

**Simplifying Venous Outflow in RFFF: A Single Anastomosis Strategy – Our Experience****Ravisankar Nutalapati<sup>1</sup>, Runjala Susan Daisy Cris<sup>2</sup>, Vijaya Chalikkad Ravi<sup>3</sup>, Thavarajah Masilamany<sup>4</sup>, Koushik Chatterjee<sup>5</sup>**<sup>1</sup>Senior Consultant, Department of Oral & Maxillofacial, Head & Neck Oncosurgery, GSL Trust Cancer Hospital, GSL Medical College, Rajahmundry, South India<sup>2</sup>Fellow, Department of Oral Oncology, GSL Trust Cancer Hospital, GSL Medical College, Rajahmundry, South India<sup>3</sup>Assistant Professor, Department of Oral & Maxillofacial, Head & Neck Oncosurgery, Faculty of Dental Sciences, SGT UNIVERSITY, Gurugram<sup>4</sup>Consultant, Department of Oral & Maxillofacial Surgery, Teaching Hospital Jaffna, Srilanka<sup>5</sup>Fellow, Department of Oral Oncology, GSL Trust Cancer Hospital, GSL Medical College, Rajahmundry, South India

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**Abstract:****Background:** The radial forearm free flap (RFFF) is widely used for head and neck reconstruction because of its reliable anatomy, long vascular pedicle, pliability, and high success rate. However, venous congestion and thrombosis remain important causes of flap compromise. The communicating vein provides a connection between the superficial and deep venous systems and may permit dual-system drainage through a single venous anastomosis.**Aim:** To evaluate the reliability of single venous anastomosis using the communicating vein in RFFF reconstruction for head and neck cancer.**Methods:** This prospective study included 60 patients who underwent RFFF reconstruction for head and neck squamous cell carcinoma between March 2023 and September 2025. Venous drainage patterns, number of venous anastomoses, re-exploration, venous thrombosis, venous congestion, hematoma, flap salvage, partial flap loss, and total flap loss were recorded.**Results:** Single-vein anastomosis was performed in 51 cases (85.0%), while two- and three-vein anastomoses were performed in 8 (13.3%) and 1 (1.7%) cases, respectively. The common trunk using the median cubital or common cephalic vein was used in 35 cases (58.3%). Venous congestion occurred in 4 cases (6.7%), including 3 cases of venous thrombosis, all successfully salvaged. Hematoma requiring re-exploration occurred in 7 cases (11.7%). One total and one partial flap loss occurred. Overall complete flap survival was 96.7%.**Conclusion:** Single venous anastomosis using the communicating vein is a reliable option for RFFF reconstruction, providing dual-system venous outflow while simplifying microvascular anastomosis.**Keywords:** Radial Forearm Free Flap; Communicating Vein; Venous Anastomosis; Head And Neck Reconstruction; Venous Congestion.**DOI:** 10.25258/ijcpr.18.7.5This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The radial forearm free flap (RFFF) remains one of the most dependable and versatile options for head and neck reconstruction because of its thin, pliable skin paddle, long vascular pedicle, consistent anatomy, suitable vessel calibre, ease of harvest, and capacity for fasciocutaneous or osteofasciocutaneous transfer [1]. Despite high flap survival rates, venous compromise continues to be an important cause of partial or complete flap failure. The RFFF has two principal venous drainage pathways: the superficial venous system, mainly

represented by the cephalic vein, and the deep venous system, formed by the paired radial venae comitantes accompanying the radial artery [2]. Selection of the optimal venous system for anastomosis remains controversial. Some studies support superficial venous drainage because of its larger calibre and technical ease, while others favour the deep system because it may represent a major physiological outflow pathway from the flap [3]. Although dual venous anastomosis can theoretically improve drainage, it may increase operative time

and may add another endothelial injury site, potentially predisposing to thrombosis. The communicating vein, also described as the antecubital perforating vein, cubital perforating vein, or profundus cubitalis vein, provides a useful anatomical connection between the superficial and deep venous systems in the antecubital fossa. Harvesting this vein permits combined superficial and deep venous outflow through a single venous anastomosis and may also provide a longer pedicle, reducing the need for vein grafting in difficult recipient-vessel situations [4,5]. The aim of this study was to evaluate the reliability of single venous anastomosis using the communicating vein in RFFF reconstruction for enhancing venous outflow and flap survival.

