ORIGINAL ARTICLE

Vascular Size Discrepancy in Head and Neck Reconstruction: Our Experience in Micro-Vascular Mis-Match

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ABSTRACT

Background: A successful anastomosis is the Achilles of all microsurgeries. Prevention of turbulence at anastomotic site is vital and ensure blood flow to be maintained.
Aim: To share our experience based on a simple method for dealing with cases of vascular discrepancy by maintaining proper intravascular flow.
Methods: Of the 110 patients undergoing surgery, a total of 240 vascular anastomoses were performed in the arteries and veins. Of these, anastomosis occurred in 10 cases with discrepancy between recipient and donor vessels.
Results: The result showed no partial or total flap necrosis occurred in these patients. In all cases we confirm anastomosis patency with portable intra-op Doppler device. In these cases, we did not have any venous congestion or any sign of blood stream compromising in flap circulation.
Conclusion: Using introduced technique is easy and feasible in advanced head and neck reconstruction. Performing this technique needs less experienced surgeon thus helping reducing total surgery time in advanced stage, post radiotherapy recurrence and morbid patients.
Keywords: Anastomosis, Head and Neck, Reconstruction, Free flap, Tumor.

INTRODUCTION

A successful anastomosis is the Achilles of all microsurgeries. Prevention of turbulence at anastomotic site is vital and ensure blood flow to be maintained. A surgeon sometimes encounters the problem of discrepancy in the diameters of the two donor and recipient vessels needing to be sutured together. This problem is broadly seen in free flaps where there is size discrepancy in the vessels[1]. With the daily progression of reconstructive surgery techniques, the success rate in eradication of head and neck cancers has increased considerably. The biggest problem in head & neck surgery is the repair of large defects caused by tumor eradication in this region, which free flaps are routinely used to repair these defects in many centers[2].

In addition to the type of surgery, not only the type of flap and the position of the flap in the region are of high importance but also the technique of arterial and venous anastomosis is also important, providing the possibility of anastomosis failure if it is not performed accurately. The most common technique to perform anastomosis is “end-end anastomosis” technique. Unfortunately, in rare cases, the diameter of the artery and/or vein of the donor and recipient are not congruent. This discrepancy between the diameters of the donor and recipient vessels is estimated to be 1: 1.5[3].

In these circumstances, if the anastomosis is not performed accurately and in accordance with the principles of Virchow’s, the turbulent flow can be generated through the vessels. Consequently, coagulation may be initiated and ultimately, can lead to anastomotic failure. To overcome these inconsistencies, several techniques have been introduced, including end-to-side techniques, dilation of vessels, oblique cuts, fish mouth incision inter-positional grafts, coupling devices, longitudinal incision, etc[4-6]. Most of these techniques require high experience and time. Thus in this study, we aim to share our experience based on a simple method that introduced by Robert D. Acland and S Raja. Sabapathy[7] for dealing with cases of vascular discrepancy by maintaining proper intravascular flow.

MATERIAL AND METHODS

The subjects were selected from among the patients who referred to the University Center Hospital and Private Hospital between 2016 and 2018, and with regard to the indication for resection of malignant tumors of head and neck repair with free tissue. Of the 110 patients undergoing surgery, a total of 240 vascular anastomoses were performed in the arteries and veins. Of these, anastomosis occurred in 10 cases with discrepancy between recipient and donor vessels. All surgeries were performed with the preferred technique by a single surgeon (author) during this period.

Surgical Technique: After identification of the donor and recipient arteries and veins, the adventitia layer is first removed from the edge of the arteries and veins. The complete removal of adventitia is not required and only adventitia is removed to the extent that it is possible to anastomose the edges of the vessels without involvement of the adventitia. This technique is used in cases, where

the discrepancy of the diameter of the vessels is greater than 1.5 to 1. After end-to-end placement of the two arteries or veins in the approximator, we begin interrupted sutures and, it is done similar to an end-to-end anastomosis and in the end, the vessel with a larger diameter is continuously sutured like the mouth of the bag.

It should be noted that depending on the direction of the bloodstream and which donor or recipient vessel is larger in diameter, and according to the Virchow's law, as well as to prevent the formation of turbulent flow in the vessel, the purse technique of the end of the vessel may be different. If the anastomosis is related to a vein, and the vein is larger in diameter at the donor side, the extra part is obliquely sutured or will be obliquely closed using vessel clips (Fig.1).

However, if the recipient vein is thicker, the extra part is sutured across horizontally and in an interrupted manner (Fig. 2).

