Original Article

Comparison of Donor Site Morbidity of Suprafasicial and Sub-Fascial Radial Forearm Flap in Maxillofacial Soft Tissue Defect Reconstruction

Md Ahsan Habib[1], Farkhaanda Mah Jebin[2], Kamrun Nahar[3], Gazi Ikhtiar Ahmed[4], Md Shahidul Islam[5]

Abstract

Background: *The most important goal of reconstructive surgery in head and neck cancer patients is the optimal restoration of function & morphology. The Radial forearm free flap (RFFF) is a very reliable flap that can restore function in the head and neck very well. However, the donor site morbidity after harvesting the flap is another important issue.*

Objective: *To evaluate the donor site morbidity in oral cancer patients after reconstruction using a free radial forearm flap.*

Materials and Methods: *Fasciocutaneous flaps were raised under a tourniquet in a conventional subfascial or suprafascial manner about 2 cm proximal to the wrist skin fold after performing Allens test. The superficial radial nerve and branches of the lateral antecubital nerve were preserved. The cephalic vein & vanae comitans was used as donor vein. The donor defect was closed with a split skin graft taken from the upper thigh at the same settings. In order to aid healing the arm was immobilized for 7 days in a dorsal hand to- upper-arm splint with a pressure dressing of a parafin gauze and foam.*

Results: *Forty patients underwent reconstruction of maxillofacial soft tissue defects by RFFF. There was 100% complete graft take in Suprafascial technique but in Subfascial technique, 2 patients had partial skin loss. In Suprafascial Radial forearm technique there was no tendon exposure but in Sub-fascial technique there was 2 cases of tendon exposure. Considering the pain and numbness, 3 patient's complaints pain and 5 patients complaints of numbness of the superficial radial nerve in Suprafascial Radial forearm technique but in Sub-fascial technique 5 patients complaints pain and 4 patients complaints of numbness of the superficial radial nerve.*

Conclusion: *Suprafascial harvest of the RFFF decreases the risk of postoperative morbidity at donar site and it can be considered over the traditional subfascial harvest technique due to its superior donor site outcomes.*

Keywords: *Reconstruction, Radial Forearm Flap, Sub-fascial Flap, Suprafascial Flap.*

Date of received: *18.04.2024*

Date of acceptance: *31.05.2024*

DOI: https://doi.org/10.3329/kyamcj.v15i02.79626

KYAMC Journal. 2024; 15(02): 61-65.

Introduction

The radial forearm flap is the most useful and versatile fasciocutaneous flap based on the radial artery & its vanae comitants with cephalic vein. The flap includes the volar forearm skin, the underlying antebrachial fascia, and the intermuscular fascia, which contains the radial artery and its cutaneous branches. Radial forearm flap was first described by Yang in 1981.[1] After that it has become the workhorse flap and it is the most commonly used fasciocutaneous flaps.[2,3] The pliability, thinness and simple eleva¬tion technique of free radial forearm flap (FRFF) makes it a leading choice of head and neck reconstructions. The vascular pedicle of the FRFF provides adequate vessel diameter and length for vascular anastomosis.

Although this flap provides an excellent result at the site of reconstruction, it is associated with remarkable donor site morbidity, and its advantages must be balanced against potential complications at the donor site. The early complica¬tions of radial forearm flap include wound breakdown and skin graft loss, leading to delayed wound healing and tendon exposure .[4,5] Long-term complications include reduced wrist mobility, wrist or hand weakness[5,6] superficial radial nerve dysesthesia, cold intolerance, and impaired functional outcome.

In previous study shows the subjective morbidity after harvest of the FRFF is more than objective morbidity. This is one of the

1. Associate Professor and HOD of Oral and Maxillofacial Surgery Department, Khwaja Yunus Ali Medical College, Enayetpur, Sirajganj, Bangladesh.
2. Assistant Professor, Dental Public Health Department, Khwaja Yunus Ali Medical College, Enayetpur, Sirajganj, Bangladesh.
3. Assistant Professor and HOD, Oral and Maxillofacial Surgery Department, Saphena Women's Dental College, Dhaka, Bangladesh.
4. Associate Professor and HOD, Dental Public Health Department, Khwaja Yunus Ali Medical College, Enayetpur, Sirajganj, Bangladesh.
5. Professor and HOD, Prosthodontic Department, Khwaja Yunus Ali Medical College, Enayetpur, Sirajganj, Bangladesh.

