNM (2018) system

T	N			Total
	cN_0	cN_1	cN_2	
T_3	69	13	6	88 (58.7±4.02%)
T_4	48	11	3	62 (41.3±4.02%)
Total	117	24	9	150 (100.0%)

The division of defects formed after radical resection of locally spread tumors depending on their localization in the maxillofacial area is shown in chart 1.

All patients underwent surgery at the first stage of treatment. Out of 150 patients included in the study, 62 (41.4%) were treated with reconstructive plastic surgery, 74 (49.3%) were combined, and 14 (9.3%) were treated with complex surgery.

Characteristics of defects formed after resective operations.

Depending on the type of defects in the patients included in the present study, the classification used by us is as follows:

1. Defects of the mucous membrane, muscle and bone tissue that are not related to the skin. This includes defects of the mucous membrane of the oral cavity.
2. Defects of skin, muscle and bone tissue unrelated to cavities (mouth, nose, pharynx). This includes defects of the skin of the nose, eyelids, cheeks and neck.
3. Bilateral open defects of mucous membrane, muscle, bone / cartilage tissue, including skin. This includes defects formed after radical resection of T_4 tumors of the oral cavity (including the red border of the lower lip), nose and cheek skin, larynx .

Defects, their localization and division depending on tissue composition are reflected in table 2.

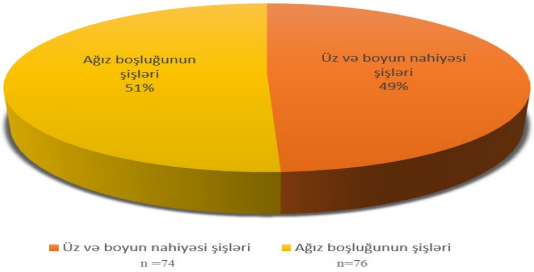

Chart 1. Division of patients depending on the localization of the tumor in the maxillofacial region.

Table 2

Division of patients depending on the localization and group of defects

Defect localization	Defect groups			Total
	1	2	3	
Oral cavity	53 (69.7±5.27%)	-	23 (30.3±3.44%)	76 (50.7±4.08%)
Face and neck area	-	58 (78.4±4.78%)	16 (21.6±4.78%)	74 (49.3±4.08%)
Total	53 (35.3±3.90%)	58 (38.7±3.98%)	39 (26.0±3.58%)	150 (100.0%)

Characteristics of flaps. This study examined the results of using arterialized pedicle flaps. Thus, in 150 patients, flaps of various tissue compositions were used to restore defects formed after radical operations for locally advanced tumors (table 3).

Table 3

Distribution of patients by type and number of reconstructive flaps

Cutaneous and fasciocutaneous flaps	N	Musculocutaneous flaps	N
Nasolabial flap NLF	33 (32,3±4,63%)	Sternocleidomastoid flap SCMF	7 (14,6±5,09%)
Forehead flap FF	40 (39,2±4,83%)	Platysma flap PLF	10 (20,8±5,86%)
Cervical flap CF	7 (6,9±2,51%)	Submental flap SMF	26 (54,2±7,19%)
Supraclavicular flap SCF	22 (21,6±4,07%)	Pectoralis major myocutaneous flap PMMF	5 (10,4±3,41%)
Total	102 (100,0%)	Total	48 (100,0%)

Statistical processing of the material. Statistical processing of the obtained indicators is based on bimetric methods: the mean value (M) used in statistics of variance, the mean error of the mean value (m), maximum (max) and minimum (min) indicators, mean squared difference (σ), Student's criterion (t) made by calculation. It was performed with SPSS version 21.0 for Windows. A P value of probability of randomness less than 0.05 was considered statistically significant. The difference between quality indicators was determined by calculating Pearson's $\chi 2$ criterion.

RESEARCH RESULTS AND THEIR DISCUSSION

As we mentioned earlier, according to the working classification we developed, defects after eliminating LATMF are divided into 3

groups. Reconstruction of these defects involves the formation of its internal and external cover using various types of tissues. At this time, in most cases, the oral cavity, nose and pharynx, as well as the skin of the face and neck, were used as epithelial surfaces (table 4).

