



# Lower trapezius myocutaneous pedicle flap in head, neck, and chest reconstructions after cancer surgeries

*Retalho miocutâneo inferior pediculado do músculo trapézio nas reconstruções após cirurgias oncológicas de cabeça e pescoço, e tórax*

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## ■ ABSTRACT

**Introduction:** In this article, we present a literature review on the lower myocutaneous trapezius flap, and report its advantages, surgical technique, and complications. **Methods:** We studied 19 patients treated at INCA with a specific technique, and compared the outcomes with those reported in the international literature. **Results:** All reconstructions achieved the procedural objectives, and the defects of soft tissues and skin were repaired. The aesthetic outcome was considered satisfactory by the patients and medical staff. The rate of complications was 21%. No necrosis or signs of infection were detected in the flaps. Concerning the functions, 89.5% of patients preserved their motor function, whereas reduced functional movements were observed in 10.5% of the patients due to tumor invasion to the accessory nerve. **Conclusion:** Despite the continuous advancements in microsurgical techniques, pedicle myocutaneous flaps are still indicated for reconstruction procedures after extended cancer resections. The use of the lower trapezius myocutaneous flap is safe and represents a suitable option for the reconstruction of soft tissues of the lateral and posterior cervical regions, side of the head, shoulder, and upper paravertebral and parascapular regions.

**Keywords:** Lower trapezius flap; myocutaneous flap; head and neck reconstruction; chest reconstruction.

## ■ RESUMO

**Introdução:** Revisão da literatura sobre o retalho miocutâneo inferior do músculo trapézio, apresentando suas vantagens, técnica cirúrgica e complicações. **Métodos:** Estudo de 19 casos tratados no INCA, através de técnica específica, e comparação dos dados com a literatura internacional.

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**Resultados:** Todas as reconstruções atingiram seus objetivos, com correção dos defeitos em partes moles e pele. O efeito estético foi considerado bom pelos pacientes e pela equipe médica. Foi observada uma taxa de 21% de complicações. Não houve necrose ou infecção nos retalhos. Em relação às funções, 89,5% apresentaram função motora preservada e 10,5%, déficit funcional por acometimento tumoral do nervo acessório. **Conclusão:** Apesar do aprimoramento contínuo das técnicas microcirúrgicas, os retalhos miocutâneos pediculados ainda encontram indicações nas reconstruções após ressecções oncológicas alargadas. O retalho miocutâneo inferior do músculo trapézio é uma alternativa segura e aplicável para as reconstruções de partes moles das regiões cervicais lateral e posterior, da região lateral da cabeça, da região do ombro e para as regiões paraespinhal superior e paraescapulares.

**Descritores:** Retalho inferior trapézio; Retalho miocutâneo; Reconstrução cabeça e pescoço; Reconstrução tórax.

## INTRODUCTION

For the reconstruction of large defects after the resection of head and neck cancers, microsurgery techniques are the preferred option, in particular because of their versatility in three-dimensional reconstructions. In the thoracic region, the availability of different pedicle flaps means that microvascularized flaps should only be used for the reconstruction of large and combined defects. Although microsurgical flaps have advantages, their indication is not appropriate in particular situations. Prohibitive medical condition, reserved prognosis, hygienic resections, and difficulty of obtaining recipient vessels are some of the reasons justifying the use of pedicled flaps. The use of pedicled flaps reduces the surgical time, simplifies the reconstructive procedures, and could be carried out at centers for reconstructive plastic surgery that do not have microsurgical expertise. The use of pectoralis major muscle flaps for head and neck surgery and of latissimus dorsi flaps for thoracic surgery are of great importance and still used with high frequency. In these specific situations, the use of the lower trapezius myocutaneous flap is still limited. However, this is a simple alternative that presents a low morbidity and provides satisfactory results, with minimal functional loss, thus constituting a suitable option for the reconstructions of the upper chest and distal third of head and neck. In this article, we describe our experience with 19 consecutive patients that were operated on at the Reconstructive Plastic Surgery and Microsurgery Service of INCA (Rio de Janeiro, Brazil), between 2004 and 2009, by using the lower trapezius myocutaneous pedicle flap. In addition, we highlight the features, advantages, and complications of this treatment method.