Fig. 1: Images shows all possible size discrepancy of vessels is head and neck reconstruction cases

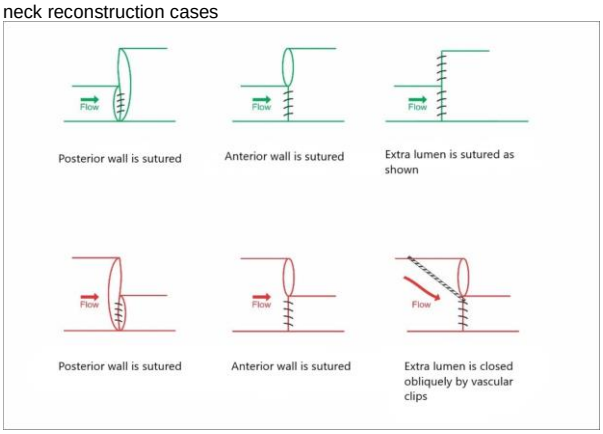

Fig. 2: 1: size discrepancy in donor and recipient vein (approximately 2:1), posterior wall is sutured. 2: anterior wall suturing is done and image shows excess amount of the vessel wall. 3: excess vessel wall is sutured as seen above.

The same considerations are applied to the arteries. It is hard to attain good anastomosis; however, rinsing with normal saline to observe the edges of the vein makes this process easier.

RESULT

During this period of time, we encountered 10 individual cases of discrepancy in vessels size. All these patients were revision surgery for a head and neck cancer. These patients were operated with different free flaps, as listed: 3 radial forearm (RFFF), 6 Anterolateral thigh (ALT) and 1 cases of deep inferior epigastric perforator (DIEP) free flaps (Table 1).

Table 1: Patient details and the extent of vascular size discrepancy during surgery

	Flap type	Related vessel	Discrepancy
SCC* tongue	RFFF	Ascending pharyngeal artery	2:1
SCC tongue	RFFF	Facial vein	1.5:1
SCC tongue	RFFF	Ascending pharyngeal artery	2:1
SCC tongue	ALT	jugular vein	2:1
SCC tongue	ALT	Facial artery	1.5:1
SCC Buccal	ALT	Jugular vein	1:1.5
SCC tongue	ALT	Ascending pharyngeal artery	2:1
Facial BCC	ALT	Internal maxillary artery	2:1
BCC facial	ALT	Super facial temporal artery	1:1.5
Hemi facial atrophy	DIEP	jugular vein	1:2

*squamous cell carcinoma

Four cases of venous discrepancy and 6 cases of arteries mismatch. All these cases anastomosis was done by senior author as mentioned above. Portable intra-op Doppler device is used to check the patency of anastomosis in every patient and repeating just before wound closure. No partial or total flap necrosis occurred in these patients.

DISCUSSION

Today, the use of free flaps is widely known in head and neck surgeries, and efforts to improve follow-up techniques such as the use of thermography to improve final results continue[8]. On the other hand, surgical technique also plays a special role in the survival of flaps. The obstacle of size discrepancy between donor and recipient vessels during microsurgeries is well established. Failure in obviating this problem can result in turbulent flow at the anastomotic site, thus thrombosis may occur. Different approaches have been introduced to overcome this problem. We compared two mentioned techniques by Turker et al., which both of these techniques empower the surgeon to overcome size discrepancies in comparison to the other techniques[7]. Although End-to-side technique significantly improve the anastomosis of vessel size discrepancy, this technique results in a turbulent flow and therefore, augments the chances of thrombosis in comparison to an end-to-end anastomosis[1]. Kruse et al. declare that coupling devices are a promising new approaches, however, are not helpful in all arteries[9]. In contrast, Turker et al. reported 100%

patency of the anastomosis at microsurgery and did not lose any of the vascularized tissues on follow-up.

In the current study we used this technique which was previously provided by Robert D. Acland and S Raja. Sabapathy[7] to conquer vascular discrepancy in 10 cases. In all cases we confirm anastomosis patency with portable intra-op Doppler device. No case of partial or total flap loss was seen in these patients. In these cases, we did not have any venous congestion or any sign of blood stream compromising in flap circulation.

Marhold et al. described a technique of linear venotomy along with the distal 2.5 cm of the vein, which in the following tapering down of the diameter reduced the circumference of the distal end of the graft, improving bypass to smaller vessels. They introduced a novel and applicable technique to obviate vessel discrepancy in cerebral bypass procedures. In fact, this technique facilitates the neurosurgical process for venous bypass procedures in the posterior fossa[10.11].

CONCLUSION

Increasing need for the use of free flaps in head and neck cancer regeneration, especially in head and neck recurrent cancers, causes to look for suitable vessels as recipients in a region previously underwent surgery or radiotherapy, which will surely cause that the surgeon will encounter different size vessels and a greater chance of discrepancy, thus the surgeon needs to be familiar with different techniques to overcome the vascular size discrepancy. To the best of our knowledge, end-to-side anastomosis is the most common technique to overcome this problem, which needs to be more refined and more experienced than end-to-end anastomosis. The end-to-side technique needs more space than the end-to-end one.

Using introduced technique is easy and feasible for conquering this problem in advanced head and neck reconstruction. Performing this technique needs less experienced surgeon thus helping reducing total surgery time in advanced stage, post radiotherapy recurrence and morbid patients.

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Informed consent: An informed consent was obtained from each individual participant and is included in the study.

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