



# Cephalic vein transposition for head and neck microsurgical reconstruction: anatomical study in cadavers

*Transposição da veia cefálica para reconstrução microcirúrgica de cabeça e pescoço: estudo anatômico em cadáveres*

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## ■ ABSTRACT

**Introduction:** Cephalic vein transposition is an interesting alternative as a donor vein in head and neck cancer reconstruction in patients with a cervical radiotherapy history. This work aims to evaluate the cephalic vein anatomical characteristics in cadavers. **Methods:** Six cephalic veins from three cadavers were dissected. The veins were sectioned in the medial part of the arm and transposed to the neck over the clavicles. **Results:** The veins had an average length of  $18.75 \pm 1.84$  cm and several tributaries with a variation of 7-9. The diameter coincided in both veins of each corpse. The anatomical parameter used to identify them (deltopectoral groove) proved reliable, allowing predictable dissection. **Conclusion:** The cephalic vein has constant characteristics and is easy to locate, being an option relevant to the reconstructive plastic surgeon's therapeutic arsenal.

**Keywords:** Head and neck neoplasms; Reconstructive surgical procedures; Microsurgery; Autologous transplantation; Radiotherapy.

## ■ RESUMO

**Introdução:** A transposição de veia cefálica é uma alternativa interessante como veia doadora na reconstrução oncológica de cabeça e pescoço em pacientes com história de radioterapia cervical. O objetivo do trabalho é avaliar as características anatômicas da veia cefálica em cadáveres. **Métodos:** Foram dissecadas seis veias cefálicas de três cadáveres. As veias foram seccionadas na parte medial do braço e transpostas até o pescoço por cima das clavículas. **Resultados:** As veias apresentaram média de comprimento de  $18,75 \pm 1,84$  cm e número de tributárias com variação de 7-9. O diâmetro coincidiu em ambas as veias de cada cadáver. O parâmetro anatômico usado para identificá-las (sulco deltopeitoral) se mostrou confiável, possibilitando uma dissecação previsível. **Conclusão:** A veia cefálica tem características constantes e fácil localização, sendo uma opção relevante ao arsenal terapêutico do cirurgião plástico reconstrutor.

**Descritores:** Neoplasias de cabeça e pescoço; Procedimentos cirúrgicos reconstrutivos; Microcirurgia; Transplante autólogo; Radioterapia.

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## INTRODUCTION

Head and neck cancers, closely related to alcoholism and smoking, have a significant prevalence in the Brazilian population. There was an increase in this type of cancer from 5.82 per 100 thousand inhabitants in 2000 to 11.54 in 2008, with squamous cell carcinoma being the most common histological type<sup>1</sup>. Only in 2008, 21,875 new cases were diagnosed<sup>1</sup>. A more recent study found 220,390 cases diagnosed between 2000 and 2014<sup>2</sup>. Transposition of free flaps is one of the techniques of choice in head and neck cancer reconstruction<sup>3</sup>. The great vascularization of this region would generally allow microvascular anastomoses with cervical receptor vessels. However, many of these patients undergo adjuvant radiotherapy. Radiotherapy significantly changes the region's vascular permeability, making it challenging to use recipient vessels (mainly veins) for the microsurgical flap<sup>3</sup>.

The grafting of veins from other parts of the body, such as the saphenous vein, is the standard choice in this situation reported above<sup>4</sup>. However, this option requires two anastomoses in the grafted vein; one in the recipient's vessel and another in the vein of the flap itself. Thus, increasing the risk of thrombosis and the surgical time and increasing the failure rate of reconstruction<sup>4</sup>.

An alternative to vein grafting is the cephalic vein transposition<sup>5</sup> because the cephalic vein is located far from the region undergoing radiotherapy. Furthermore, it has a relatively constant course and caliber, in addition to a slightly variable number of tributaries. The cephalic vein is extremely useful in head and neck reconstruction<sup>4,5</sup>. This venous transposition requires only a cervical anastomosis in the flap with a lower risk of thrombosis and less execution time.

## OBJECTIVE

To evaluate the cephalic vein anatomical characteristics in cadavers for cervical transposition and its use in microsurgical flaps.

## METHODS

### Cadavers

The present study is primary. Six cephalic veins from three cadavers were dissected: a 71-year-old woman and two men, 50 and 62 years old, at the death verification service of the *Faculdade de Medicina da Universidade de São Paulo (SVO-FMUSP)*, from October to December 2019. The *Universidade Federal de São Paulo* Research Ethics Committee (CEP analyzed and

approved this study under number 0675/2019, after its registration at *Plataforma Brasil*.

### Surgical technique

First, the deltopectoral groove was identified to delimit the incision; the cut was made between 1 and 2 cm lateral to the groove to avoid direct injury to the cephalic vein. The distal incision progressed to the humeral mid-level, on the arm's lateral surface (usual topography of the cephalic vein). When identified the vein, its tributaries and the distal vein were connected, besides rotating the axilla from distal to proximal (Figures 1 and 2). The vein was transposed up to the neck over the clavicle, as shown in Figure 3.