## PATIENTS AND METHODS

We conducted a retrospective study of medical records of patients who underwent surgical treatment, between 2004 and 2009, for the resection

of advanced chest, head, and neck tumors. The subsequent reconstruction was performed by the plastic surgery team of INCA, by using the lower trapezius myocutaneous pedicle flap. We recorded the patients' demographic data, stage, location and histopathological diagnosis of the tumor, size of the surgical specimen (obtained from the pathological records), and complications related to the procedure. The patients were followed from the date of the scheduled surgery and monitored from 15 days to 31 months, during the outpatient treatment, for an average period of approximately 15 months. All patients were evaluated postoperatively in relation to the abduction capacity and elevation of the ipsilateral upper limb above the shoulder line.

### *Surgical technique*

The trapezius muscle is divided into three parts: upper, middle, and lower. Its vascularization derives from the transverse cervical, occipital, dorsal scapular, and perforating vessels from the posterior intercostal vessels. Owing to this pattern, several authors classify this vascularization as presenting the V pattern of Mathes and Nahai. Its motor innervation derives from the spinal nerve. Besides having other secondary functions, the trapezius muscle participates in the elevation, retraction, and rotation of the scapula, in addition to allowing the elevation of the shoulder during the abduction and flexion of the arm. Its denervation results in a drop of the shoulder<sup>1-6</sup>.

Demarcation of the skin island is carried out by taking as references the middle line and tip of the scapula. This should be planned in such a way that at least one-third of this area is located above the tip of the scapula, thus providing sufficient contact between the skin island and the muscle, while ensuring the preservation of the minimum number of perforating myocutaneous vessels and sufficient vascular supply to the skin. Once the skin island is planned and the medial edge is incised, muscle dissection can begin. The positioning of the skin

island could be changed according to the overlap between this structure and the muscle. Therefore, if juxtaposed, the marking should be maintained and in the presence of discrepancies, the skin island would then need to be re-marked, more caudal or cranial, depending on the position of the muscle. A craniocaudal dissection is performed with the transection of spine inserts and their lateral border, having as cranial limit the spine of the scapula. Thus, the dorsal scapular artery is identified, being located between the rhomboid major and minor muscles, which elevate the flap up to its pivot point, juxtaposing to the rhomboid minor muscle, which could be sectioned to improve flap rotation. The maintenance of a double vascularization provided by both the superficial cervical and dorsal scapular arteries ensures the safety of the procedure, which presents a lower rate of partial losses and flap necrosis. The communication between donor and recipient areas can be achieved by tunneling the cranial skin to the flap, or with incision and detachment. Muscle dissection should not exceed > 10 cm from the spine of the scapula, which represents the emergency point of the scapula, an option corroborated by other authors<sup>7-9</sup>. This limit for the muscle section is also essential to preserve the function of muscle horizontal fibers, which are responsible for the abduction of the upper limb and its elevation above the shoulder line. The implementation of the lower flap through this technique and the plan described above allows producing a flap with a skin island, the length of which varies according to the capacity of the flaccid skin of the patient to allow the primary suture of the donor area, since usually the arc of rotation enables to reach the lower temporal, occipital, parotid, and auricular regions, in addition to the lateral and posterior cervical regions. In the thoracic region, the arc of rotation involves the shoulder, scapular and parascapular, and ipsilateral and contralateral regions. Therefore, we were able to obtain a flap that was safe from a circulatory point of view and presented minimal functional morbidity<sup>1,9,10-18</sup>.

## RESULTS

Nineteen reconstructions were performed by using a lower trapezius myocutaneous pedicle flap. These were carried out at the Reconstructive Plastic Surgery and Microsurgery Service of INCA, in 12 female and 7 male patients. At the time of surgery, all patients presented an advanced tumor stage and were classified as T4 (TNM)<sup>19</sup>. The average age of the patients was 66.1 years and varied between 44 and 82 years.