Table 4

Division of patients according to the type of reconstructive flap and defect groups

Type of flap		Defect groups			Total	
		1	2	3		
Cutaneous and fasciocutaneous flaps	NLF	6 (11,3%)	12 (20,7%)	15 (38,5%)	33 (22,0±4,63%)	x^2=17,45 p<0,01
	FF	_	29 (50,0%)	11 (28,2%)	40 (26,7±4,83%)	
	CFF	_	7 (12,1%)	_	7 (4,7±2,51)	
	SCF	9 (17,0%)	6 (10,4%)	7 (17,9%)	22 (14,7±4,07%)	
Musculocutaneous flaps	SCMF	7 (13,2%)	_	_	7 (4,7±5,09%)	x^2=4,39 p>0,10
	PLF	8 (15,1%)	2 (3,4%)	_	10 (6,7±5,86%)	
	SMF	20 (37,7%)	2 (3,4%)	4 (10,3%)	26 (17,3±7,19%)	
	PMMF	3 (5,7%)	_	2 (5,1%)	5 (3,3±3,41%)	
Total		53 (35,3±3,90%)	58 (38,7±3,98%)	39 (26,0±3,58%)	150 (100,0%)	

In the material included in the study, 2 fasciocutaneous and 4 musculocutaneous reconstructive slices were used in 53 patients included in group 1, and the following indications were determined for the use of each of them.

NLF can be successfully used in the reconstruction of medium-

sized defects in the anterior parts of the oral cavity in elderly and somatically weakened patients with clearly defined facial skin folds and elastic skin.

SCF can be considered a promising reconstructive method for the reconstruction of oral defects. Based on our personal experience, we can say that the advantages of this flap are its large size, the ability to restore the donor area with local tissue in most cases, and the short operation time.

SCMF can be evaluated as a simple and reliable method of reconstruction in defects of the anterior regions of the oral cavity. Due to partial necrosis of the muscle and its skin fragments in patients who have undergone bilateral neck dissection at the same time, we do not consider it appropriate to use SCMF in such clinical situations.

The use of PLF provides sufficient results of reconstruction in this group of defects. In our opinion, the use of PLF in women is not considered appropriate due to the insufficient development of the subcutaneous muscle in them.

Considering our personal experience with the use of PMMF, we do not consider it advisable to use this flap for defects of the soft tissues of the oral cavity in which the integrity of the jaw bone is not compromised.

SMF is currently considered the “working” flap for oral soft tissue defects. The slice can be used with high efficiency to restore soft tissue defects in any area of the oral cavity.

Thus, defects in the soft tissues of the oral cavity are a natural result of radical operations performed for locally advanced tumors of this organ, and require a reasonable and planned approach to solving the problem. When choosing a plastic material for reconstructive surgery, the size, shape, tissue composition of the defect, the somatic condition of the patient, etc. are taken into account. In our opinion, SCF and SMF are suitable for this group of defects. At the same time, PLF, SCMF and NLF can be used in the reconstruction of this group of defects for certain indications.

In the study material, 4 cutaneous and fascial-cutaneous and 2 musculocutaneous flaps were used as reconstructive material in 58

patients with defects of group 2; the indications for the use of flaps were formulated as follows:

The effectiveness of NLF in restoring this group of defects is undoubted and coincides with literature data. NLF can be widely used for plastic surgery of medium-sized skin defects of the nose and eyelids.

FF is the oldest method for reconstructing facial defects, especially the nose and paranasal region, and is still widely used today. Our results show the high effectiveness of this flap in the reconstruction of nasal skin defects and can be considered as an ideal method for reconstructing defects in this localization.

The use of CF is limited and its effectiveness is not always at the desired level. However, depending on the clinical situation, it is possible to use CF in the correction of skin defects located nearby.

Our experience in using PLF for this group of defects makes it advisable to use it for superficial defects of the facial skin.

The results of the study of SCF in the reconstruction of this group of defects show that it can be considered as the method of choice for defects of the middle and lower part of the face and large skin defects of the neck. Reliable blood supply, the ability to form a large flap, and the compatibility of its color and texture with the areas of the face and neck make it an ideal reconstructive flap.

SMF, in our opinion, can be considered an appropriate reconstructive option for deeper facial defects.