Corresponding author: Md Ahsan Habib, Associate Professor and HOD of Oral and Maxillofacial Surgery, Khwaja Yunus Ali Medical College, Enayetpur, Sirajganj, Bangladesh. **Cell**: +880 1728-641864, **E-mail:** shreyas2011@yahoo.com

reasons that some reconstructive surgeons shift their attention to other fasciocutaneous flap for reconstruction of defects in the head and neck.[7] So we are aim to investigate these subjective complaints in more detail in maxillofacial cancer patients in Bangladesh.

Materials and Methods

This comparative study was done different clinic in Dhaka, Bangladesh from March 2014 to December 2018 with the age group of 30 to 70 years in 17 male & 23 female patients diagnosed with oral squamous cell carcinoma. After taking the written consent from the patient, nondomidant hand was selected to perform radial forearm flap harvest.

Preoperatively the Allen's test was performed to ensure adequate collateral supply to the hand via the ulnar artery. The radial artery and cephalic vein is palpated and marked. Fasciocutaneous flaps were raised under a tourniquet in a conventional subfascial or superfascial manner about 2 cm proximal to the wrist skin fold. The superficial radial nerve and branches of the lateral antecubital nerve were preserved. The cephalic vein was used as donor vein. The radial artery was not reconstructed in any patient. The donor defect was closed with a split skin graft (0.6 mm) taken from the upper thigh at the same site. In order to aid healing the arm a pressure dressing of a parafin gauze and foam was placed over the skin and the arm was immobilized for 7 days in a dorsal hand to- upper-arm splint.

Details of the reconstruction including laterality, tourniquet time, and harvest technique were noted. Finally, donor and recipient site complications were identified. The donor site was evaluated for tendon exposure at the time of the bolster removal and at 2 weeks and 1 month postoperatively. Pain, numbness, paresthesia & itching were evaluated after 3 months, 6months & one year postoperatively.

Results

This comparative study was done different clinic in Dhaka with the age group of 30 to 70 years where the male and female ratio was 1: 1.35.[Table-I] There was 100% complete graft take in Suprafascial Radial forearm technique [Fig-1] but in Subfascial technique [Fig-2], 2 patients had partial skin loss.