After the resection of malignant neoplasms, all patients were treated with immediate reconstruction. The resected tumors were as follows: basal cell carcinoma in 8 cases, squamous cell carcinoma in 4 cases, and fibrosarcoma in 2 cases. One case each of the following histological types was also found:

osteosarcoma, peripheral nerve sheath tumor, cerebellar ovarian carcinoma metastasis, pilomatrix carcinoma, and soft tissue sarcoma. The dimensions of the tumors varied between  $7 \times 5 \times 3 \text{ cm}^3$  and  $18 \times 16 \times 6 \text{ cm}^3$ . These measures probably underestimated the actual size of the defect, owing to the primary contraction of the tumor after its resection. All flaps that were used have smaller dimensions. The 19 cases are summarized in Table 1.

All reconstructions achieved the proposed objectives in the surgical plan, and the defects due to soft tissue reduction and skin coverage were repaired. The aesthetic outcome in the recipient area was considered satisfactory by the patients and medical staff.

Complications were observed in 21% of the patients. No necrosis of the flaps or infections were observed in the receiving area. One patient presented a delay in the integration of the flap, and a new surgical procedure for the revitalization of the contact surface between the recipient bed and the flap was required. Two patients presented small dehiscences; however, these did not need a second surgical intervention. In all cases, a primary synthesis of the donor area was performed. Scar enlargement was observed on the back of four patients. One case of seroma was detected on the back of one patient, whereas no hematomas occurred after the removal of vacuum drains that were used in all patients in donor and receiving areas. The motor function of the ipsilateral upper limbs was preserved in 17 patients (89.5%). Two patients (10.5%) presented a reduced functionality of the ipsilateral upper limb, which was caused by the resection of the accessory nerve along with the tumor. Figures 1 to 5 show cases in which reconstruction with a lower trapezius flap was indicated, in addition to the surgical plan and outcomes during the immediate and late postoperative period.

## DISCUSSION

The first description of a trapezius muscle flap was published by Conley in 1972, based on perforating veins of the paraspinal muscle derived from posterior intercostal vessels<sup>20</sup>. McCraw et al., in 1977, were pioneers in studying skin regions in flaps<sup>21</sup>. Lateral and lower flaps were originally described by Demergasso and Piazza in 1979 and by Baek et al. in 1980, respectively<sup>10,11</sup>. As composite flaps, these were commonly used in jaw reconstructions. However, the high rate of complications, need for intraoperative decubitus change, and development of better techniques prevent their use nowadays. The trapezius muscle flap, being either muscular, musculocutaneous, or osteomyocutaneous, was classified as type II by Mathes and Nahai<sup>1</sup>. As the main pedicle, it presents transverse cervical vessels; on the other hand, occipital, dorsal scapular, and posterior intercostal perforating vessels serve as secondary pedicles. When the reconstruction is planned only with the use of a

**Table 1.** Summary of the cases.

Patients	Age (years)	Diagnosis	Tumor size (cm)	Topography (regions)
1	64	Fibrosarcoma	13 × 8 × 5	Upper paravertebral
2	53	Osteosarcoma	18 × 16 × 6	Shoulder
3	64	Tumor of the peripheral nerve sheath	11 × 9 × 5	Posterior cervical
4	54	BCC	15 × 11,5 × 5	Upper thoracic
5	78	SCC	9,5 × 8,5 × 3	Lateral cervical
6	63	BCC	10 × 9,8 × 3	Auricular and mastoid
7	78	BCC	6 × 5 × 4,5	Auricular
8	72	BCC	7 × 5 × 3	Auricular and parotid
9	71	SCC	9 × 8 × 3	Lateral cervical and auricular
10	58	Cerebellar metastasis of ovarian cancer	13 × 6 × 3	Occipital and posterior cervical
11	44	Pilomatrix carcinoma	18 × 13 × 3	Occipital and posterior cervical
12	65	SCC	8 × 7 × 4	Parotid
13	57	SCC	10 × 7 × 4	Parotid and cervical
14	69	Soft tissue sarcoma	12 × 11 × 3	Upper thoracic
15	77	BCC	8 × 6 × 3	Auricular
16	82	BCC	10 × 10 × 5	Posterior cervical
17	79	BCC	12 × 10 × 3,5	Occipital
18	55	Fibrosarcoma	14 × 7 × 4	Paravertebral
19	73	BCC	19 × 7 × 6	Shoulder

BCC, basal cell carcinoma; SCC, squamous cell carcinoma.