Thus, referring to the presented data, we can conclude that the 2nd group of defects formed after removal of the VGS is characterized by a variety of types in shape, location, size and reconstructive flaps used. The reconstructive material used in patients with this group of defects should be well vascularized and mobile, there should be no unsightly scars in the donor area, and the color, thickness and consistency should match the tissues surrounding the defect. In our opinion, it is NLF, FF, SCF and SMF that best meet the above requirements.

The 3rd group of defects formed after removal of the LATMF consisted of 39 patients. Reconstruction of this group of defects is considered the most difficult option for reconstruction of the

maxillofacial area. Thus, when reconstructing full-thickness defects in this area, it is necessary to reconstruct at least two surfaces to ensure the seal of natural or planned cavities, which usually requires the use of multiple flaps.

During the study, one flap was used in 15 patients, and two flaps were used in 24 patients as reconstructive material in the reconstruction of this group of defects. In 10 of 15 patients in whom one flap was used, in 15 of 24 patients in whom two flaps were used, bipaddled flap modification was performed and the following results were obtained:

Reconstruction of extensive defects of the lower lip was carried out using the NLF method, using modifications of Nakajima and Karapandzic cheiloplasty. This reconstruction tactic shortens the operation time, and the functional and aesthetic results of using the flap are satisfactory.

FF can be considered the main reconstructive material for the reconstruction of open nasal defects. For defects of this localization, both its duplication modification can be used, and with combined plastic surgery it can be used to restore the outer covering of the defect.

The SCF can serve as an internal defect wall in patients with an open buccal mucosal defect, and it can also be bipaddled modified in patients with a full-thickness lower lip defect. At the same time, in patients with an open pharyngeal defect, SCF may act as the outer wall of the defect.

In all cases of the use of SMF in patients with this group of defects, its bipaddled modification was used. Our results make it reasonable to widely use bipaddled modification of SMF in clinical practice.

In this group of patients, PMMF can act as an external covering of the defect in cases of pharyngeal defect.

Thus, primary reconstruction of open defects of the maxillofacial region using one or more flaps after radical surgery can be considered appropriate. In this case, when using a flap, its bipaddled modification can be considered the most optimal material for reconstruction. For open defects, depending on their location and

clinical condition, their internal or external covering can be restored with a flap of any nature (cutaneous-fat, fascial-cutaneous or musculocutaneous).

3D modeling in reconstructive surgery of soft tissue defects of the maxillofacial area. In recent years, the use of computed tomography angiography (CTA) for adequate planning of reconstructive surgeries for locally advanced defects of the maxillofacial region has undergone a period of development. CTA and 3D reconstruction make it possible to individualize the characteristics of local and regional blood flow during the formation of donor flaps, to assess the condition of the large arteries feeding the donor flap and their branches. The advantage of CTA is that it combines diagnostic and surgical planning functions. Obtaining three-dimensional remodeled images as a result of computer processing of the obtained data provides the surgeon with important information for adequate planning of reconstructive surgery.

The purpose of this subsection of scientific work was to study the effectiveness of using 3D planning in reconstructive surgery of soft tissue defects formed after radical resection of the LATMF. This part of the study was based on 9 patients with soft tissue defects after radical surgery for locally advanced tumors of the maxillofacial area. According to existing in our department protocol of preoperative assessment of tumor cases all patients underwent contrast CT scan of the head and neck for primary tumor and regional metastases detection.

Accumulated data was well documented and used for subsequent computer assisted preoperative planning.

CAS. The general idea of presented method comes from capabilities of Materialise Mimics Reasearch 21.0 software, which allows to perform advanced segmentation of heart and coronary arteries. . CT scan data was obtained in DICOM format and uploaded to cited software. On the first step of initial segmentation by the means of “Bone scale Thresholding” and “Region growth” virtual functions were done. This maneuver allows to segment both facial skeleton and contrasted arteries of the region of interest. Then, by implication of “Crop mask” and additional implication of “Region

growth" functions segmentation of external carotid artery was achieved. Next to this step one used "Advanced coronary segmentation" tool in order to trace the course of submental artery, which was well contrasted on CT scan data. After tracing of named artery on axil sliced 3D reconstruction of its course was also achieved. The next step was associated to 3D reconstruction of basic anatomical structures, which should be used in such reconstructive procedure. Therefore additional segmentation followed by 3D virtual reconstruction was done for artery, bones and skin of the patient (figure 1).

