

RECONSTRUCTIVE MICROSURGERY WITH FREE FLAPS IN HEAD AND NECK CANCER: A NARRATIVE REVIEW OF THE CURRENT LITERATURE ON SURGICAL TECHNIQUES, RESULTS AND COMPLICATIONS

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Abstract: Objective: To discuss the relevance of reconstructive microsurgery with free flaps in patients with tissue defects resulting from resection of head and neck cancer, as well as the influence of this reconstruction on the potential improvement of patients' quality of life and the possible reduction in the need for additional surgeries. **Methodology:** Literature review conducted through searches in the Scielo and Pubmed databases. A total of 178 articles were identified, of which 18 were selected after applying exclusion criteria, all published from 2013 to 2022. **Results:** Microsurgery with free flaps is indicated in situations of extensive tumor removal to achieve superior aesthetic and functional results, as well as reduce morbidity in the donor area. It is not recommended for the repair of small defects, in which grafts or local flaps are used. The main flaps used include the antebrachial radial, fibular and latissimus dorsi muscle flaps. Furthermore, the free flap of the medial femoral condyle, of bone nature, has advantages such as flexibility, ease of implantation and capacity for remodeling. Donor site morbidity and complications are generally minimal, including hematoma, seroma, suture abscess, and necrosis. Serious complications, such as radial nerve injury and dehiscence, were only observed in the lateral arm flap.

Final considerations: Reconstruction microsurgery with free flaps constitutes an efficient and safe approach for the management of patients undergoing resection of head and neck neoplasms. We highlight better aesthetic and functional outcomes, decreased morbidity in the donor area and the feasibility of performing more complex procedures.

Keywords: Reconstruction with Free Retail; Head and Neck Neoplasms; Postoperative; Techniques.

INTRODUCTION

Head and neck cancer represents the sixth most common form of cancer, with an estimated worldwide incidence of more than 600,000 new cases annually. Technological advances in the use of free flaps in reconstructive operations have transformed the treatment of this type of tumor, as they adapt to the lesion and allow for more complex reconstructive procedures and more extensive simultaneous resections of the head and neck (LIANG et al., 2018). Previously, the pedicle flap or local flap was used to correct significant defects, but aesthetic and functional reconstruction was challenging, mainly due to tissue necrosis, in addition to the lack of efficacy in covering the skin and mucosa (ONODA S.; MASAHITO K., 2020; GABRYSZ-FORGET, F. et al.2019). The development of the microsurgical technique with free flaps has reduced the prevalence of postoperative vascular problems to a rate of 1% to 3% in such operations (MOYA-PLANA A. et al., 2019).

Among the frequently performed reconstructive procedures, microsurgical tissue transfer is considered the gold standard for large head and neck defects (SAKURABA M. et al., 2013). Most flap failures occur within the first 48 postoperative hours, with thrombosis in the vascular pedicle being the main cause, with a higher prevalence of venous than arterial. However, failure is uncommon, and success rates for free flaps range from 94 to 99% (FORNER D. et al., 2018).

This study aims to address the use and role of reconstructive microsurgery with free flaps in patients with tissue defects resulting from head and neck cancer resection. In addition, we intend to discuss the role of reconstruction with free flaps in improving the quality of life of patients and potentially reducing the need for additional surgeries.

METHODOLOGY

This is a narrative bibliographic review developed according to the criteria of the PVO strategy, an acronym that represents population or research problem, variables and outcome. This strategy was used to elaborate the guiding question of the present research, which was the following: "Does the microsurgery technique of reconstruction with free flaps in patients with head and neck cancer provide better results and fewer complications?". In this sense, according to the parameters mentioned above, the population or problem of this research refers to patients with head and neck cancer, the variable refers to reconstruction microsurgery with free flaps for and the outcome would be better prognosis. The searches were carried out through searches in the PubMed and Scientific Electronic Library Online (SciELO) databases. Such descriptors were used in different combinations with the Boolean operators "AND" and "OR". As a result of such searches, a total of 935 articles were found in PubMed and 67 in SciELO. Such articles were submitted to an initial analysis, by reading the title and abstract, leading to a total of 178 articles which were submitted to the inclusion and exclusion criteria explained below. Inclusion criteria were: articles published in English, Portuguese and Spanish; published in the period from 2013 to 2022; review, meta-analysis, cohort study and clinical trial; available in full and that addressed the themes proposed for this research. Exclusion criteria were duplicate articles, available in summary form and that did not directly address the studied proposal and did not meet the other inclusion criteria. After applying these inclusion and exclusion criteria, a total of 18 articles were selected to compose the collection of this study, 15 articles from PubMed and 3 articles from Scielo.

