Submental Artery Island Flap in Patients who Have Received Prior Neck Irradiation

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Abstract Submental Artery Flap (SMAF) was first described in 1990 and has gained popularity ever since. However there has been relative paucity on information about the use of this flap in irradiated patients. Our aim was to explore the success of SMAF for reconstructing defects following oral cancer resection in this group of patients. After prior approval from scientific and ethical committee, we performed a retrospective review of records of eleven patients who underwent SMAF reconstruction between March 2009 and September 2012. Seven patients (63 %) had undergone prior irradiation. The flap was viable in all the patients excepting for superficial epidermal loss in one patient who had undergone prior irradiation. There was major donor site complication in one, and recurrences in four patients, all in the irradiated group. SMAF may be used in patients with irradiated neck taking special precautions to avoid donor site morbidity. Previous neck irradiation may not affect flap viability.

Keywords Submental flap · Radiotherapy · Neck dissection · Oral cancer · Reconstruction

Introduction

SubMental Artery island Flap(SMAF) was first described in 1990 [1] and has rapidly been incorporated into clinical prac-

tice for varied indications. Experience with the flap in reconstructing head and neck defects has steadily grown worldwide, but surprisingly, there is very little information about the application of this flap in post radiotherapy oral defects. In this scenario, there are three issues, one, reliability of the flap when harvested from a irradiated neck, two, technical modifications to ensure safe harvesting of the flap in the presence of radiotherapy related fibrosis and three, donor site morbidity. The authors report their experience of using the submental flap for reconstruction in seven patients who underwent ablative surgery for residual/recurrent oral cancer after irradiation, over the past one year.

Methods

A retrospective study of records of patients who had undergone SMAF reconstruction for oral cancer between March 2009 and September 2012 was performed after obtaining prior approval from the JIPMER Scientific Advisory Committee (JIP/DME/JSAC/7/2012/72) and the Institute Ethics Committee (JIP/IEC/SC/2013/1/269). The study included only patients with pathologically confirmed squamous cell carcinoma of the oral cavity who were treated at JIPMER (Jawaharlal Institute of Postgraduate Medical Education and Research). The Surgery was performed in a single department by a single surgeon with experience in Surgical Oncology and Head and Neck Reconstruction.

Results

Eleven patients had undergone SMAF reconstruction between March 2009 and September 2012. Among them, seven had received prior irradiation to the primary and the neck (Table 1). Six patients had received irradiation with Cobalt-60. One patient with a floor of mouth tumor received

The study is a retrospective analysis of patient records of human participants. Informed consent was obtained for the procedure as per standard institution policy.

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Table 1 Clinical parameters of the seven patients who underwent SMAF reconstruction following radiotherapy

S No	Age/Sex/date of surgery	Diagnosis	Stage Clinical/ pathological	Radiotherapy source	Field Size	RT Start Date	RT End Date	Fractions	TotalDose (Gy)	DPF (Gy)
1	M 56 Surgery 10-08-2012	Squamous cell carcinoma of Left Buccal Mucosa	CT2N0M0 pT2N0M0	Co-60	Left Anterolateral Wedge Fields	NA	NA	NA	NA	NA
2	F 64 Surgery 17-07-2012	Squamous cell carcinoma left buccal mucosa	cT3N1 pT3Nx	Co-60	Left anterolateral wedge fields	23-08-11	22-10-11	32	64	2
3	M 47 Surgery 04-05-12	Squamous cell carcinoma Floor of mouth	cT2N2c pT4aN1	Co-60 And Brachytherapy implants	Left lateral 10x14cm Right lateral 10x14cm direct anterior 6x18cm SSD=80 cm Brachytherapy using iridium wires	07-09-11 23-08-11	05-10-11 26-08-11	25 7	50 17.5	2 250 cGy
4	M 40 Surgery 10-04-12	Squamous cell carcinoma Right buccal mucosa	cT1N1 pT4aNx	Photons 6 MV	Right Anterior 12x6cm Right Lateral 12x12cm SSD=100	02-12-10	05-2-11	29	64	2.2
5	M 45 Surgery 01-12-11	Squamous cell carcinoma left buccal mucosa	cT3N1 pT2Nx	Co-60	13x10cm Face and neck Bilateral opposing lateral fields SSD=80 cm	04-7-11	19-07-11	7(left)+6(right)	39Gy	3Gy
6	F 65 Surgery 09-07-11	Squamous cell carcinoma left buccal mucosa	cT2N1 pT3Nx	Co-60	Left anterior and lateral wedge Left anterior 10x6cm Left lateral 10x10cm Ssd=80	25-10-10	09-12-10	32	64	2
7	M 61 Surgery 31-05-11	Squamous cell carcinoma right buccal mucosa	cT3 N0 pT3Nx	Co-60	Right anterior and right lateral face Field size details not available	05-10-01	13-11-01	28	63	2.25

Interstitial Implant Brachytherapy in addition to External Beam Radiation therapy (EBRT). While six patients had received EBRT with curative intent, one had received 39 Gy in 13 fractions with palliative intent. With regard to management of the cancer, the resection margins were free on frozen section and final paraffin section in all patients.