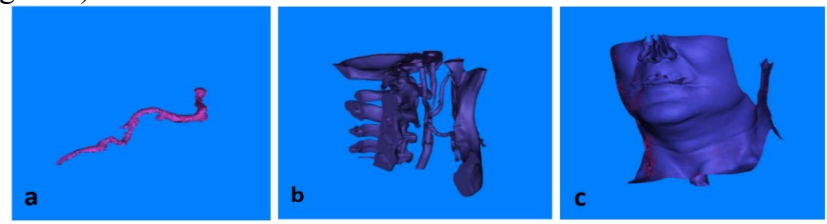

Figure 1. 3D reconstruction step: a) 3D reconstruction of submental artery; b) 3D reconstruction of facial skeleton; c) 3D reconstruction of the skin.

Additionally, we performed analysis of the relationship of submental artery and mandible and measure the length of artery. In order to complete full thickness virtual submental flap one performed additional segmentation of anterior belly of digastric muscle and submental fat pad, as well as final outlining of skin part of the flap (figure 2).

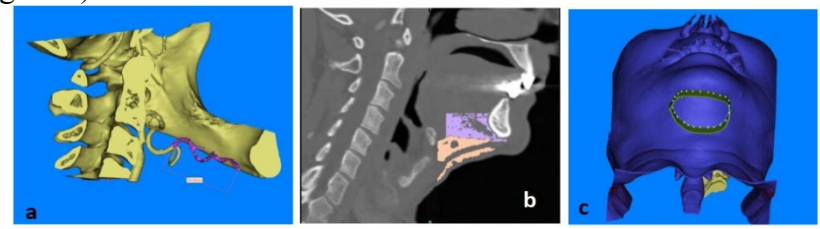

Figure 2. Prefabrication of submental flap raising scenario: a) determination of the length of submental artery; b) segmentation of anterior belly of digastric muscle and submental fat pad; c) outlining of proposed submental flap's skin component.

After all necessary preparations were done final design of flap was achieved and final virtual transfer of the flap was done (figure 3).

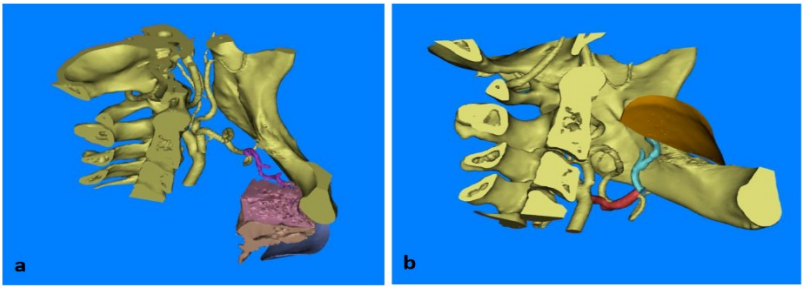

Figure 3. 3D simulation of flap transfer: a) complete 3D reconstruction of all components of the flap; b) virtual transfer of submental flap to defected region.

Finally, all virtual data was well documented and used intraoperatively as additional guidelines.

For the comparative evaluation of various criteria of the surgical operation, 14 patients were used as a control group, which was reconstructed using the traditional method. According to the clinical and pathological characteristics of the patients, there was no significant difference between the compared groups, and for all criteria (gender of the patients - p=0.5, average age - p=0.3, T-p=0.6, N-p=0.7, location of the defect - p=0.4) the main and control groups were compared.

As for the reconstructive slice used to repair the defect, in the main group, SMF was used in 7 of 9 patients (77.8), SCF in 2 (22.2), and in the control group, SMF was used in 10 of 14 patients (71.4 %) and SCF in 4 (28.6%) (p=0.1). The results of reconstructive operations are shown in table 5. As can be seen from Table 5, the average operation time of patients in the CAS group ($t=3.95$; $p<0.01$) and length of stay in the clinic after surgery ($t=1.27$; $p>0.05$) were significantly shorter than in the traditional group. shortened.

Intraoperative blood loss was similar in both groups of patients (t=1.23; p>0.05).

Table 5.