### Methods

This prospective study was conducted between March 2023 and September 2025. Patients diagnosed with early or advanced head and neck malignancies and requiring surgical excision followed by microvascular reconstruction were included. Most patients underwent wide local excision of the primary tumour, along with ipsilateral or bilateral neck dissection, depending on the tumour site and stage. Reconstruction of the surgical defect was performed using RFFF in all cases. The age distribution, pathological diagnosis, and tumour subsites were recorded. All reconstructive procedures were performed by single surgeon to maintain uniformity in operative technique. In the initial cases, flap harvest was performed using the standard technique without extending dissection to identify the communicating vein. In subsequent cases, deliberate dissection was carried proximally into the antecubital fossa to identify and incorporate the communicating vein into the flap design.

For flap harvest, the donor upper limb was positioned on an arm board at approximately 90° abduction from the operating table. The surface markings of the radial artery, radial venae comitantes, and cephalic vein were made preoperatively. The skin paddle was designed to include the drainage territories of both the superficial venous system and the deep venous system. After tourniquet application and incision, the distal ends of the cephalic vein, radial artery, and venae comitantes were identified and ligated. The flap was elevated in the subfascial plane while carefully preserving the radial nerve and its branches. The cephalic vein was dissected from distal to proximal within the subcutaneous tissue, with ligation of its tributaries. Similarly, the radial artery and accompanying venae comitantes were dissected proximally. As the dissection approached the antecubital fossa, meticulous exploration was performed to identify the communicating vein connecting the superficial and deep venous systems.

The venae comitantes and their tributaries were divided proximal to the emergence of the communicating vein, thereby allowing the venous outflow from both systems to converge through the communicating venous channel.

After completion of flap elevation and division of the pedicle, transfer to the recipient site was performed. Arterial anastomosis was completed first, followed by venous anastomosis using 8-0 nylon or polypropylene sutures on a round-body needle under microscopic magnification. The vein demonstrating adequate drainage through the communicating vein, usually the median cubital vein or cephalic vein, was selected for single venous anastomosis. In cases where drainage of the deep system through the communicating vein was inadequate, the cephalic vein distal to its branching was divided and prepared for anastomosis. In selected cases, the larger radial vena comitans was also prepared for a second venous anastomosis. The number of veins used for venous anastomosis was recorded. Postoperative outcomes included the need for re-exploration, venous thrombosis, venous congestion or insufficiency, hematoma, re-anastomosis, flap salvage, partial flap loss, and total flap failure. Common trunk, median cubital vein, common cephalic vein, and vena comitantes were documented as relevant venous drainage patterns.

### Results

Among the 60 patients who underwent RFFF reconstruction, 46 were male and 14 were female. The age of patients ranged from 23 to 78 years, with a mean age of 47 years. All patients had squamous cell carcinoma. The tongue was the commonest primary subsite, accounting for 38 cases (63.3%), followed by buccal mucosa in 12 cases (20.0%). Floor of mouth and maxilla contributed 3 cases each (5.0%), while retromolar trigone and combined buccal mucosa with lip involvement were observed in 2 cases each (3.3%). Single-vein anastomosis was performed in 51 cases (85.0%), while two-vein and three-vein anastomoses were performed in 8 cases (13.3%) and 1 case (1.7%), respectively. The common trunk using the median cubital vein or common cephalic vein was the most frequently used venous outflow pattern, observed in 35 cases (58.3%). The cephalic vein alone was used in 15 cases (25.0%), while cephalic vein with vena comitans was used in 8 cases (13.3%). Venous congestion occurred in 4 cases (6.7%), of which 3 cases were due to venous thrombosis and were successfully salvaged by redo anastomosis. One case of pedicle kinking was corrected by hitching the pedicle to adjacent tissues. Hematoma requiring re-exploration occurred in 7 cases (11.7%), but arterial and venous anastomoses remained intact in all. Total flap loss occurred in one case where the cephalic vein was used alone, and partial flap loss occurred in one case where common vena comitantes alone was