RESULTS

BASIC PRINCIPLES OF RECONSTRUCTIVE MICROSURGERY WITH FREE FLAPS: INDICATIONS AND CONTRAINDICATIONS

Free flap microsurgery has revolutionized contemporary plastic surgery with fundamental changes in the therapy of advanced head and neck neoplasms. Reconstruction with free flaps has already been considered a routine procedure in head and neck surgery due to better functional and aesthetic results, as well as generally higher success rates. This technique replaces other types of flaps by improving the aesthetic and functional quality of reconstructions by translocating multiple tissues in a single procedure, also enabling the execution of more complex reconstructive procedures (ONODA S.; MASAHITO K., 2020; LIANG J. et al., 2018). For Moya Plana A. et al. (2019), free flaps are considered the gold standard due to their versatility and adaptability in patients with extensive head and neck neoplasms.

As described by Souza C.D. (2012), free flap microsurgery is indicated in cases of extensive tumor removal in order to obtain better aesthetic and functional results and reduce morbidity in the donor area. In cases of sarcomas in young people and in healthy patients, extensive resections can be performed, and reconstruction with free flaps is an adequate, safe, reliable and versatile option, with minimal morbidity at the donor site (BOLEA E. et al., 2020). This procedure is indicated especially in situations involving significant loss of anatomical structures that require complex reconstructions, such as the dura mater, bones and vessels. Miller L.E. et al. (2020) also recommend the use of free flaps for secondary reconstruction of recurrent diseases, fistulas and dehiscence after

primary resection. Several studies highlight that the procedure is also recommended for individuals with multiple comorbidities, since most patients with neoplasms are elderly (KANG S. Y. et al., 2018; MILLER L.E. et al., 2020).

However, according to Souza C.D. (2012), the technique of microsurgical free flaps is contraindicated for the repair of small defects, preferring the use of grafts or local flaps (KANG S. Y. et al., 2018). It is also important to note that this procedure differs from other normal surgical procedures, and a novice operator is not able to perform it, even when assisting a more experienced surgeon (ONODA S.; MASAHITO K., 2020; KANG S. Y. et al., 2018). A highly trained multidisciplinary team with hospital support is required to perform this procedure, and it is inappropriate to perform it in hospitals without available resources (SOUZA C.D., 2012). As mentioned by Cash H. et al. (2019), these patients usually require postoperative care and monitoring in intensive care units. This results in a longer hospital stay and costs involved than other types of flaps.

SURGICAL TECHNIQUE: AN OVERVIEW OF THE MOST COMMON FREE FLAP TECHNIQUES

There are countless surgical techniques for reconstruction with free flaps. However, such possibilities present a challenge to the surgeon. The absence of tissue and positive functional and aesthetic results after tumor excision, osteonecrosis or severe trauma are the main existing obstacles, mainly due to extensive and voluminous defects in the head and neck. Proximity to important anatomical structures (for example: orbital contents, internal carotid artery, skull base) causes difficulties for a wide resection. In this context, a reconstruction procedure becomes mandatory after a major surgical resection that has vital potential

(protection of the skull base and vessels against bacteria and desiccation), functional (oculopalpebral, speech and swallowing) and aesthetic consequences (MOYA-PLANA A. et al., 2019).

The combination of cancer, resection and immediate reconstruction of the head and neck is a time-consuming operation, with a total time of 6 to 10 hours. To reduce surgical time and invasiveness, the two-teams approach has been widely adopted (SAKURABA M. et al., 2013). Studies have shown that the use of VSP (Virtual Surgical Planning) technology reduced the time in the operating room by 1.0 to 2.5 hours. This technology facilitates reconstructions by creating milled or printed plates that fit perfectly to the planned reconstruction (CASH H. et al., 2019). Such an improvement in efficiency and procedure time is significant, as operating room time in the United States is estimated to cost US\$50-100 per minute. Taking these numbers into account, there is an estimated saving of US\$ 3,000 to US\$ 10,000 per case, also financially justifying the costs of such technology.