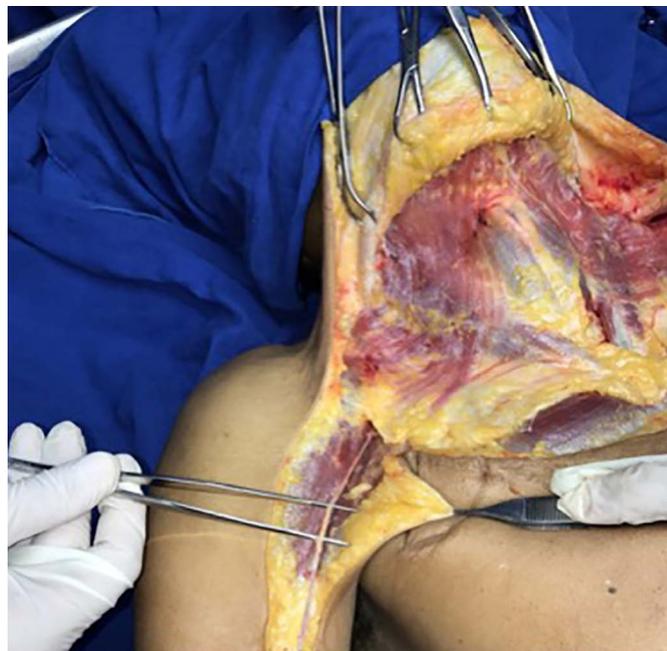
**Figure 1.** Dissection of the left cephalic vein, incision made near the deltopectoral sulcus, and the tributaries' ligature. The neck was dissected for anatomical purposes only.

## RESULTS

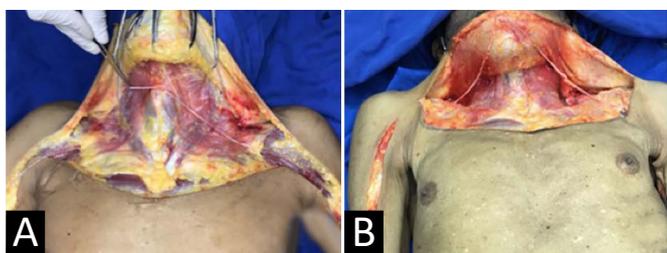
The veins had an average length of  $18.75 \pm 1.84$ cm and the number of tributaries with a variation of 7-9. The diameter coincided in both veins of each cadaver, as shown in Table 1. The anatomical parameter used to identify them (deltopectoral groove) proved reliable, allowing predictable dissection.

## DISCUSSION

Head and neck oncological reconstruction went through different stages. In the 40s, there were several attempts to correct these defects with local flaps and skin grafts, which did not show good long-term



**Figure 2.** Dissection of the right cephalic vein, incision made close to the deltopectoral sulcus, and ligation of the tributaries. The neck was dissected for anatomical purposes only.



**Figure 3.** Transposition of the cephalic vein to the cervical region. A. Note that there is the possibility of extending the left cephalic vein to the contralateral cervical region, showing the versatility of the cephalic vein; B. Demonstration of both cephalic veins dissected and transposed to the cervical region.

results, evolving with orofacial fistulas, dehiscences, necroses, and complex deformities resulting from reconstruction<sup>6</sup>. Other options have emerged over time, such as the temporofrontal pedicled flap<sup>7</sup> and the pectoralis major myocutaneous flap<sup>8</sup>. However, the difficulty of axial rotation and the fact that there is little available tissue adjacent to the lesion caused free flaps to emerge as one of the main options for reconstruction

in these cases<sup>9</sup>. They are more advantageous than pedicled axial flaps, as they allow better blood supply, less tension, greater malleability, moldability and tissue extension for reconstruction<sup>1,2</sup>.

In patients who have not undergone previous radiotherapy or surgical treatment, it is possible to use the neck and face's recipient vessels, such as branches of the external carotid artery and tributaries of the internal jugular vein or the external jugular vein<sup>10</sup>. The transposition of veins in the thoracic region has been a viable option to circumvent vascularization impairment in patients undergoing cervicofacial radiotherapy<sup>10,11</sup>.

In this described technique, the transposed cephalic vein will be anastomosed to the flap vein, making a single anastomosis, reducing the risk of thrombosis, and decreasing the reconstruction's failure rate. There are several possible options for vessels to be transposed. In addition to the cephalic vein, we have the thoracodorsal vein and the transverse cervical vein<sup>11</sup>. Among these options, the cephalic vein is one of the main alternatives, as it has an adequate diameter, predictable dissection and is located farther from the usual radiotherapy site for head and neck cancer<sup>12,13</sup>.

Our work corroborated data from the literature, showing the constant profile of the vein concerning the caliber and length, in addition to the little variable number of tributaries. It allows excellent venous drainage and is generally free from radiotherapy ablation due to its lateral thoracic location.

The literature has several reports on the successful use of the cephalic vein<sup>11,13,14</sup>, which confirms this technique as a reliable option in head and neck reconstruction.

### CONCLUSION

The transposition of the cephalic vein is an interesting option for head and neck cancer reconstruction, as it has constant characteristics and a predictable location and maybe a suitable technique to the therapeutic arsenal of the reconstructive plastic surgeon.

**Table 1.** Patients weight and volume transfused.

Cephalic Vein	Side	Gender	Age	Height\Weight (m\Kg)	No. of Tributaries	Length (cm)	Diameter (mm)
1	D	Male	50	1,60\71	8	19	4
2	E	Male	50	1,60\71	7	19,5	4
3	D	Male	62	1,63\62	9	20,3	3
4	E	Male	62	1,63\62	8	18,9	3
5	D	Female	71	1,52\55	7	17,8	3
6	E	Female	71	1,52\55	8	17	3

## COLLABORATIONS

<b>RGFF</b>	Realization of operations and/or trials, Writing - Original Draft Preparation, Writing - Review & Editing
<b>PNGD</b>	Resources, Writing - Original Draft Preparation
<b>ACL</b>	Analysis and/or data interpretation, Investigation, Resources
<b>FMVW</b>	Realization of operations and/or trials, Supervision
<b>AWC</b>	Analysis and/or data interpretation, Formal Analysis, Supervision
<b>JAM</b>	Formal Analysis, Supervision
<b>LMF</b>	Final manuscript approval, Project Administration, Supervision

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