



# Reconstruction of the upper region of the back with a V-Y trapezius musculocutaneous flap based on the dorsal artery of the scapula

## *Reconstrução da região superior do dorso com retalho musculocutâneo do trapézio em V-Y baseado na artéria dorsal da escápula*

JOÃO LORENZO BIDART

SAMPAIO ROCHA<sup>1,2\*</sup>

GERUZA REZENDE PAIVA<sup>1,2</sup>

LORENZO CARVALHO

SAMPAIO ROCHA<sup>2</sup>

ALLAN GOMES QUEIROGA<sup>1</sup>

FELIPE GOMES QUEIROGA<sup>1</sup>

### ■ ABSTRACT

**Introduction:** Defects in the upper region of the back are generally difficult to treat, especially in cases of exposure of vertebrae, meninges, or synthetic material. Primary closure with a muscular or musculocutaneous flap is the best choice, but the donor area to treat large defects may require grafting. Preservation of the dorsal artery of the scapula appears to ensure a larger cutaneous territory than that of the classic trapezius musculocutaneous flap based only on the transverse cervical artery. **Method:** A wide triangular island of skin was designed over the trapezius muscle based on the dorsal scapular artery with pendulum transfer and a V-Y type procedure in five patients after the extirpation of malignant tumors. **Results:** The defects and donor areas were closed primarily with full viability of the flaps and no complications were observed other than the occurrence of seroma. **Conclusion:** The trapezius musculocutaneous flap based on the dorsal artery of the scapula offers safety in the treatment of bone exposure in the upper back region.

**Keywords:** Back; Back muscles; Surgical flaps; Myocutaneous flap; Spine; Plastic surgery procedures.

### ■ RESUMO

**Introdução:** Defeitos na região superior do dorso geralmente são de difícil tratamento, especialmente nos casos de exposição de vértebras, meninge ou material de síntese. O fechamento primário com retalho muscular ou musculocutâneo é a melhor escolha, mas a área doadora para tratar grandes defeitos pode requerer enxertia. A preservação da artéria dorsal da escápula parece assegurar um território cutâneo maior do que o do retalho musculocutâneo do trapézio clássico baseado apenas na artéria cervical transversa. **Método:** Foi concebida uma ampla ilha triangular de pele sobre o músculo trapézio baseado na artéria dorsal da escápula com transferência por movimento pendular e um procedimento tipo V-Y em cinco pacientes após a extirpação de tumores malignos. **Resultados:** Os defeitos e as áreas doadoras foram fechados primariamente com total viabilidade dos retalhos e não foram observadas complicações além da ocorrência de seroma. **Conclusão:** O retalho musculocutâneo do trapézio baseado na artéria dorsal da escápula oferece segurança no tratamento de exposição óssea na região superior do dorso.

**Descritores:** Dorso; Músculos do dorso; Retalhos cirúrgicos; Retalho miocutâneo; Coluna vertebral; Procedimentos de cirurgia plástica.

Institution: Fundação Hospitalar do Acre, Programa de Reabilitação e Assistência ao Fissurado da Face (PRAFF), Rio Branco, AC, Brazil.

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<sup>1</sup> Fundação Hospitalar do Acre, Programa de Reabilitação e Assistência aos Fissurados da Face, Rio Branco, AC, Brazil.

<sup>2</sup> Clínica Paiva e Rocha, Pouso Alegre, MG Brazil.

## INTRODUCTION

Large defects in the upper region of the back, such as in cases of vertebrae exposure, pressure ulcers, or those that evolve with dehiscence and exposure of plates or screws, can require complex closure, as well as in meningeal exposure in high myelomeningoceles. Conventional treatment may require large flaps with skin grafting in the donor area and, sometimes, the time necessary for sufficient granulation<sup>1</sup>.

The trapezius muscle can be divided into three parts: ascending, transverse, and descending, with irrigation by the occipital, transverse cervical, dorsal scapular, and posterior intercostal arteries. According to the classification of Mathes & Nahai<sup>1</sup>, this vascularization is type II based on a dominant pedicle, the transverse cervical artery (TCA)<sup>1</sup>.

According to Horch & Stark<sup>2</sup>, after tumor extirpation, the ideal treatment is early closure, preferably performed with a muscle flap, which irrigates the defect.

The first trapezius musculocutaneous flap was described by Baek et al., in 1980, with application to the head and neck, but with vascularization limitations that are still referred to in other publications<sup>1-5</sup>.

According to studies by Weiglein et al.<sup>3</sup>, the dorsal scapular artery (DSA) is important in guaranteeing a larger cutaneous territory, and its preservation in the trapezius flaps can include it in the Mathes and Nahai type V classification.