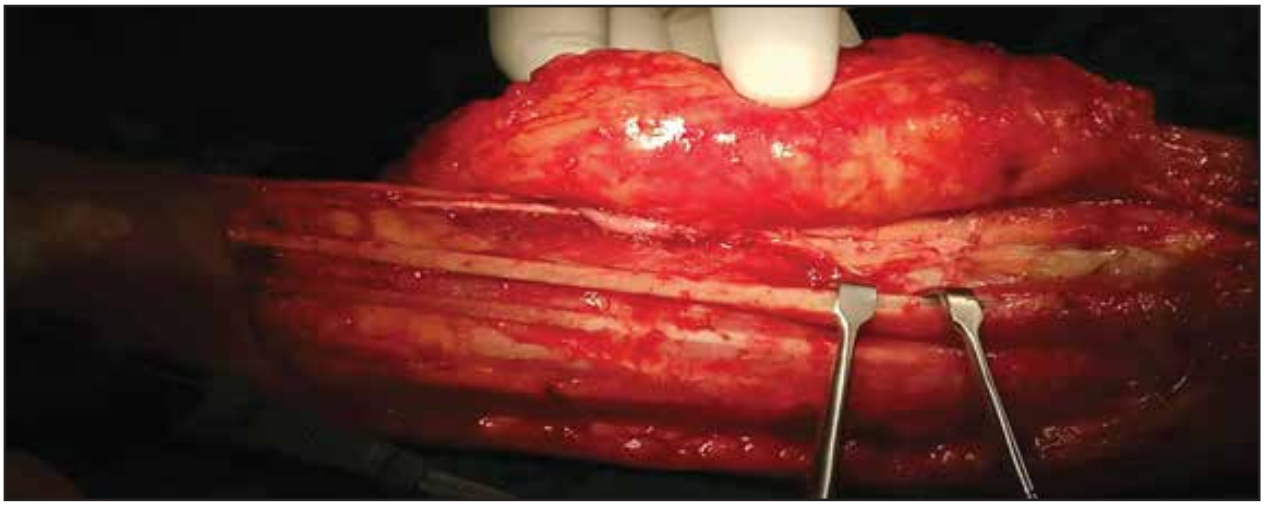

Figure 1: Suprafascial dissection of RFFF

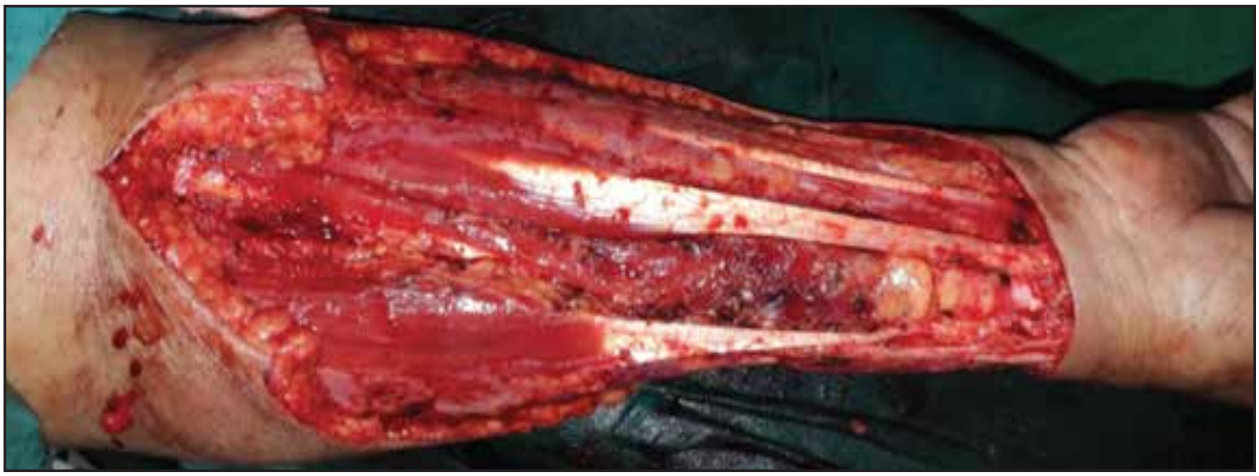

Figure 2: Subfascial dissection of RFFF

This area of graft loss represented less than 1% of the total grafted area and that was healed completely by one month after the skin graft. The most extensive skin loss was in early in which the graft had not been adequately fenestrated resulting in a seroma.

Table I: Demographics feature of patients.[n=20]

Demographic	Suprafascial n=20	Subfascial n=20
Male	8	9
Female	12	11
Age group	35 - 70	30 - 70
Recipient site		
Oral cavity	12	10
Extra oral	8	10

In Suprafascial Radial forearm technique there was 1 case of delayed healing but no tendon exposure. In Sub-fascial technique there were 2 cases of delayed healing and 2 cases of tendon exposure [Fig-3]. Considering the pain and numbness, 3 patient's complaints pain and 5 patients' complaints of numbness of the superficial radial nerve in Suprafascial Radial forearm technique but in Sub-fascial technique 5 patients complaints pain and 4 patients complaints of numbness of the superficial radial nerve.

