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Success Rate of Free Flap Reconstructions in Elderly Patients

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Abstract There is much evidence that microvascular free flaps are successfully used in the reconstruction of the head and neck defects in cancer patients. It has become evident that proportional with ageing population, there is an increase in the number of elderly patients requiring microvascular reconstruction after radical excision of tumors in the head and neck region. The aim of this study is to estimate the correlation between the application of a microvascular free flap for defect reconstruction in elderly patients based on ASA (American Society of Anesthesiology) classification and postoperative surgical and medical morbidity. Study included 31 patients older than 70 years hospitalized in the period from 1996 to 2010 at the Clinic for Maxillofacial Surgery, Zagreb, Croatia. Base of reference for every patient included data about: gender, age, date and length of surgical procedure, basic diagnosis, chronic illneses, ASA (American Society of Anesthesiology) clasiffication, type of surgical procedure, type of microvascular free flap, postoperative complications, length of hospitalization and treatment results. Based on the data analysis it is estimated that morbidity was significantly higher in the number of male patients than the number of female patients (61% : 38.7%). Average age was 76 years and the oldest patient was 87 years old. According to ASA clasiffication patients were mostly ASA III (60,87%) and then ASA II 26.08%. Overall, the success rate of microvascular free flap was 94%. Moreover, postoperative medical complications were in the correlation with ASA status 19.45%. The study shows that the successs rate of microvascular free flap reconstruction of cancer in the head and neck region with elderly patients is directly related to ASA and the length of surgical procedure, as significant predictors in postoperative surgical and medical morbidity.

Keywords: ASA clasiffication, microvascular free flap, radical surgical procedure, hemodynamic parameters

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1. Introduction

Microvascular free flaps are successfully used in the reconstruction of head and neck defects in cancer patients. The role of the free flap is aimed to improve the postoperative functions of the patient such as: chewing, swallowing, voice articulation and speech. Moreover, patient's quality of life directly depends and is significantly affected by the postoperative functional results, facial expressions and a specific method of reconstruction [1].

The emergence of microvascular tissue transfer during seventies in the last century opened entirely new possibilities in the sphere of reconstructive surgery. The most significant shift in reconstructive surgery was the application of a forearm flap for reconstruction of defects in the oral cavity.

First microvascular forearm flap transfer was made in 1978. in China for the reconstruction of the face and neck burns, however, it was not performed in the oral cavity. In 1982. Soutar first used a forearm flap for the reconstruction of the oral cavity. In the next few years that followed, research and literature generated a series of modifications and descriptions of the microvascular flap [2].

Muhlbauer [3] first described the advantages of forearm fasciocutaneous microvascular flap and particularly its thinness, simplicity with raising the flap, anatomical consistency, as well as long and large-diameter vascular pedicle. Many surgeons (Cheng, Hatoko, Chen) applied this technique (forearm flap) for reconstruction of the oral cavity and reconstruction of the tongue, hard and soft palate, the closure of alveolar ridge and creation of a base for the prosthesis, as well as the closure of defects of the hypopharynx, trachea and esophagus. With the inclusion of the bone segment radius, osteocutaneous forearm flap can be used for reconstruction of the mandible.

Loewen [4] and others have determined that there is insufficient evidence for the use of unnerved radial forearm flap for reconstruction of defects after hemiglosectomy. In 8 patients with the anterior reconstruction of the two thirds of the tongue paresis with

radial forearm free flap tests were administered for taste, chewing and speech abilities. The taste part of the tongue which was not operated on was not significantly different from the control cases after the reconstruction, while the operated part of the tongue showed significant difference. Although operated patients had similar taste abilities as the control cases, there were significant differences between the two groups. Even though taste abilities were mostly preserved, functional results for chewing and speech clarity, in a certain number of patients significantly deteriorated.

Hara [5] and others in a study of 25 patients evaluated the postoperative swallowing, speech and mortality of the donor region. Intraoral defect reconstruction with LUFF (lateral upper arm free flap) was performed in 18 patients, and 7 had a RFFF (radial forearm free flap). Video fluoroscopy method was used in the assessment of swallowing, Freiburger's audiometry was used for the assessment of speech, and measuring hand diameters was used to assess the morbidity of the donor region. A questionnaire was used for the evaluation of speech, swallowing and mortality of the donor region. Swallowing Impairment level depended on the region of resection. Front and rear intraoral resection affected swallowing more than lateral resection. Front lateral resection and LUFF affected the speech abilities. There was no difference between the damage by the LUFF and the RFFF. They concluded that LUFF was better in comparison to RFFF, because the donor region can be closed primarily and flap deterioration and decay are minimal.