Comparison of surgical outcomes between CAS and conventional groups

Results	CAS group (n=9)	Conventional group (n=14)	t	P
Operating time (minutes)	190±7,8	235±8,3	3,95	<0,01
Intraoperative blood loss (grams)	215±8,0	230±8,7	1,27	>0,05
Length of hospital stay after surgery (days)	7,6±2,9	13,2±3,5	1,23	>0,05

The study of postoperative local complications between the comparison groups showed that postoperative local complications were recorded in 2 of 9 patients (22.2%) in the CAS group and in 5 of 14 patients (35.7%) in the conventional group (x^2=0.47; p>0.05).

Thus, the results obtained in the study showed the effectiveness of using 3D technology in the reconstruction of soft tissue defects after ablastic operations performed for SCI. This technology shortens the operation time and hospital stay of patients and reduces the frequency of local postoperative complications. The mentioned technology allows specialists to create a personalized 3D virtual model of soft tissue defects, defining clear and safe surgical boundaries. The results of the study show that 3D technology can be used in maxillofacial surgery to repair soft tissue defects caused by locally advanced tumors and other diseases.

Local complications after reconstructive-plastic operations and their prevention. Local complications were recorded in 59 (39.3 ± 3.99%) of 150 patients who underwent reconstructive surgery after the removal of LATMF, which is consistent with literature data. Despite the low frequency of local complications, complications accompanied by total (subtotal) necrosis of the flap T/SN were recorded in only 2 (3.4±1.48%) patients. Partial necrosis (PN) was

observed in 18 (30.5±3.76%), marginal necrosis (MN) in 11 (18.6±3.18%) patients, and in the remaining 28 (47.5±4.08%) patients wound dehiscence (WD) was revealed (chart 2).

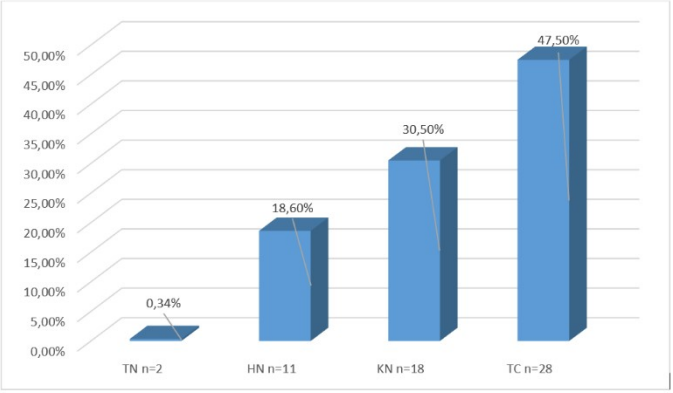

Chart 2. Distribution of local complications of patients according to the structure.

We investigated the structure of local complications depending on the gender and age of the patient, the degree of spread of the primary tumor, the localization and type of defect, and the reconstruction option used in the repair of the defect.

Depending on the age of the patients, the highest number of local complications occurred in the age group of 50-69 years (37 patients) and was 62.7%. No statistical difference was determined depending on the gender of the patients, local complications were found at approximately the same frequency (52.5±6.5% and 47.5±6.50%, respectively) in men and women ($t=0.55$; $p>0$,05).

The study of local complications depending on the spread of the primary tumor showed that they were 53.2±4.07% (33 patients) in patients with T4 tumors and 29.6±3.73% (26 patients) in T3 tumors ($t= 4.27$; $p<0.01$).

Regarding the frequency of local complications depending on the localization of the defect, it was determined that this indicator was 43.4±4.05% in oral cavity defects (33 out of 76 patients), and 35.1±3.90% in facial neck defects (26 out of 74 patients) ($p>0.05$).

The results of studying local complications depending on the type of postoperative defects according to tissue composition showed that 59 patients in whom local complications were registered belonged mainly to the 1st (26 patients or 44.1±4.05%) and 3rd (20 patients or 33.9±3.86%) group of defects, while in the 2nd group of defects this indicator was lower (13 patients or 22.0±3.26%) ($t=2.78$; $p<0.05$). In our opinion, this is due to the fact that the operations performed to repair the 1st and 3rd groups of defects are carried out in areas with natural cavities, which have favorable conditions for bacterial background. At the same time, it should be noted that in case of defects of the 1st and 3rd groups, the healing of wounds after reconstructive operations, in addition to infectious factors, is also negatively affected by the enzymatic activity of the natural secretions of these areas (oral saliva, mucus, tears). The above indicators prove the complexity of reconstructive operations for repairing 1 and 3 group of defects.