used. The overall complete flap survival rate was 96.7%.

**Table 1: General characteristic features of the study members**

Gender	Number
Male	46 (76.6%)
Female	14 (23.3%)
Diagnosis	Number
Squamous cell Carcinoma	60 (100%)
Subsites	Number
Tongue	38 (63%)
Floor of Mouth	3 (5%)
Buccal Mucosa	12(20%)
RMT	2 (3.3%)
Maxilla	3 (5%)
Buccal Mucosa + Lip	2(3.3%)

**Table 2: Pattern of venous anastomosis among the study members**

Anastomosis pattern	N	%
Number of veins used		
1 vein	51	85
2 vein	8	13.3
3 vein	1	1
Type of venous drainage used		
Common trunk (MCV/CCV)	35	58.3
Cephalic Vein alone	15	25
Cephalic Vein + Largest VC	8	13.3
VC + VC + cephalic vein	1	1.6
Common VC alone	1	1.6

MCV: Median cubital vein; CCV: Common cephalic vein; VC: Vena comitantes

## Discussion

The present study evaluated venous drainage patterns and postoperative outcomes in 60 patients who underwent RFFF reconstruction for head and neck squamous cell carcinoma. The overall complete flap survival rate was 96.7%, with only one total flap loss and one partial flap loss. This finding is consistent with the established reliability of RFFF as a workhorse flap in head and neck reconstruction. Its thin, pliable skin paddle, dependable vascular anatomy, long pedicle, and suitability for intraoral reconstruction make it particularly valuable for defects of the tongue, floor of mouth, buccal mucosa, retromolar trigone, and maxilla [1]. In the present series, tongue carcinoma was the commonest indication, reflecting the frequent requirement for a thin and mobile flap to restore oral cavity contour, mobility, and function. Contemporary head and neck reconstruction literature also confirms that free flaps have high success rates when performed in structured microsurgical units, although vascular compromise remains the most important cause of early flap failure [6, 7].

A key observation in this study was the frequent use of single-vein anastomosis, which was performed in 51 cases (85%). Among these, the common trunk

formed by the median cubital vein or common cephalic vein, incorporating the communicating vein, was used in 35 cases (58.3%). This technique allowed drainage of both the superficial venous system and deep venous system through a single anastomosis. The anatomical basis for this approach is important because the RFFF has two major venous pathways: the superficial system, represented mainly by the cephalic vein, and the deep system, represented by the paired venae comitantes accompanying the radial artery [2]. The communicating or antecubital perforating vein links these systems near the antecubital fossa, creating the possibility of combined venous drainage without the need for multiple recipient-site venous anastomoses. Moreno et al. reported that antecubital perforators can capture both superficial and deep venous outflow through a single extended venous pedicle, thereby reducing the risk of venous insufficiency and avoiding additional venous anastomosis [4]. The absence of intrinsic venous insufficiency in the common-trunk group in the present study supports this anatomical and physiological concept.