According to Cormack & Lamberty<sup>6</sup>, the ascending and transverse parts of the muscle are irrigated by the occipital and transverse cervical arteries with branches piercing the skin that guarantee a cutaneous territory within the anatomical limits of the muscle. However, in the descending part, when the cutaneous portion exceeds the inferior angle of the scapula by 5 centimeters, it suffers and becomes necrotic, as the skin in this region is irrigated by direct perforators of the DSA which, although it has a larger cutaneous territory, is not preserved in flaps based on in TCA<sup>2,6</sup>.

Yang & Morris<sup>4</sup> dissected 20 cadavers and described two irrigation patterns for the descending portion of the trapezius muscle and noted the constancy of the DSA whose cutaneous territory is described as having dimensions that exceed the limits of that attributed to the TCA, but they did not establish its limits.

Netterville & Wood<sup>5</sup> studied the irrigation of the trapezius muscle and reported the DSA as the dominant pedicle on 15 sides of 30 dissections, the TCA on 9 sides, and 6 sides the dominance of both arteries. The authors emphasized the importance of the first in irrigating the musculocutaneous portion caudal to the inferior angle of the scapula.

Rocha et al.<sup>7</sup> studied eight sides by dissection in cadavers and 60 sides by EcoDoppler in volunteers and found the constancy of the DSA with the two trajectory patterns already described. They found that both patterns allow mobilization of the flap in a musculocutaneous composition with a cutaneous territory that goes beyond the limits of the muscle in its lower third.

Bearing in mind these concepts and the difficulties encountered in cases of defect in the upper region of the back, the authors planned a trapezius musculocutaneous flap that, with the preservation of the DSA, would ensure a large cutaneous territory and allow primary closure of the donor area with mobilization in V-Y.

## OBJECTIVE

To treat large defects with bone exposure in the upper region of the back with a trapezius musculocutaneous flap with a cutaneous territory larger than that recommended in the literature and close the donor area primarily with V-Y mobilization.

## METHOD

The protocol for this study was approved by the Research Ethics Committee of the Faculty of Medical Sciences of the University of Vale do Sapucaí, under number 169/02, on August 20, 2002, and the procedures were conducted from 2002 to 2012.

Five successive cases of patients with malignant neoplasia in the upper back (Table 1) underwent diagnostic incisional biopsy.

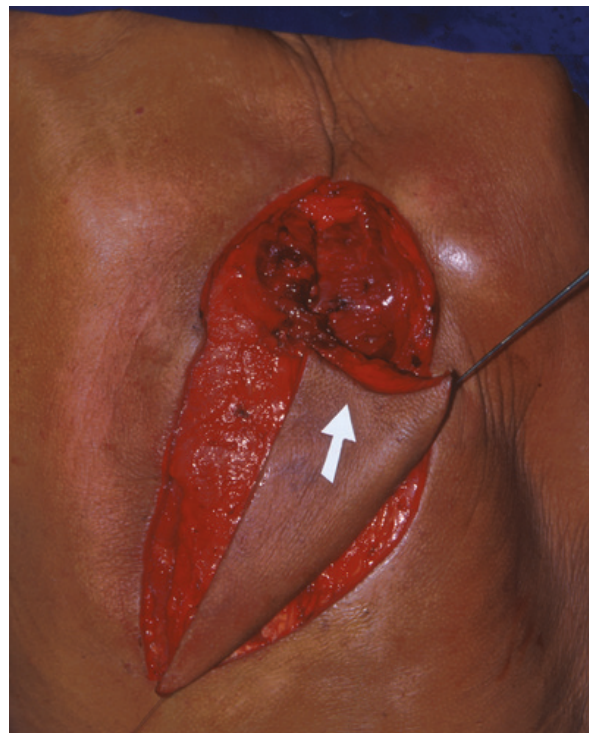
By post-informed consent, they adhered to the protocol and were individually subjected to tumor extirpation.

The procedures consisted of creating a triangular island of skin and subcutaneous tissue in the vicinity of the defect and with part of its extension over the trapezius muscle on the chosen side, preserving the perforators of the lower extremity originating from the DSA. In each case, the muscle was dissected in its descending part, freed from its vertebral origins and scapular insertions. The posterior intercostal vessels were ligated with 4-0 polyglactin 910 thread and divided without the use of thermocautery. The muscle was elevated from the medial to the lateral margin to allow identification and preservation of the DSA that penetrates the deep surface (Figures 1 to 20).

The flaps were transferred by rotating the muscle to promote, in a pendulum movement, the advancement of the skin island towards the defect and closure in V-Y. The detachments were drained with continuous suction for three days.



