

The Submental Flap: Be Wary

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Abstract

Background: The submental island flap (SIF) has emerged as an alternative to free tissue transfer in reconstruction of head and neck defects. SIF is reported to have comparable success rates and potentially lower costs and hospital length of stay as compared to free flaps. This review examines the outcomes of SIF for reconstruction of oral cavity defects and other head and neck sites in a single institution.

Methods and Materials: This retrospective case series with chart review includes 10 consecutive patients who underwent SIF reconstruction following various head and neck procedures by 2 different physicians at a single care facility between November 2016 and April 2018.

Results: 10 total patients underwent submental flaps between 2016 and 2018. Five were female, and 5 were male. Age of patients ranged from 33 to 85, with an average age 60.7 years. Two patients were smokers. Four patients had hypertension, and one had diabetes. Six of the patients had no comorbidities. Nine of the patients had simultaneous neck dissection. None of the patients had prior chemotherapy or radiation.

All ten patients suffered failure of SIF as the definitive reconstructive procedure. Eight of the patients required a second procedure in the operating room. Submental flaps were aborted during the initial procedure in 3 of the patients.

Six of the 10 patients had initial placement of the SIF and further debridement at a second OR sitting. Three of those had venous congestion, and 3 of those were due to necrosis from poor arterial supply. One patient noted survival of a portion of the SIF for a parotid defect but needed a subsequent cervicofacial rotation flap for closure of the remaining defect.

Conclusion: Despite comparing favorably to free tissue transfer in published reports, SIF in this series had a high failure rate, and the need for secondary procedures negated any cost or time savings. Patient age, history of radiation, tobacco use, or diabetes was not associated with failure. It was thus considered that technical issues such as surgeon experience and years out of training could have contributed to the failure rate. This series demonstrated the need to examine non-patient factors when outcomes vary significantly from published literature.

Keywords: Submental flap; Free flap; Necrosis; Dehiscence; Floor of mouth

Introduction

Oral cavity cancer is the sixth most common cancer worldwide, comprising 30% of all H&N cancers [1]. Surgery is considered the gold standard to achieve tumor control [2]. The traditional surgery has been the use of micro vascular free flaps, albeit at higher costs and hospital length of stay than alternatives. Other head and neck resections result in tissue deficits, such as after parotidectomy. The submental island flap (SIF) has emerged as an alternative over the more costly and lengthy free flap, for oral cavity and other head and neck defects.

The first description of the SIF was by Martin and colleagues in 1993 [3]. They described it as a reliable alternative to the more traditional free flap procedure and as a means of reconstruction after oncologic procedures of the head and neck. Arising deep to the

submandibular gland, the submental artery, a reliable branch of the facial artery, is the main contributor to the SIF [4-6]. At the mylohyoid, the artery either continues deep (70%) or superficial (30%) to the anterior belly of the digastric muscle, terminating at the mandibular symphysis [6-7]. Up to 4 cutaneous perforators have been described in other SIF studies; however, cadaveric studies have only been able to consistently find 1 reliable perforator to supply the skin paddle [8]. Also, the submental vein has been found to be the primary vessel for venous drainage of the SIF [9]. With decreased hospitalizations and shorter operating times, the SIF transformed into a plausible and effective alternative to traditional free flap reconstruction [5]. However, even with its relatively consistent anatomy and large number of positive surgical outcomes, the SIF has had its fair share of complications.

This study seeks to analyze and explain the various post-op complications surrounding submental island flaps. It will estimate the potential impact submental flaps may have relative to the traditional

method of using free flap reconstruction, once post-op complications are taken into consideration. It will also serve as a warning to new reconstructive surgeons who consider using a submental flap, as opposed to the more traditional free flap.

