

## Case Report

# Retrograde vascularisation of fibula free flap in composite oro-mandibular reconstruction

G. I. Nambi, M. Dhiwakar<sup>1</sup>

Plastic and Reconstructive Microvascular Services, <sup>1</sup>Head and Neck Oncology Services, Comprehensive Cancer Center, Kovai Medical Center and Hospital, Coimbatore, Tamil Nadu, India

**Address for correspondence:** Dr. G. I. Nambi, Plastic and Reconstructive Microvascular Services, Comprehensive Cancer Center, Kovai Medical Center and Hospital, Avinashi Road, Coimbatore - 641 014, Tamil Nadu, India. E-mail: nambi75@rediffmail.com

## ABSTRACT

We present a case of composite oromandibular reconstruction with fibula free flap in which the vascularity to the flap was established in a retrograde direction through the distal end of the peroneal pedicle vessels. The flap was initially designed in such a way so as to anastomose with superior thyroid artery. However after initial good flow, the superior thyroid artery flow became insufficient. Therefore, an attempt was made to vascularise the flap by anastomosing the distal end of peroneal vessels with the facial artery and a tributary of the internal jugular vein so that the flap was perfused in a retrograde direction. This was successful and the retrograde flow was adequate to ensure flap survival. We believe this to be the first successful case of reverse vascular flow reported for composite oromandibular reconstruction with the fibula free flap.

## KEY WORDS

Composite oromandibular defects; fibula free flap; oromandibular reconstruction; retrograde vascularisation

## INTRODUCTION

Fibula free flap has become the first choice flap for composite oromandibular reconstruction owing to its versatility. Thus with the widespread use of this flap, a variety of reports on various aspects of this flap such as side specificity, variations in vascularity, techniques of osteotomy, skin paddle types, donor side morbidity, and use of this flap as an alternative to double free flaps are available in the literature.<sup>[1-7]</sup> Retrograde vascularisation of free flaps in the lower limb reconstruction is a

known phenomenon when one of the major vessels is injured (anterior tibial or posterior tibial) and is not available as donor vessel in proximal leg.<sup>[8,9]</sup> We present a case of composite oro-mandibular reconstruction where the fibula free flap was revascularised with a reversal of blood flow in the flap pedicle vessels. Here, because of unfavourable perfusion in the first choice vessel in the neck, the second choice vessel (facial artery) was used to anastomose with the distal end of the peroneal artery and the accompanying venae comitantes to a tributary of the internal jugular vein establishing the vascular flow in a reverse direction and successfully completing the reconstruction after tumour extirpation.

## CASE REPORT

A 64-year-old gentleman with a post radiation recurrent squamous carcinoma of the left lower alveolus was posted for composite resection and reconstruction with

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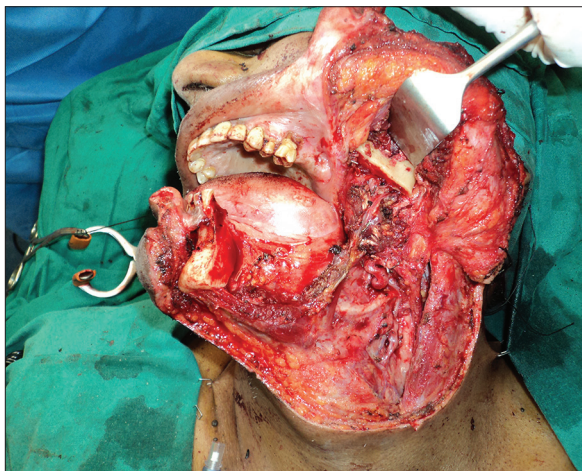
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fibula free flap by simultaneous two team approach. The left fibula was selected and after flap harvest, the left neck vessels (superior thyroid and facial) were assessed for the volume and character of the flow and were found to be good. The bone defect was extending from midline anteriorly to proximal ramus posteriorly and the soft-tissue defect was confined to the oral cavity [Figure 1]. The flap was designed in a manner so that the superior thyroid vessels were to be used as donor vessels as they were away from the previous zone of irradiation and the blood flow was also good after dissecting them and dividing to look for the volume and adequacy of blood flow. After osteotomy and preliminary intra oral inset of the skin paddle, and during the time of anastomosis, it was found that the flow in the superior thyroid artery was inadequate after initial good flow. Routine measures such as application of warm saline, xylocaine solution and later papaverine did not improve the flow and in such a situation, the options available were

- To open the right neck and use vessels from that side either directly or with a vein graft
- To use a vein graft and anastomose with the facial artery on the same (left) side as the flow in this vessel was good
- To use the distal end of the flap pedicle vessels for anastomosis with left facial artery, so as to establish the vascular flow in a retrograde manner. This was because the clipped distal ends of the peroneal pedicle vessels were near to the left facial artery.