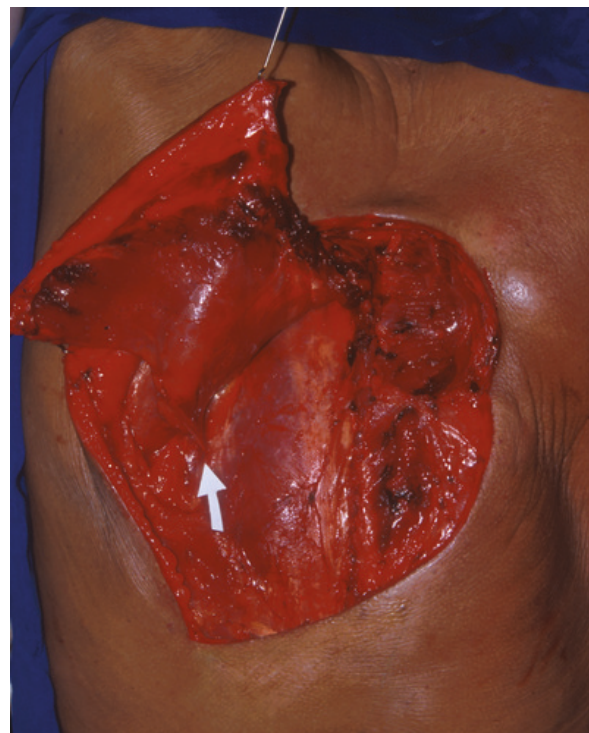
**Figure 1.** (Case 1): Basal cell carcinoma in the upper region of the back.



**Figure 3.** (Case 1): Island of skin and subcutaneous tissue over the lower portion of the left trapezius muscle.



**Figure 2.** (Case 1): Defect measuring 8 x 8cm with exposure of vertebrae.



**Figure 4.** (Case 1): Muscle reflected and dorsal artery of the scapula preserved. The island of skin exceeds the dimensions of the muscle and the midline.



**Figure 5.** (Case 1): Muscle rotation with the transfer of the skin island to the defect. The arrow indicates the dorsal scapular artery at the pivot of rotation.



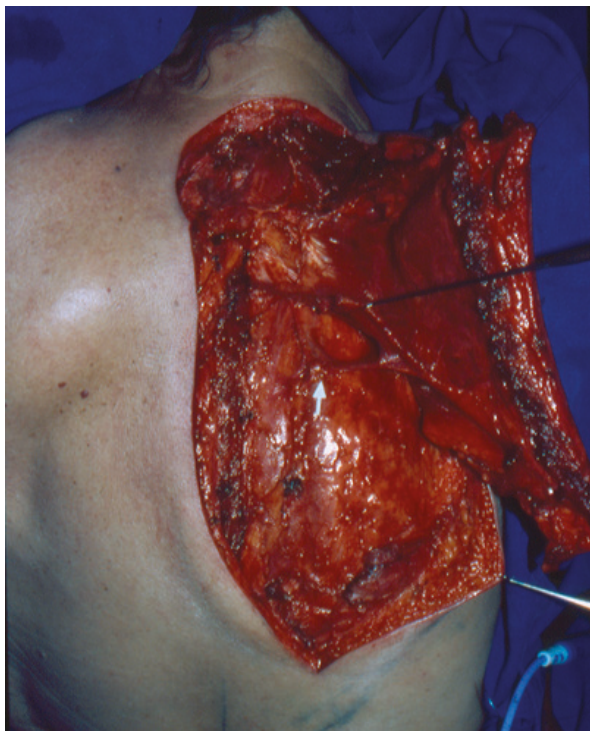
**Figure 7.** (Case 2): Basal cell carcinoma in thoracocervical transition.



**Figure 6.** (Case 1): Flap transferred and donor area closed in VY.



**Figure 8.** (Case 2): Defect measuring 9 x 9cm with exposure of vertebrae.



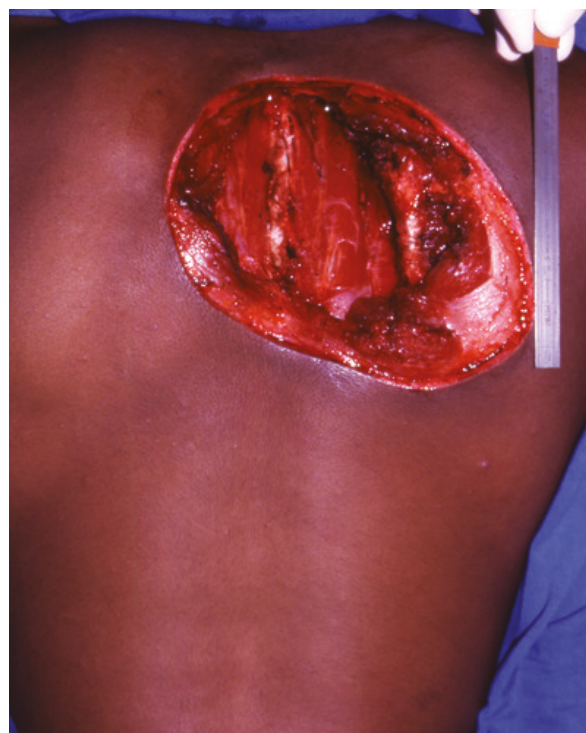
**Figure 9.** (Case 2): Flap with an island of skin that goes beyond the limits of the muscle. The arrow indicates the dorsal artery of the scapula penetrating the deep surface of the muscle.