In general, the most common methodologies for reconstruction with free flaps are the antibrachial radial, fibular and latissimus dorsi muscle flaps. Therefore, flaps need to have certain characteristics such as: versatility in shape, sufficient tissue stock, superior texture, low morbidity at the donor site, availability of different types of tissue in a pedicle, possible reinnervation, long pedicle, feasibility of an approach of two teams and consistent anatomy for safe and easy flap elevation. Both the latissimus dorsi (LD) flap and the anterolateral thigh (ALT) flap fulfill most of these characteristics and are widely used for the reconstruction of extensive and/or voluminous defects in the head and neck region (HORN D. et al., 2014).

Among such flaps mentioned, one of the most used are the radial of the forearm,

anterolateral of the thigh and fibular (FORNER D. et al., 2018). The free flap of the medial femoral condyle (MFC) is a bone flap covered by periosteum, essential in bone recovery. This flap is indicated for reconstructions of the maxilla and mandible and preferably in smaller defects of up to 3 cm, but it can also be used in reconstructions of up to 13 cm and is widely used in the treatment of bone fractures with complex healing. (FORNER D. et al., 2018; BANASZEWSKI J. et al., 2019). The latissimus dorsi scapular free flap is a technique indicated for large face and maxillary defects (MOYA-PLANA A. et al., 2019). Another flap option is the lateral arm flap, indicated for defects that require reconstruction of soft tissues in the head and neck such as the lip, tonsil, pharynx, larynx, forehead, cheek/parotid, orbit, scalp (KANG S. Y. et al., 2018).

The periosteal flap of the MFC is collected through a skin incision made along the posterior edge of the vastus medialis muscle and its fascia with anterior retraction of the muscle. The vessels are identified and the arterial branch is chosen based on its diameter, descending genicular or superomedial genicular, the vessels are then ligated along the pedicle and the flap is chiseled. The MFC flap reaches a diameter of 13 cm to cover bone defects (FORNER D. et al., 2018). The latissimus dorsi scapular free flap is mostly collected contralaterally to the flap receiving area. These flaps can be collected variably from the latissimus dorsi with a scapular tip, with serratus or independently (muscular and/or cutaneous), (MOYA-PLANA A. et al., 2019). In the lateral flap of the arm, a line is drawn between the deltoid and the lateral epicondyle of the humerus and the pedicle is dissected using a posterior and anterior approach from distal to proximal. This flap provides access to donor nerves, such as the posterior cutaneous nerve of the arm, a branch of the radial nerve,

which provides sensation to the flap (KANG S. Y. et al., 2018).

The MFC flap allows for complex reconstructions that can incorporate cortical, cancellous, periosteum, muscle, tendon, cartilage and skin bones. It is a flexible flap, easy to implant and remodel. Added to this, it is a flap used in the reconstruction of airways in laryngeal and tracheal support, avoiding tracheostomy in many cases. The MFC flap has low rates of complications and morbidity (FORNER D. et al., 2018). Free latissimus dorsi scapular flaps are advantageous in complex defects of the middle third of the face, such as in maxillary defects, and have low rates of complications and morbidity, in most cases observed, they did not interfere with speech, swallowing and mastication (MOYA-PLANA A. et al., 2019). Regarding the lateral arm flap, collection is tedious due to the small blood vessels and short pedicle, however, it is excellent in fat volume reconstructions, a notable option for skin resurfacing of cervicofacial defects, in addition to the favorable color combination, which favors aesthetics after the procedure (KANG S. Y. et al., 2018).

COMPLICATIONS AND MANAGEMENT: MOST COMMON COMPLICATIONS

As with most major surgery, there are risk factors that increase your chances of complications. Crises and flap failures are still reported, and the reasons associated with these complications are varied (LIANG J. et al., 2018). The main complications of the free flap, including dehiscence, vascular congestion, necrosis and hematoma, require immediate treatment (MOYA-PLANA A. et al., 2019). According to Crawley M.B. et al. (2019), the most common variables associated with failure to use the free flap are revision of the vascular pedicle during surgery,

absence of blood supply for an extended period, and alcohol intake and abstinence. To reverse this situation, a set of preoperative interventions is necessary, such as the early recognition of hospitalized patients at risk of developing alcohol withdrawal, combined with therapeutic resources and nutritional procedures, as a way to minimize the possible complications that affect the rate. success of the surgery.