Before exploring the opposite neck or harvesting a vein graft, a decision was made to attempt retrograde vascularisation of the flap via the distal end of the peroneal vessels. First, the arterial anastomosis was completed between the distal end of the peroneal artery



**Figure 1:** Composite mandible defect – left side

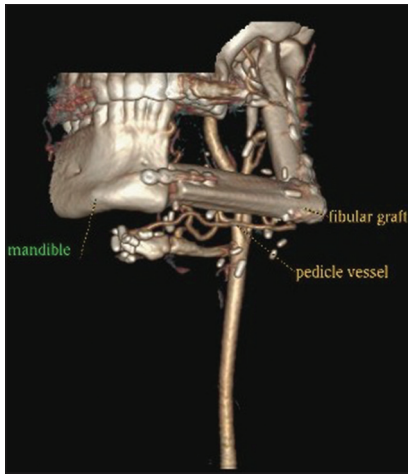
and left facial artery (end-to-end) and the flow was checked. The arterial flow was good as evidenced by the pulsations of the donor and recipient vessels and with the venous outflow from the distal end of the peroneal venae comitantes. This was followed by venous anastomosis between the distal end of the peroneal venae comitantes and a tributary of the left internal jugular vein (end to end). The skin paddle bleeding was also good with a sterile needle prick. Thus, the vascularity was restored with retrograde flow and was well established by the time the intra oral inset was completed [Figure 2]. The neck was then closed and post-op period was uneventful. After 6 weeks, a computed tomography (CT) angiogram revealed good establishment of blood flow to the neo mandible [Figures 3 and 4].

## DISCUSSION

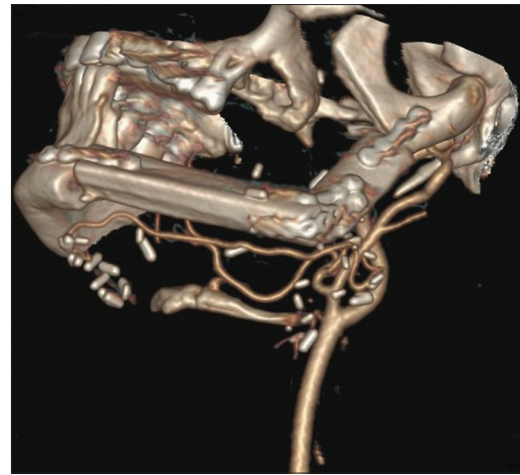
Retrograde vascularisation refers to the flow of blood in a direction opposite to its normal flow. This is commonly seen in limbs (both upper and lower) when one of the principal artery is occluded or injured at some point in its course and the tissues distal to the point of occlusion is vascularised by flow of blood in a retrograde manner (distal to proximal) due to back flow of blood from the normal unoccluded or uninjured counterpart. This retrograde flow in the native vessel was well-utilised in micro vascular reconstruction of composite lower limb defects<sup>[8,9]</sup> so that the normal uninjured vessel remains untouched and blood supply to the limb remains intact during and after micro reconstruction. However still in these cases, the flow in the flap pedicle vessels (after the anastomotic site) remains in the normal direction (prograde).



**Figure 2:** The proximal end of the peroneal (pedicle) vessels being held in forceps and the distal end, which was used for retrograde vascularisation with left facial artery and a tributary of the internal jugular vein is shown with the background material



**Figure 3:** Late CT-Angio picture of the peroneal artery (Anterior view) showing the free proximal end



**Figure 4:** Late CT-Angio picture of the peroneal artery (Lateral view) showing the anastomosed distal end

Retrograde vascularisation of a free flap via its pedicle vessels has so far been an undescribed phenomenon. Literature search revealed one report<sup>[10]</sup> where an anterolateral thigh flap used for reconstruction of oncological intra oral defect had insufficient arterial flow through its primary vessel and therefore, it was supercharged with a second arterial anastomosis where one of the branches of the arterial pedicle was anastomosed with the artery of an adjacent muscle so as to perfuse in a retrograde direction. A CT-Angiogram conducted in the late post-operative period revealed that the second arterial anastomosis was the sole source of blood supply to the flap and the primary vascular supply had become defunct. However even in this case, the venous outflow in the pedicle was prograde. In our case, an attempt was made to revascularise the fibula free flap via the distal end of the peroneal vessels as they were near to the second choice vessels (facial artery and internal jugular vein tributary) and technically this was less demanding than the other on-table options, which were available as described before. The possible causes that could explain the successful retrograde vascularisation are

- High pressure flow in the neck arteries
- Negative intra thoracic pressure, which sucks the blood from the internal jugular vein and its tributaries.

Both of the above factors could have made the valves in the flap pedicle vessels incompetent and thereby offering the least resistance to the flow of blood in the reverse direction. In the previous reports on retrograde vascularisation of free flaps, the flow of blood in the pedicle vessels was prograde while the reversal of flow

was seen only in the native vessels. In our case, the flow in the pedicle vessels were retrograde (distal to proximal in the flap artery and proximal to distal in the flap vein) while the flow of blood in the neck vessels remained prograde. To conclude, the demand of an on-table situation prompted us to revascularise the fibula free flap in a retrograde manner and was found to be successful. Further clinical and experimental studies are required to establish this as a routine phenomenon and if proved successful, this will further add up the versatile characters of fibula free flap.

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