Over the last ten years the use of free flaps has been intensified and is slowly taken a leading role in the reconstruction of head and neck region. Benefits of free flaps are the optimal size and thickness of the free flap with minimal morbidity of the donor region. Further anatomical-surgical studies have led to the application of the thigh as the donor region with three new types of free flaps: posterior, anterolateral and anteromedial. (Song 1984). Anterolateral flap (ALT) showed to be the most successful type for the reconstruction of head and neck region. Due to the fact that perforator goes through the lateral vastus muscle, rather than strictly along the intermuscular septum, lateral vastus muscle components must be included in the flap in such cases. Besides the posibillity to raise a large area of a skin flap it is also possible to raise just the muscle flap, indicating the multiple applications of the ALT flap [6].

Wolff[7] was the first to apply a microsurgical transfer vastus lateralis muscle in the oral cavity by a using myofascial and myocutaneous flap. In his further research, Wolff pointed out the importance of using the muscles in a combination with skin pedicles for reconstruction of the head, neck, skull base defects and perforated cheek defects.

Wei [8] and others define perforating vessels as cutaneous vessels which penetrate the muscle and fascia to reach the skin. The true perforator flap (cutaneous or fasciocutaneus) includes intramuscular dissection of perforator vessels up to the main stem to obtain adequate length and diameter of the vessels. During the dissection peroneal artery is normally preserved. Most commonly a thin piece of skin 6x8cm in diameter is used to cover the defect after resection of squamous cell carcinoma of the bottom of the oral cavity, soft palate, tongue and buccal mucosa. Anastomosis is performed on the lingual artery and pripadajuća vein. Perforator flaps healed without complications and functional results were generally satisfactory. At the donor site, which was immediately closed a 15 cm scar remained with no functional disorders. Perforator flaps from the lower part of the leg have numerous applications in intraoral soft tissue reconstruction in particular due to the low rate of decay and deterioration of the flap.

Type of free flap depends on the size and location of the defect, lumen of blood vessels, technique and experience of the surgical team and the overall state of the patient. For a succesfull free flap the most important factors are surgical technique and a good function of anastomized blood vessels, but there are other factors which may contribute to the survival rate of the free flap such as hemodynamic parameters, peripheral vascular diseases, length of surgical procedure, perfusion and oxygenation of tissue, blood flow, anticoagulants [9,10,11,12].

Most studies on microvascular reconstruction includes only younger population. Aging is a progressive physiological process with not completely known mechanism on cellular and biochemical level which leads to changes in tissues and organs. Proportional with aging population there is an increase in the number of elderly patients requring microvascular reconstruction after radical excision of tumors in the head and neck region. Most epidemiologic studies use the following aging division: old 65-74, older 75-84 and very old over 85 years. Surgical procedure with these patients enables improvement and/or function maintanance, life quality improvement, reduces pain and further suffering. There is a significantly high risk rate for complications with elderly patients after surgical procedure due to existing chronic illnesses, high rate of alcoholism and smoking in patients with head and neck cancer [13]. Aim of this research is to show the validity of applying a microvascular free flap for defect reconstruction in elderly patients.

2. Materials and Methods

Study included 31 patients older than 70 years hospitalized in the period from 1996 to 2010 at the Clinic for Maxillofacial Surgery, Zagreb, Croatia. Base of reference for every patient included data about: gender, age, date and length of surgical procedure, basic diagnosis, chronic illneses, ASA clasiffication, type of surgical procedure, type of microvascular free flap, postoperative complications, length of hospitalization and treatment results. All patients were treated by the same team of surgeons, maxillofacial surgery specialist with other residents conducted an ablativ procedure followed by another specialist for reconstructive surgery during the same procedure. Microvascular anastomoses were performed in an end-end fashion with the most suitable recipient vessels, with the assistance of an operating loupe. A single arterial and venous anastomosis was performed in an end–end fashion with the most suitable recipient vessels with interrupted 8-0 nylon sutures in most cases. No vein grafts were used in this study. The outcomes were tabulated and entered into a computer database for analysis (Microsoft Excel, Redmond Washington).

Anesthetics were administered by the same specialist who also administered the ASA status. During surgery all patients were routinely monitored. Central vein pressure, direct artery pressure and diureses were measured routinely. Postoperatively patients spent 24 hours in ICU (in some cases more) after which they were transfered to PACU.