The choice between superficial, deep, dual, or united venous drainage remains debated. Some surgeons prefer the cephalic vein because of its larger diameter, easier dissection, and technically simpler anastomosis. Others prefer the venae comitantes

because they accompany the radial artery and may provide more physiological deep venous drainage from the flap. A systematic review and meta-analysis by Xie et al. concluded that the optimal single venous drainage system in RFFF remains controversial, with available evidence not clearly establishing universal superiority of either superficial or deep drainage [3]. More recently, Chong et al. reported that flap outcomes did not significantly differ among superficial, deep, and united venous drainage systems when intraoperative outflow was favourable [8]. These findings are highly relevant to the present study. Rather than supporting one isolated venous system, the present results favour a practical intraoperative strategy: when the communicating vein is present and drainage through the common trunk is satisfactory, single-vein anastomosis through the united venous pathway appears reliable and efficient.

The postoperative vascular events in this series were within acceptable limits. Venous congestion occurred in 4 cases (6.7%), including 3 cases (5%) of venous thrombosis, all of which were salvaged with redo anastomosis. One case of pedicle kinking was corrected by hitching the pedicle to adjacent tissues. These findings emphasize that venous congestion after free flap surgery is not always due to intrinsic inadequacy of the selected venous system; mechanical factors such as kinking, compression, hematoma, or recipient-vessel geometry may also contribute. Uehara et al. highlighted that free flap complications after oral cancer ablation require prompt identification and active salvage, while broader head and neck literature also indicates that early recognition of vascular compromise strongly improves flap salvage outcomes [9, 10]. In the present study, successful salvage of all three thrombosed flaps indicates effective postoperative monitoring and timely re-exploration. This is clinically important because most microvascular vascular crises occur early, and delayed intervention may convert a salvageable flap into complete loss.

The present study also showed that hematoma requiring re-exploration occurred in 7 cases (11.7%), although arterial and venous anastomoses were intact in all. This finding underlines that postoperative re-exploration does not necessarily represent microvascular failure; it may reflect wound-bed bleeding, dead space, or pressure-related risk around the pedicle. A recent meta-analysis of oral cancer free flap reconstruction reported that flap-related complications remain common, including vascular crisis, bleeding or hematoma, wound dehiscence, infection, and partial or total flap necrosis [11]. Similarly, risk-factor studies have shown that flap complications may be influenced by comorbidities, nutritional status, infection, operative duration, and postoperative wound conditions [12,

13]. In the present series, the complete flap survival rate of 96.7% is favourable despite 11.7% hematoma re-exploration, suggesting that early return to the operating room protected the flap rather than indicating poor outcome. Therefore, re-exploration should be interpreted as a proactive salvage measure when performed before irreversible thrombosis or necrosis develops.

The clinical significance of this study lies in demonstrating that single venous anastomosis using the communicating vein/common trunk can provide dependable RFFF drainage in head and neck reconstruction. Compared with routine double-vein anastomosis, this approach may reduce operative time, simplify recipient-vessel selection, and avoid creating an additional endothelial injury site. At the same time, it preserves the physiological advantage of draining both superficial and deep venous systems. Recent evidence on cephalic-vein-only anastomosis also suggests that single venous outflow may be safe in selected cases when adequate drainage is confirmed intraoperatively [14]. However, the present findings suggest that when available, the communicating vein offers an additional advantage over isolated cephalic or isolated vena comitans drainage by uniting both systems. The study is limited by its moderate sample size and non-randomized design, and the initial cases did not include deliberate communicating vein dissection. Nevertheless, the results support routine exploration of the antecubital fossa for the communicating vein during RFFF harvest. A larger comparative study evaluating operative time, venous thrombosis, re-exploration, donor-site morbidity, and long-term flap function would further clarify its role.

## Conclusion

This study suggests that the communicating vein is present in most patients undergoing RFFF reconstruction and can be used safely for single venous anastomosis when adequate intraoperative drainage is confirmed. By preserving both superficial and deep venous outflow through one common venous channel, this technique may simplify the procedure, reduce the need for multiple venous anastomoses, and support favourable flap survival. However, the study is limited by its single-centre design, moderate sample size, non-randomized nature, and lack of long-term functional outcome assessment. Larger comparative studies are required to validate these findings further.

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