The study of local complications depending on the type of reconstructive flap showed the following results.

This indicator was 32.4±3.82% (in 33 out of 102 patients) when using cutaneous and fascial-cutaneous flaps and 54.2±4.07% (in 26 out of 48 patients) when using musculocutaneous flaps ($t=3.89\%$; $p<0.01$).

A high incidence of local complications in the total number of flaps was observed when using SCMF - 71.4±4.07% (in 5 of 7 patients), PLF - 70.0±4.03% (in 7 of 10 patients), PMMF - 60 .0±4.50% (in 3 out of 5 patients) and CF - 57.1±4.06% (in 4 out of 7 patients). In the remaining 4 flaps this figure is lower: SMF - 42.3±3.92% (in 11 of 26 patients), SCF - 40.9±3.89% (in 9 of 22 patients), FF - 30.0± 3.70% (in 12 out of 40 patients) and NLF - 24.2±3.65% (in 8 out of 33 patients).

Prevention of postoperative local complications is of great importance in reconstructive surgery of LATMF. Taking into account the literature data and our personal experience, we see the following ways to prevent local complications:

- selection of the optimal type of reconstructive flap;

- high technique for forming a reconstructive flap;
- adequate tactics for managing patients in the postoperative period;
- postoperative wound care and monitoring;
- antibiotic therapy;
- regulation of microcirculation.

Results of reconstructive plastic surgery. In the study, when assessing FR and ER after repair of defects formed after radical removal of LATMF, a universal system of criteria was used, developed using the EORTC QLQ c.30, QLQ-H&N.35 and ECOG systems. The system combines assessment based on general and specific criteria.

General criteria include the intensity of the feeling of pain and options for eliminating pain, the professional suitability and ability to work of the patient depending on the functionality of the operated area, his perception and emotional assessment of the results of the operation, and criteria specific to the maxillofacial area include the ability to eat any food (chewing, swallowing), the degree of articulation and speech impairment, the level of adaptation to the social environment, a noticeable degree of aesthetic defect.

Each criterion was assessed on a 5-point scale according to the corresponding symptoms. To obtain the final result, the ratio of the maximum number of points to the number of points determined in a particular case was studied. With a final score of ≥75% – "good", 50–75% – "sufficient", 25–50% – insufficient, ≤25% – "bad" result. We classified "bad" results as unsatisfactory results, due to the fact that we did not notice much difference between them. Functional results (FR) and aesthetic results (ER) of reconstructive operations are presented in chart 3.

The discrepancy between the numerical indicators of FR and ER, which can be seen from the graph, is explained by the fact that after restoring defects in some localizations, we did not evaluate FR and were satisfied with only ER. Thus, reconstructive surgeries performed in a group of patients on the skin of the face and neck did not lead to significant impairment of body functions. This group

included 22 patients, of which 4 had skin defects on the neck, 8 had skin defects on the cheeks, and 10 had skin defects on the nose. Thus, FR was studied in 128 of the 150 patients included in the study, and ER was studied in all. As can be seen from the graph, good results of FR and ER were recorded in 57 (44.5±4.39%) and 61 (40.7±4.01%) patients, respectively, which can be considered as a high rate of reconstructive operations performed in oncology . It is also noteworthy that sufficient FR and ER were observed in 66 (51.6±4.42%) and 73 (48.7±4.08%) patients, respectively (t=0.48; p>0, 05).

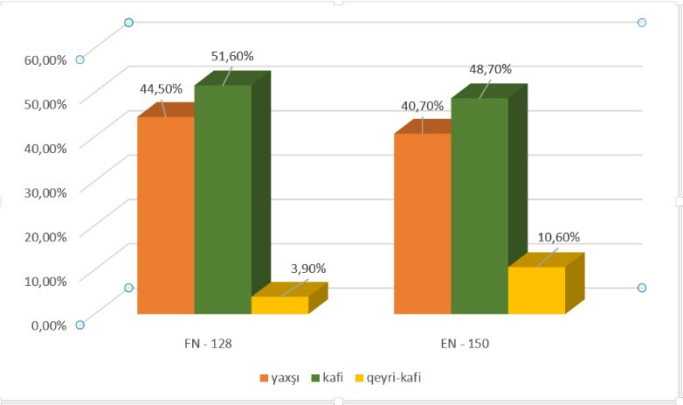

Chart 3. Distribution of FR and ER depending on the total number of patients.