3. Results

In the period from 1996 to 2010 at the Clinic for Maxillofacial Surgery, Zagreb, Croatia, 345 microvascular free flap surgeries were completed after tumor ablation in 31 patients older than 70 years. Results show that the number of male patients was significantly higher than the number of female patients (61% : 38.7%). Average age was 76 years and the oldest patient was 87 years old. According to ASA clasiffication patients were mostly ASA III (60,87%) and then ASA II 26.08%. The success rate of microvascular free flap was 94%. Postoperative medical complications were in the correlation with ASA status 19.45%

The most common tumor localization in our patients was pharynx in 32.25% of patients (Table 1). Definite pathohistological results after tumor ablation in 67.74% was planocellular cancer. Forearm free flap was used for reconstruction in 12 patients, latissimus dorsi flap was used in 6 patients (Table 2). Average surgery length was 6 hours and 12 minutes (ranging from 4 to 14 hours). Postoperative surgical complications were 19.35% (Table 3). In two patients revisions of anastomosis were performed due to danger of bleeding or morbidity of flap. With anastomosis revision one artery trombosis and one vein trombosis were found. Out of 31 free flaps 27 were a primary success. Revised flaps resulted in two successes and two failures. Overall success rate of microvascular free flap rate was 94%. One patient had tendon necrosis M. flexor halucis longus, and necrotomy was performed. Postoperative medical complications were 19.45% which is in correlation with ASA status according to age groups. Most common medical complication was the change in psychic state (delirium), bronhopneumonia, heart arithmia, cerebrovascular accident. Average length of stay in the hospital was 20 days and with an extended stay in ICU in some patients.

Table 1. Anatomic distribution of malignancies

Site	Number of patients	Percentage
Pharynx	10	32.25%
Oral cavity	7	22.58%
Orbit	5	16.10%
Maxilla	4	12.90%
Mandible	3	9.67%
Head	2	6.45%

Table 2. Method of Reconstruction After Radical Excison of Head and Neck Malignancies

Types of Free Flaps	Number of patients	Percentage
Radial forearm FF	12	38.70%
Osteofasciocutanous FF	8	25.80%
Latisimus dorsi FF	6	19.35%
Latisimus dorsi+scapula FF	2	6.45%
ALT FF	3	9.67%

Table 3. Postoperative surgical complications

No complications		21	67.77%
Complications:		6	19.35%
Hematoma	1		
Dehiscence in the mouth	1		
Dehiscence on the neck	2		
Tendon necrosis	2		
Postoperative deaths		4	12.90%

4. Disscusion

After the age of 50 starts a slow fibrosis of the heart system and with it the loss of cells in the sinus atrial knot which leads to an increase in arithmia occurence and reduction of heart minute volume. Kidney function decreases by 1 % in terms of reduction of clearens creatin agents 1ml/min/year. Lungs start to lose alveolar compartments, anatomic dead space increases and with reduction of elastin and the overall size of alveoles. With reduction of liver functions proportional flow reduction through the liver occurs. All of these factors are often used as the age risk factors for the failure of the surgical procedure. Most common defect reconstruction with elderly population after tumor removal in the head and neck region was a miocutaneous pectoralis major i latissimus dorsi flap. The advantage is the simplicity in raising and closing soft defects. As the life quality of older patients grows so does the need in that age for more functional defect reconstruction and microvascular flap. Reconstrucion with microvascular flap is a complicated surgical procedure tied with increased anesthesiological risk due to prolonged length of surgery [14-19]. The average length of surgery based on the research by Ingles et.al. was 6.6 hours [20] which is equal to an average length of surgery at Clinic for Maxillofacial Surgery, Zagreb, Croatia. Optimal preoperative patient preparation and careful postoperative care contribute to a smaller number of complications intra and postoperative which is supported by Serrleti et.al. [21] Postoperative complications in our research were relatively low 19.3%. Bonawitz [22] had similar results in series of microvascular free flaps in 47 patients above the age of 60, where postoperative complications were evident in 15 (21%) patients. Donor region complications as well as other surgical complications were mostly treated in a conservative way (antibiotics, active wound dressing) which has also been done in the study by Bridger et al [10].

Several aspects of this study deserve special comments. The study shows that age should not be a counterindication for radical surgical procedure of cancer in the head and neck region and then reconstruction with microvascular free flap. ASA and the length of surgical procedure are significant predictors in postoperative surgical and medical morbidity. Although age of the patients cannot be linked to an increased risk in postoperative complications, most studies show that other factors such as prolonged anesthesia in elderly patients can be linked to an increased chance of more severe complications.

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