Three patients developed recurrence (patients nos. 3, 4 and 6). The recurrence was a mucosal local recurrence in patients no.3 (within 6 months) and patient no.4 (after 12 months), it was a non-mucosal recurrence in the infra-temporal fossa for patient no. 6 (after 12 months) possibly related to perineural invasion.

With regard to flap viability, there was partial flap loss (epidermal loss) in patient no. 3, while the flap was 100 % viable in all other patients ($n=11$). The flap was single paddled in nine, and bipaddled in two patients. In the irradiated group, patient no. 4 had a bipaddled flap for full thickness cheek resection.

Donor site morbidity in the form of skin flap necrosis including portion of lip ipsilateral to the side of the flap (midline lip split cheek flap was used for access) occurred in patient No.5. The flap was 100 % viable, and the defect was covered with a deltopectoral flap.

Discussion

The surgical anatomy of the SMAF and technique of harvest have been well described [2, 3] Our institution had reported a

bipaddled modification of the conventional single paddled submental flap in non-irradiated patient [4] (Figs. 1 and 2). In this series the same technique was used to perform a bipaddled reconstruction in patient No. 4 (irradiated) without any compromise to flap viability.

Briefly, the flap is marked in an horizontal elliptical fashion in the submental area. The upper border is marked along the lower border of the mandible and the lower border is marked after a “pinch test” which allows primary closure of the donor area. The length of the flap is between the angle of the mandibles. The flap is raised from the contralateral side in a subplatysmal plane till the ipsilateral digastrics muscle is reached taking care to clear the Level 1 A nodes. Subsequently, the ipsilateral digastrics muscle is divided at the intermediate tendon and at the mandible to allow for its harvest with the flap and thereby ensuring safety of the perforators. The rest of the flap is dissected off the sub-mandibular glands clipping a few vessels entering the gland. The facial vessels are identified along with the submental branch. The facial vessels are clipped distally and the flap harvest is complete for intraoral use.

Node positivity is a strong predictor of recurrence in patients who undergo SMAF reconstruction.[5]. In our series, we did not perform a comprehensive neck dissection in irradiated patients if they were clinically node negative at the time of surgery for recurrence/residual cancer. Among the eleven patients, the three patients who developed recurrence had received prior irradiation. In a series of 136 patients who underwent submental flap reconstruction, recurrence rates have reported to be about 19.8 % and pre-operative clinical

Fig. 1 Bipaddled Submental artery flap. **a** SMAF vascular pedicle delineated with hemostat, **b** SMAF inset demonstrated, **c** SMAF inset in Bipaddled fashion demonstrated, **d** Early Post-operative outcome of bipaddled SMAF in irradiated patient

Fig. 2 Single paddled Submental artery flap. In a clockwise direction the figure reveals the Submental flap territory, completed harvest, Vascular pedicle, and Intraoral Inset

node staging was the only significant predictor of recurrence in univariate and multivariate analysis [5]. In our series, we did not perform a comprehensive neck dissection in irradiated patients who had residual/recurrent disease, if they were clinically node negative. The recurrence rate among the irradiated patients was quite high, 3/7 (42 %). One of these patients had pathologically positive nodes in Level I and developed locoregional recurrence within 6 months. The other three developed either local or infratemporal recurrence after 12 months.

There is a paucity of data with regard to the use of SMAF in patients who have previously been irradiated. In a retrospective study of 21 patients by Taghnia et al., six of the nine patients who underwent SMAF reconstruction after prior irradiation experienced major complications, which included total flap loss (1/9), partial flap loss (2/9) and scar contracture (3/9) [6]. While there are reports of higher risk of marginal mandibular nerve palsy in irradiated necks, submental flap per se may not be contraindicated in such patients [7].

Some authors have reported series of patients who underwent SMAF reconstruction which included patients who were irradiated [8, 9] without significant increased risk of complications.

Conclusion

Submental flap may be performed in selected clinically node negative oral cancer patients even after prior irradiation. As

apparent from published literature, the surgeon should be aware of the potential for complications like donor site morbidity and recurrence but there seems to be no increased risk of flap loss in this group of patients.

Compliance with Ethical Standards The study was performed after obtaining prior approval from the JIPMER Scientific Advisory Committee (JIP/DME/JSAC/7/2012/72) and the Institute Ethics Committee (JIP/IEC/SC/2013/1/269).

Conflict of Interest There are no conflict of interest.

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