No significant difficulties were faced in both techniques of Radial forearm flap harvest. The mean harvest time was 75 min in Sub-fascial technique and 90 min in Suprafascial technique where the range of flap size was 20-150cm2.[Table II]

Table II: Comparison of donor site morbidity of suprafasicial & sub-fascial radial forearm flap. [n=20]

	Suprafascial n=20	Subfascial n=20
Skin loss	0	2 partial loss
Tendon exposer	0	2
Wound healing	1	2
Pain	3	5
Numbness & Paraesthesia	5	4
Itching	10	12
Time of Harvest	90 min	75 min

Early mobilization of the hand was achieved in all cases. In 1 month follow-up, no patient complained of significant loss of grip strength or range of movement in both techniques. Two patients after 1 month of follow up had transient paraesthesia of the superficial radial nerve of Sub-fascial technique which was treated conservatively. The main complaints of Radial forearm harvest were itching in both techniques. Almost all patients were complaints of itching.

Discussion

The most important goal of head and neck reconstructive surgery in cancer patients is the optimal restoration of function. The FRFF is a very reliable flap which can restore function as well as aesthetics in the head and neck reconstructive surgery very well.[8-10] Besides this, the donor site morbidity after harvesting the FRFF flap is another important issue. Although the main concern of head and neck reconstructive surgery was the reconstruction the function of primary site but during follow-up, the donor site become more important to patients.[11]

Suprafascial and sub-facial technique were predominantly used to reconstruct the defect after head and neck cancer surgery. Previous study shows that aesthetic morbidity after harvest of the FRFF is more than functional morbidity.[7] Suprafascial harvest of the FRFF has been shown to reduce donor site morbidity, where the predominant disadvantage of the radial forearm flap harvest was in the subfascial plane.[12]

There was 100% complete graft take in Suprafascial Radial forearm technique but in Subfascial technique, 2 patients had partial skin loss. This area of graft loss represented less than 1% of the total grafted area and that was healed completely by one month after the skin graft. Avery reported that there was 100% early and complete graft take in the full thickness group but one area of partial loss in the split thickness group in Suprafascial Radial forearm technique.[13] This area of graft loss represented less than 0.5% of the total grafted area in this series.

In Suprafascial Radial forearm technique there was 1 case of delayed healing but no tendon exposure [Fig-4]. In Sub-fascial technique there were 2 cases of delayed healing and 2 cases of tendon exposure [Fig-3]. Shonka demonstrate that Postoperative tendon exposure at the donor site occurred in 5 (20%) of the patients in the subfascial group and in 0 (0%) of the patients in the suprafascial group.[14] Avery also found no cases of tendon exposure or delayed healing in Suprafascial Radial forearm technique.[13] Delayed healing is not unusual at the subfascial donor site, where it has been reported as 28% and 22% .[15, 16]

Figure 3: Tendon Exposure After 12 Days Postoperatively in Sub Fascial Technique

Figure 4: Donar site 3 months posoperative suprafascial technique

Lutz reported that, there was no remarkable cold intolerance in any of the 50 patients.[17] Critical evaluations of sensory change revealed numbness distal to the donor site in 54 percent of the patients. However, dysesthesia was usually mild and improved spontaneously as time passed. 13 also reported that seven patients had transient paraesthesia of the superficial radial nerve, one developed a neuroma, which was treated conservatively, In this study, 3 patient's complaints pain and 5 patients complaints of numbness of the superficial radial nerve in Suprafascial Radial forearm technique but in Sub-fascial technique 5 patients complaints pain and 4 patients complaints of numbness of the superficial radial nerve.

Conclusion

This study demonstrates that, suprafascial dissection for harvesting of radial forearm-free flap results in lower donor-site morbidity as compared to that of subfascial dissection. Suprafascial donor site shows superior graft uptake and results in much lower incidence of delayed healing as compared to subfascial donor site and it reduced burden of postoperative wound management. So suprafascial technique should be considered over the traditional subfascial harvest technique due to its superior donor site outcomes.

Acknowledgment

Authors of this study are thankful to Late Dr. Rajan Karmakar, former assitant professor, BSMMU, Shahbag, Dhaka & Dr. Avijit Sarker, assistant professor , NITOR, Shyamoli, Dhaka.