Materials and Methods

This retrospective case series with chart review includes 10 patients that underwent SIF reconstruction following various head and neck procedures by 2 different physicians at a single care facility between November 2016 and April 2018. These surgeons were newly out of fellowship training and embarking on their first attending surgeon position. The first ten consecutive SIF cases performed at one institution were included. Inclusion criteria were adults with a diagnosis of malignancy of the head and neck undergoing surgery with

reconstruction using SIF, that then went on to fail SIF reconstruction. Demographics and preoperative risks were collected. Data were gathered regarding the type of procedure performed. Postoperative variables and wound dehiscence were recorded.

Results

10 total patients underwent submental flaps between 2016 and 2018. Five were female, and 5 were male. Age of patients ranged from 33 to 85, with an average age 60.7 years. Only 2 patients were smokers. Four patients had hypertension, and one had diabetes. Six of the patients had no comorbidities. Nine of the patients had simultaneous neck dissection. None of the patients had prior chemotherapy or radiation. The defects requiring reconstruction were widely varied (Table 1).

| Patient | Sex | Age | Comorbidities | Tobacco Use | Simultaneous Neck Dissection | Previous Radiation or Chemotherapy? | Outcome | Need for second trip to OR | Defect |
|---------|-----|-----|---------------|-------------|------------------------------|-------------------------------------|--|----------------------------|---|
| 1 | F | 61 | None | Yes | Yes | No | Aborted due to pathologic nodes in submental area and Free Flap next day | Yes | Composite resection of right floor of mouth, right ventral tongue partial glossectomy, and right marginal mandibulectomy. |
| 2 | F | 33 | None | No | No | No | Residual postauricular defect that needed cervicofacial rotational flap reconstruction | Yes | Parotid defect |
| 3 | M | 56 | None | Yes | Yes | No | Congested and debulked | Yes | FOM/Ventral tongue |
| 4 | F | 85 | DM, HTN | No | Yes | No | Performed a submental island flap. Later it was noted that the submental vein drained into the external jugular system | Yes | Tongue/RMT |
| 5 | F | 62 | HTN | No | Yes | No | Aborted and did alloderm | No | FOM |
| 6 | M | 59 | HTN | No | Yes | No | Necrotic and debulked | Yes | Partial glossectomy |
| 7 | M | 67 | None | No | Yes | No | Congested and debulked | Yes | Buccal mucosa |
| 8 | M | 53 | None | No | Yes | No | Aborted and did STSG | No | Ventral tongue/FOM |
| 9 | F | 73 | HTN | No | Yes | No | Necrotic and debulked | Yes | Ventral tongue/FOM |
| 10 | M | 58 | None | No | Yes | No | Necrotic and debulked | Yes | Buccal mucosa |

All ten patients suffered failure of the SIF as the definitive reconstruction. Eight of ten patients required a second procedure in the operating room. Three of ten patients received an intra operative change in reconstruction plan, aborting the SIF during the initial procedure. Patient 1, a 61-year-old female and tobacco user, had her SIF reconstruction aborted due to pathologic nodes in the submental

area. She subsequently underwent a free flap reconstruction the following day. Patient 5, a 62-year-old female with hypertension, had her SIF aborted because of poor venous flow. Instead, she had an acellular dermal matrix allograft placed. Patient 8, 53-year-old male with no comorbidities, had his SIF reconstruction aborted due to poor

blood supply to the island graft. He then underwent a split thickness skin graft (STSG) the same day.

Six of the 10 patients had initial placement of the SIF and further debridement at a second OR sitting. Three of those had venous congestion, and 3 of those were due to necrosis from poor arterial supply. One patient noted survival of a portion of the SIF for a parotid defect but needed a subsequent cervicofacial rotation flap for closure of the remaining defect.

Discussion

Although the submental flap is relatively thin, easy-to-harvest, and typically well-vascularized, it does have complications. Our single institution series varied from the literature with 100% failure rate [10].