After the performed reconstructive operations, insufficient FR was observed in 5 (3.9±1.71%), and insufficient ER in 16 (10.6±2.51%) cases (t=2.22; p<0,05).

Thus, complete or almost complete restoration of the function of various organs of the maxillofacial region after reconstructive operations was recorded in 123 out of 128 patients, which is 96.1%. Good and sufficient ER was achieved in 134 patients out of 150, which was 89.4% of the total number of patients. We studied FR and ER depending on the extent of tumor spread, location and type of defect, as well as the reconstructive flap used.

A study of FR and ER depending on tumor spread showed that

among 128 patients in whom FR was studied, good and adequate results were achieved in 86 of 88 patients with T3 tumors (97.7 ± 1.32) and in 37 of 40 patients with T4 (92.5±2.33%) (t=1.94; p>0.05). Among 150 patients in whom ER was studied, this figure was 88.6 ± 2.58% (in 78 of 88 patients) and 90.3 ± 2.42% (in 56 of 62 patients) for T3 and T4 tumors, respectively (t=0.46; p<0.05).

A study of FR and ER depending on the location of the defect showed that good and sufficient FR were approximately equal in the compared groups, in the 1st group of defects - 44.7±4.39% (in 34 of 76 patients) and 51.3% ±4.42% (in 39 of 76 patients; t=1.06; p>0.05), respectively, in the 2nd group 44.2±4.39% (in 23 of 52 patients) and 51.9 ± 4.42% (in 27 of 52 patients) respectively (t=1.24; p>0.05). The same can be said about ER. Thus, good and sufficient ER in group 1 was observed in 31 of 76 patients (40.9±4.01%) and 37 of 76 patients (48.6±4.08%), respectively (t=1.37; p>0.05), in the 2nd group - in 30 (40.5±4.00%) and 36 (48.7±4.08%) patients, respectively (t=1.44; p>0.05).

A study of FR and ER depending on the type of defect showed that between the compared groups, good and sufficient FR in type 1 defects was 96.2±1.69% (in 51 of 53 patients), 97.2±1.35% (in 35 out of 36 patients) in type 2 defects, 94.9±1.80% (in 37 out of 39 patients) in type 3 defects. According to EN, these indicators were respectively 90.6±2.38% in the 1st group (48 out of 53 patients), in the 2nd group 87.9±2.66% (in 51 out of 58 patients), in 3rd group - 89.7±2.48% (in 35 of 39 patients).

Depending on the type of reconstruction flap, the study of FR and ER showed the following:

- good and sufficient FR was observed in 79 of 81 patients (97.5±1.38%) when using cutaneous and fasciocutaneous flaps and in 44 of 47 patients (93.6±2.16%) when using musculocutaneous flaps;
- the frequency of good and sufficient ER was 90.2±2.43% (in 92 of 102 patients) when using cutaneous and fasciocutaneous flaps and 87.5±2.70% (in 42 of 48 patients) when using musculocutaneous flaps;
- the highest rates of good and sufficient FR were observed

when using NLF, SCF and SMF and amounted to 100.0% (in all cases when NLF-29, SCF-19, SMF-26 were carried out). When using FF, this indicator was 96.6±1.60% (in 28 out of 29 patients), PLF-88.9±2.78% (in 8 out of 9 patients), SCMF-85.7±3.09% (in 8 out of 9 patients), PMF-80.0±3.53% (in 4 out of 5 patients) and CF - 75.0±3.83% (in 3 out of 4 patients);

- the best ER rates were observed when using SMF, SCF, NLF and FF and amounted to 96.2±1.56% (in 25 of 26 patients), 95.4±1.71% (in 21 of 22 patients), 93.9±1.95% (in 31 of 33 patients) and 87.5±2.70% (in 35 of 40 patients), respectively. When using SCMF, PMMF and NLF, these results had the following frequency: 85.7±2.86% (in 6 out of 7 patients), 80.0±3.26% (in 8 out of 10 patients) and 60.0±4 .00% (in 3 out of 5 patients), respectively.