References

1. Yang GF, Chen PJ, Gao YZ, Liu XY, Li J, Jiang SX, et al. Forearm free skin flap transplantation: a report of 56 cases. Br J Plast Surg 1981;50:162–165.

2. Soutar DS, Scheker LR, Tanner NS, McGregor IA. The radial forearm flap: a versatile method for intra-oral reconstruction. Br J Plast Surg 1983; 36:1–8.

3. Evans FGR, Schusterman MA, Kroll SS, Miller MJ, Reece GP, Robb GL, et al. The radial forearm free flap for head and neck reconstruction: a review. Am J Surg 1994; 168:446–450.

4. Bardsley AF, Soutar DS, Elliot D, et al. Reducing morbidity in the radial forearm flap donor site. Plast Reconstr Surg 1990;86:287-292.

5. Timmons MJ, Missotten FE, Poole MD, et al. Complica¬-tions of radial forearm flap donor sites. Br J Plast Surg 1986; 39:176-178.

6. Toschka H, Feifel H, Erli HJ, et al. Aesthetic and functional results of harvesting radial forearm flap, especially with re¬gard to hand function. Int J Oral Maxillofac Surg 2001;30: 42-48.

7. de Witt CA, de Bree R, Verdonck-de Leeuw IM, Quak JJ, Leemans CR. Donor site morbidity of the fasciocutaneous radial forearm flap: what does the patient really bother. Eur Arch Otorhinolaryngol. 2007;264(8):929-934.

8. Borggreven PA, Verdonck-de, Leeuw I, Langendijk JA, Doornaert P, Koster MN, et al. Speech outcome after surgical treatment for oral and oropharyngeal cancer: A longitudinal assessment of patients reconstructed by a microvascular Xap. Head Neck 2005; 27:785–793.

9. Su WF, Hsia YJ, Chang YC, Chen SG, Sheng H. Functional comparison after reconstruction with a radial forearm free Xap or a pectoralis major Xap for cancer of the tongue. Arch Otolaryngol Head Neck Surg 2003; 128:412–418

10. Hara I, Gellrich NC, Duker J, Schon R, Fakler O, Smelzeisen R, et al. Swallowing and speech function after intraoral soft tissue reconstruction with lateral upper arm free Xap and radial forearm free Xap. Br J Oral Maxillofacial Surg 2003; 41:161–169

11. Ito O, Igawa HH, Suzuki S, Muneuchi G, Kawazoe T, Saso Y, et al. Evaluation of the donor site in patients who underwent reconstruction with a free radial forearm Xap. J Reconstr Microsurg 2005; 21:113–117.

12. Desai AK, Kumar N, Singhania V and Prabhu A. Comparison of the outcome of suprafacial and subfacial dissection of radial forearm in head and neck reconstruction.)ral Cancer 2018; 2:27–35

13. Avery CM, Pereira J, Brown AE. Suprafascial dissection of the radial forearm flap and donor site morbidity. Int J Oral Maxillofac Surg. 2001 Feb;30(1):37-41.

14. Shonka DC Jr, Kohli NV, Milam BM, Jameson MJ. Suprafascial Harvest of the Radial Forearm Free Flap Decreases the Risk of Postoperative Tendon Exposure. Ann Otol Rhinol Laryngol. 2017 Mar;126(3):224-228. doi: 10.1177/0003489416685322. Epub 2017 Jan 6.

15. Richardson D, Fisher SE, Vaughan ED, Brown JS. Radial forearm flap donor site complications and morbidity: a prospective study. Plast Reconstr Surg 1997;9(1):109–115.

16. Bardsley AF, Soutar DS, Elliot D, Batchelor AG. Reducing morbidity in the radial forearm flap donor site. Plast Reconstr Surg 1990; 86(2):287–292.

17. Lutz BS, Wei FC, Chang SC, Yang KH, Chen IH. Donor site morbidity after suprafascial elevation of the radial forearm Xap: a prospective study in 95 consecutive cases. Plast Reconstr Surg 1999;103:132–137.