**Figure 11.** (Case 3): Dermatofibrosarcoma in the upper region of the back.



**Figure 10.** (Case 2): Flap sutured to the defect and donor area closed in VY.



**Figure 12.** (Case 3): Defect measuring 10 x16cm with exposure of vertebrae and right.



**Figure 13.** (Case 3): Flap with an island of skin that goes beyond the limits of the muscle and the midline. The arrow indicates the dorsal artery of the scapula penetrating the deep surface of the muscle.



**Figure 15.** (Case 4): Basal cell carcinoma in thoracocervical transition.



**Figure 14.** (Case 3): Third postoperative day. Flap sutured to the defect and the donor area closed in V-Y.



**Figure 16.** (Case 4): Defect measuring 10 x 9cm with exposure of vertebrae.



Figure 17. (Case 4): Third month postoperatively.



Figure 19. (Case 5): 10 x 14cm defect with removal of the transverse portion of the trapezius muscle and the transverse cervical artery (TCA), preserving only the dorsal scapular artery (DSA).



Figure 18. (Case 5): Basal cell carcinoma seeded by ornamental tattoo.



Figure 20. (Case 5): Fourth post-operative week.

## RESULTS

All specimens were studied and showed tumor-free margins.

There were no complications related to anesthesia or the surgical procedure, except for the occurrence of seroma, which was detected and drained on an

outpatient basis in the second week after surgery in the first two cases, despite the use of the drain.

The skin stitches were removed between the 10th and 15th days.

In all the five cases, the flaps evolved without suffering and were sufficient to treat large defects (Table 1).

**Table 1.** Patients.

Sex	Age in years	Diagnosis	Defect dimensions (longitudinal x transverse)
Male	69	Basal cell carcinoma	8cm x 8cm
Female	80	Squamous cell carcinoma	9cm x 9cm
Male	17	Dermatofibrosarcoma Protuberans	10cm x 16cm
Male	70	Basal cell carcinoma	10cm x 9cm
Male	53	Basal cell carcinoma seeded by ornamental tattoo	10cm x 14cm

## DISCUSSION

The pedicles were easily identified in the two anatomical patterns of the DSA and preserved<sup>1,3,4</sup>.

Preservation of the DSA did not hinder the rotation arc of the flap, since the flaps were designed distally to the defects and mobilized in the cephalic direction, approaching the origin of the vessels<sup>2,4,7</sup>.

In all cases, the cutaneous territory exceeded the longitudinal and transverse limits, unlike the discouraging recommendations described in the literature as characteristics of TCA-based flaps. Viability was demonstrated well beyond the 5cm caudal to the tip of the scapula and the dimensions of the trapezius muscle and even beyond the midline of the back<sup>2,4,6,7</sup>.

The extension of the cutaneous territory obtained with the preservation of the DSA allowed the creation of the skin island with an elongated shape, convenient for V-Y closure, attenuating the tension in the donor area and the dimensions of the pedicle allowed the mobilization of the island for defects up to the fourth cervical vertebra and above the spine of the scapula (Figures 8, 9, 10, 18, 19, 20).

The V-Y flap has the virtue of transferring a large area of skin and treating the donor area simultaneously, by redistributing the skin island, unlike transposition flaps, usually made with the trapezius muscle.

The motor innervation, via the XI cranial nerve, of the ascending portion of the muscle was preserved and maintained the scapular elevation movement in all cases.

## CONCLUSION

The islanded trapezius musculocutaneous flap based on DSA is safe and can be transferred in V-Y with primary closure of the donor area in cases of defect with bone exposure in the upper back region.

## COLLABORATIONS

- JLBSR** Conception and design study, Methodology, Realization of operations and/or trials, Writing - Original Draft Preparation
- GRP** Analysis and/or data interpretation, Methodology, Realization of operations and/or trials
- LCSR** Analysis and/or data interpretation, Writing - Original Draft Preparation
- AGQ** Investigation, Realization of operations and/or trials
- FGQ** Realization of operations and/or trials



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**\*Corresponding author:****João Lorenzo Bidart Sampaio Rocha**

Av. Alberto de Barros Cobra, 717, Pouso Alegre, MG, Brazil.

Zip code: 37553-459

E-mail: joaolorenzorochoa@gmail.com