**Figure 1.** Defect, reconstruction, immediate postoperative period, and 7 days after the resection of retroauricular basal cell carcinoma.

muscle component, the middle and lower portions of the muscle, based on the descending branch of the transverse cervical artery, are used. This allows an arc of rotation based on the inferior-posterior region of the neck, and is able to reach the occipital, cervical, and superior-posterior thoracic regions as well as the middle third of the face. Three variants of myocutaneous flaps can be used: the lateral flap, upper flap, and lower trapezius myocutaneous flap. With this flap, it is possible to use vascularized bone tissues that include the spine and part of the body



**Figure 2.** Defect, reconstruction, immediate postoperative period, and 3 months after the surgery with a lower trapezius flap for the reconstruction of the occipital region. Notice the relation between the skin island and the projection of the trapezius muscle fibers.

of the scapula for the reconstruction of complex defects, such as in cases of mandibular resection<sup>22</sup>.

The lower trapezius myocutaneous flap presents the following advantages: reconstruction with tissue that is distant from the resection area and a long vascular



**Figure 3.** Repair of the largest defect in the occipital region carried out after resecting a pilomatrix carcinoma.



**Figure 4.** Photograph of the left shoulder resection, dissection and positioning of the flap to avoid disarticulation of the ipsilateral limb, and immediate aspect of the donor area. Late postoperative period of 6 months, showing the occurrence of an unsightly scar, with a satisfactory defect coverage and no functional loss.



**Figure 5.** Appearance after the resection of a large squamous cell carcinoma on the right shoulder. Images of the immediate postoperative period, and at 7 days and 12 months after the reconstruction. Scar enlargement in the donor area can be observed, with no motor dysfunction.

pedicle that provides an excellent arc of rotation. Moreover, it contains little subcutaneous tissue on its skin island, which presents few hairs and allows the primary synthesis of the donor area<sup>2-4,10,20,23-26</sup>. On the other hand, it has the disadvantage of causing the appearance of an unsightly scar in the donor area.

Mastering the angiosome concepts of the body allows modifying the skin islands plan, in order to increase the arc of rotation and ensure its viability, with a small contact area between the muscle and

skin island<sup>27</sup>. Recent studies showed that the use of the lower trapezius flap extending beyond the scapular spine is a feasible procedure, based on the vascularization obtained from the scapular dorsal artery and choke vessels located among its branches and intercostal vessels. Therefore, it is possible to obtain musculocutaneous flaps with sizes up to 7 × 38 cm, without the involvement of the dermal plexus and overlying skin, which in most cases remain functional and preserve the abduction capacity<sup>23-26</sup>. However, larger series of patients would be required to obtain statistically significant results to support the feasibility of this procedure.

The results from new anatomical studies and clinical series<sup>9</sup> have started to allow a safer indication of this procedure with less morbidity. A better knowledge on vascularization and the limitations of its recommendation in specific situations has allowed ensuring flap survival and significantly diminished failures<sup>7-9,12,17,18</sup>.

In our experience, the dissection of the lower trapezius myocutaneous pedicle flap based on two vascular pedicles, i.e., the superficial cervical and dorsal scapular vessels, allowed achieving a great vascularization of the flap, avoiding partial loss or necrosis, without presenting any difficulty with their rotation toward the cervical and thoracic regions. In addition, no associated functional losses were observed, contrarily to what was suggested by Haas et al.<sup>9</sup>. There is a lack of data in the literature on the morbidity of double-vascularized flaps, whereas this study demonstrates a concrete technique with safe results. However, further investigations on this technique are still required to corroborate our findings.

## CONCLUSION

Despite the continuous improvement of microsurgical techniques, myocutaneous pedicle flaps are still indicated for reconstruction procedures after extended cancer resections. The use of the lower trapezius myocutaneous flap is safe and represents a suitable option for the reconstruction of soft tissues of the lateral and posterior cervical regions, side of the head, shoulder, and upper paravertebral and parascapular regions.

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