In this sense, there are also other factors that lead to failure of the free flap, such as vessel depletion, hypercoagulability, external pressure from structures, and both failure to remove and manage the pedicle. To solve this flap loss, the most reliable and safest option is the placement of a second flap consecutively, which presented fewer complications and permissible period of hospitalization. For this, it is up to the physician to carry out a thorough evaluation of the patient and a thorough investigation of the flap failure, with the aim of increasing the satisfaction rates of free flap surgeries (COPELLI C. et al.2017).

The dorsoscapularis latissimus free flap has been shown to be a reliable technique for the reconstruction of complex midface defects. In fact, despite large maxillary defects (interruption of three facial pillars in 70% of patients) and a high rate of adjuvant RT (more than 80% of patients), 90% of patients did not have functional disturbances in terms of speech, swallowing and chewing. In addition, no serious complications were observed in the donor area, except for a seroma, and there were no infections or scarring problems; in contrast, the complication rate reported in the literature is approximately 5-10% (MOYA-PLANA A. et al., 2019).

The risk of complications from the MFC free flap is very low. Hematoma, seroma, suture abscess, femur fracture and cutaneous paresthesia of the saphenous nerve were some of the complications observed in a minority

of patients who underwent the procedure. (FORNER D. et al., 2018) The latissimus dorsi scapular free flap has a very low complication rate in the literature, such as flap or bone necrosis, more incidents in patients who received radiotherapy treatment or previous surgeries. Reconstruction of the orbital floor remains a challenge due to the high rate of postoperative complications such as oculo-palpebral and aesthetic problems. In addition, soft palate surgery has a poor prognosis for swallowing and speech disorders. (MOYA-PLANA A. et al., 2019) In the lateral arm flap, serious complications may occur, such as radial nerve injury, dehiscence, and impossibility of primary closure of the donor site when collecting large flaps. (KANG S.Y. et al., 2018)

In addition, the single microvascular free flap has been used mainly in head and neck surgeries with more complex intraoperative defects. However, there are more extensive resections involving many tissues which require the simultaneous association with another free flap or with a locoregional flap, since they require greater coverage to minimize defects in size, volume and tissue variety present. These deficiencies can lead to less common complications, such as infection, retraction of the surgical wound, hematomas, seromas and sialoceles. The main ones being the return to surgery to explore the vessel, total or partial death of the flap, fistulas, osteonecrosis, serious infections, large hematomas, healing of serious wounds and carotid rupture, mainly due to the greater complexity and time of the surgery. When comparing these new alternatives, the double flap showed lower rates of both complications and reduced flap survival. This way, it is more reliable for solving extensive defects and with greater difficulty in solving them that involve multiple tissues. Once chosen as a therapeutic method, an analysis of patients' comorbidities,

cost-effectiveness of surgery and surgical success rates is necessary in order to prevent postoperative risks and inform the real perspectives of surgery for patients (CHEN C. L. et al, 2018).

With regard to the postoperative period, the main late complications are venous thrombosis of the vascular pedicle, mainly due to the delay in angiogenesis of the flap caused by inadequate blood supply. Even more, it is worth noting that it is considered an uncommon failure, which usually happens in the second postoperative week (FORNER D. et al., 2018). In line with this parameter, according to Mashrah M. A. et al. (2022), when analyzing post-surgical complications, such as decreased flap survival, necrosis, reoperation, readmission, venous congestion, arterial thrombosis, sepsis, pneumonia, respiratory arrest, sepsis and delirium, it was found that patients undergoing hospitalization patients in the ICU compared to those who received nursing care and were not hospitalized did not show clinical differences in terms of reduction in flap failure and postoperative complications. This way, therapeutic care outside the ICU minimizes both hospital expenses and the most common postoperative complications, such as sepsis and pneumonia (VARADARAJAN V. et al., 2017).

FINAL CONSIDERATIONS

After reviewing the literature, it was found that reconstructive microsurgery with free flaps represents a safe and effective strategy for the management of patients with tissue defects resulting from the resection of head and neck neoplasms. In general terms, the evaluated results linked this method to superior aesthetic and functional outcomes, to the reduction of morbidity in the donor area and to the possibility of performing more complex procedures. In this context, it is noted that the use of free flaps in reconstructive

interventions proves to be a viable alternative, with a good prognosis, adequate adaptability to lesions and high versatility, enabling simultaneous resections of the head and neck.

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