Thus, good and sufficient FR and ER as a result of reconstruction of defects after radical operations performed for locally advanced tumors in 150 patients of the main group were found in 96.1±1.71% and 89.4±2.51% of patients, respectively ($t=2.25$; $p<0.05$).

CONCLUSIONS

1. The proposed working classification of soft tissue defects formed after the removal of LATMF dictates a different approach to the selection of an effective method of reconstruction. The main criteria for the choice of the reconstruction method are the localization, dimensions and type of the defect, anatomical characteristics of the reconstructed and donor areas [5,20].
2. The application of 3D modeling and planning in the reconstruction of soft tissue defects of the maxillofacial region allows obtaining accurate information about the volume characteristics of the defect, which enables the formation of a reconstructive flap with minimal traumatization of the donor zone, and early rehabilitation of patients. In the CAS group, compared to the traditional group,

the average operation time (t=3.95; p<0.01) and the length of stay in the clinic after surgery (t=1.23; p>0.05) were significantly reduced[24].

3. The vast majority (93.1±2.07%) of skin defects of the facial region and neck, not associated with cavities, were restored with cutaneous and fasciocutaneous flaps, tumor defects of the oral cavity not associated with the skin in most cases (71.7± 3.67%) was reconstructed with musculocutaneous flaps (t=5.08; p<0.001). When reconstructing full-thickness defects in this area, cutaneous and fasciocutaneous flaps were used in 82.1±3.13% of cases, musculocutaneous flaps - in 15.4±2.95% of cases (t=5.08; p<0.001) [13, 14, 15].
4. The frequency of postoperative local complications during the reconstruction of the defect formed as a result of removal of LATMF was 39.3±3.99% and agrees with literature data. The structure of local complications was TN (3.4±1.48%; t=8.45; p<0.01), PN (18.6±3.18; t=4.05; p<0.01)), MN (30.5±3.76%; t=1.61; p>0.05) and WD (47.5±4.08%; t=1.44; p>0.05), which shows the efficiency of the used reconstruction algorithm[23].
5. The study of the results of treatment showed the high effectiveness of reconstructive operations in terms of quality of life. Good and adequate FR and ER were recorded in 96.1±1.71% and 89.4±2.51% of cases, respectively, and inadequate results was observed in 3.9±1.71% and 10.6±2.51 of patients (t=2.21; p<0.05) [4,21].

PRACTICAL RECOMMENDATIONS

1. In order to plan the method of reconstruction of large soft tissue defects of the maxillofacial region, the use of CTA during the preoperative examination ensures the selection of an adequate reconstructive flap and the optimization of early surgical rehabilitation of patients.
2. It is more appropriate to perform the reconstruction of the large defects formed after the radical surgery in one stage.

This makes it possible to shorten the period of surgical rehabilitation of patients and reduce the financial costs of their stay in the hospital.

3. The division of large soft tissue defects of the maxillofacial region into 3 main groups allows to systematize and simplify the methodological approaches to the initial planning of reconstructive operations, as well as provides accurate formulation of instructions and contraindications for the restorative stage of the operation.
4. The use of multiple cutaneous, fasciocutaneous and musculocutaneous flaps for the reconstruction of large soft tissue defects of the maxillofacial area is useful for the reconstruction of any defects, regardless of location, size and composition of tissues, without additional costs for special expensive equipment required for the use of free grafts and can be performed in any surgical hospital without request.
5. The main effect of FR and ER of reconstructive-plastic surgery of large tumor defects of the maxillofacial area is the frequency and nature of local postoperative complications. From this point of view, correction of homeostasis indicators in the preoperative period, high technical execution of the formation of reconstructive flaps during the operation, active anti-inflammatory and anticoagulant treatment in the postoperative period are of urgent importance.

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LIST OF ABBREVIATIONS

CAS – computer assisted simulation
CF – cervical flap
ER – esthetic results
FF – forehead flap
FR – functional results
PN – partial necrosis
MN – marginal necrosis
CTA – computed tomography angiography
NLF – nasolabial flap
PF – proqnostic factors
PLF – platysma flap
PMMF – pectoralis major myocutaneous flap
SCF – supraclavicular flap
SCMF – sternocleidomastoid flap
SMF – submental flap
T/SN – total/subtotal necrosis
WD – wound dehiscence
LATMF – locally adanced tumors of maxillo-facial region

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