Chow *et al.* reported partial loss of 2 out of 10 flaps in their 2007 study, while Merten *et al.* reported loss of 1 flap in 11 nonirradiated patients in their 2002 study [11-12]. In a series of SIF performed in 2018 by Faisal *et al.*, 2 complete and 3 partial flap losses were recorded [10]. The authors mentioned that they avoided the SIF if the neck had been previously irradiated, with Taghinia *et al.* reporting that preoperative radiotherapy was the most consistent finding in those who suffered flap loss [13].

Nine of our 10 patients required simultaneous neck dissection. When a neck dissection is needed during a procedure where SIF is planned, the reconstructive surgeon should have a careful discussion with the resecting head and neck surgeon so that the facial artery or vein is not ligated during the neck dissection. In the circumstance that the vein or artery is injured, using that side of the neck for the SIF is not recommended, and the submental flap should be based on the contralateral side.

Three of the patients were noted to have venous congestion, requiring second trip to the OR. The submental vein has been found to be the primary venous drainage of the flap, but in one of our cases the submental vein was noted to drain into the external jugular system during the bring-back procedure. The external jugular system had been ligated during the initial procedure. Perhaps this could have been avoided with an earlier identification of the anatomy. A different mode of reconstruction could have been undertaken during the initial procedure.

Three of the patients were noted to have necrotic SIF from lack of blood supply. Studies have shown only one reliable perforator of the SIF, which is much smaller than the perforators of the work-horse anterolateral thigh free flaps and radial forearm free flaps. The size difference for vessel handling can be a potential technical challenge.

Our poor SIF results were independent of the defect site. We used SIF for soft tissue defects resulting from composite resection of mandible/tongue/floor of mouth; as well as defects of oral tongue; retromolar trigone; buccal mucosa; floor of mouth; and parotid. Sittitrai and colleagues concluded that the SIF is reliable, is suitable for oral tongue reconstruction, and had a lower complication incidence when compared to the radial forearm free flap. While there is an abundance of support for free flaps and the success is >95% in the literature, there is also as much positive data on the SIF [14].

Our reconstructive surgeons had a greater than 90% survival rate when performing free flaps and a 0% success rate when using SIF. Thus, technical and training factors were examined: in typical head and neck surgical oncology fellowships, free flaps are a far more

common form of reconstruction than SIF. Regenbogen and several others have acknowledged that commonly recommended interventions, like restricting high-complexity operations to experienced surgeons and additional trainings for inexperienced surgeons would lead to an improvement in outcomes [18]. In our hands, free tissue transfers have superior outcomes compared to pedicled flaps due to our experience and knowledge of free flaps.

Studies have shown less cost with pedicled flaps than free flaps. However, 70% of our SIF patients required second trips to the operating room during their initial stay, compared to 5% of our free flap patients. In our hands, patients who underwent SIF did not experience decreased cost, length of stay, and operative time compared to free flaps, as reported in other series [14-17].

As Zhou and colleagues reiterate, in regard to intraoperative factors, surgical technique is regarded as the most important component of free flap success [18-20]. In their very own study, Zhou had two surgeons perform the microvascular anastomoses in the free flap reconstructions for his study, with each having been in practice 5 years or more [21]. Such experiential and technical rigor has not been analyzed in SIF outcome literature, perhaps because SIF is may be viewed as a simpler procedure.

Conclusion

Despite their promising potential and numerous cases with positive outcome results, submental flaps are still open to failure. In our series, surgeon experience may have been more influential in outcomes than patient factors such as age, type of defect, history of radiation, tobacco use, or other comorbidities. In our institution, a free flap is preferable and has lower risk of complications compared to a pedicle flap, and the pedicled flap is the backup secondary option when a free flap is lost.

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Conflicts of Interest

The authors report no relevant financial disclosures related to this current work.

Ethical Considerations

All issues related to ethics were taken into consideration throughout the study design and proposal and implemented during the research study itself. Informed consent was obtained, beneficence was made a top priority, and respect for confidentiality and privacy were upheld during the study and its various analysis and information assertion components.

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