

Abstract

Introduction: Free tissue transfer has revolutionized the clinical course of oral cavity carcinoma patients, allowing for patients to regain near-normal swallow, speech and overall function. However, radial forearm free flaps (RFFF), the prototypical workhorse for free flap reconstruction of medium sized defects of the oral cavity, are associated with significant operating time, prolonged hospitalization and increased trips to the operating room with possible skilled nursing home utilization. Locoregional flaps such as FAMM (fascial artery musculomucosal) flap have equivalent outcomes and less morbidity with reduced healthcare utilization. While there have been some reports dictating institutional comparison of the procedures, there has yet to be a cost utility analysis comparing the two modalities.

Methods: A cost utility analysis was performed in Excel evaluating patients who undergo a RFFF or a FAMM. A decision model was utilized over a 5-year timeframe. The health states were assumed to be: (1) Healthy - No Flap Complications, (2) Flap Complications Requiring Surgery, (3) Flap Complications Not Requiring Surgery but needing skilled nursing, and (4) Death. All costs, health utilities, and ranges were found from reported values. The number of quality adjusted life years (QALY) and incremental cost effectiveness analysis (ICER) was tabulated.

Results: In the decision model over 5 years, the expected cost for the RFFF in total was \$35247 compared to \$24188 for the FAMM. The cost per QALY for those who underwent a FAMM was \$6765 and \$12536 per QALY for those who underwent an RFFF. As such, there was a -\$25829 change for a 1 change in QALY and RFFF was strongly dominated by FAMM.

Conclusions: In patients amenable to either a FAMM or RFFF, a FAMM procedure is a cost-effective strategy.

Methods

- Cost Utility Analysis In Microsoft Excel
- The health states were assumed to be: (1) Healthy - No Flap Complications, (2) Flap Complications Requiring Surgery, (3) Flap Complications Not Requiring Surgery but needing skilled nursing, and (4) Death.
- Costs and utility values were obtained from online resources.

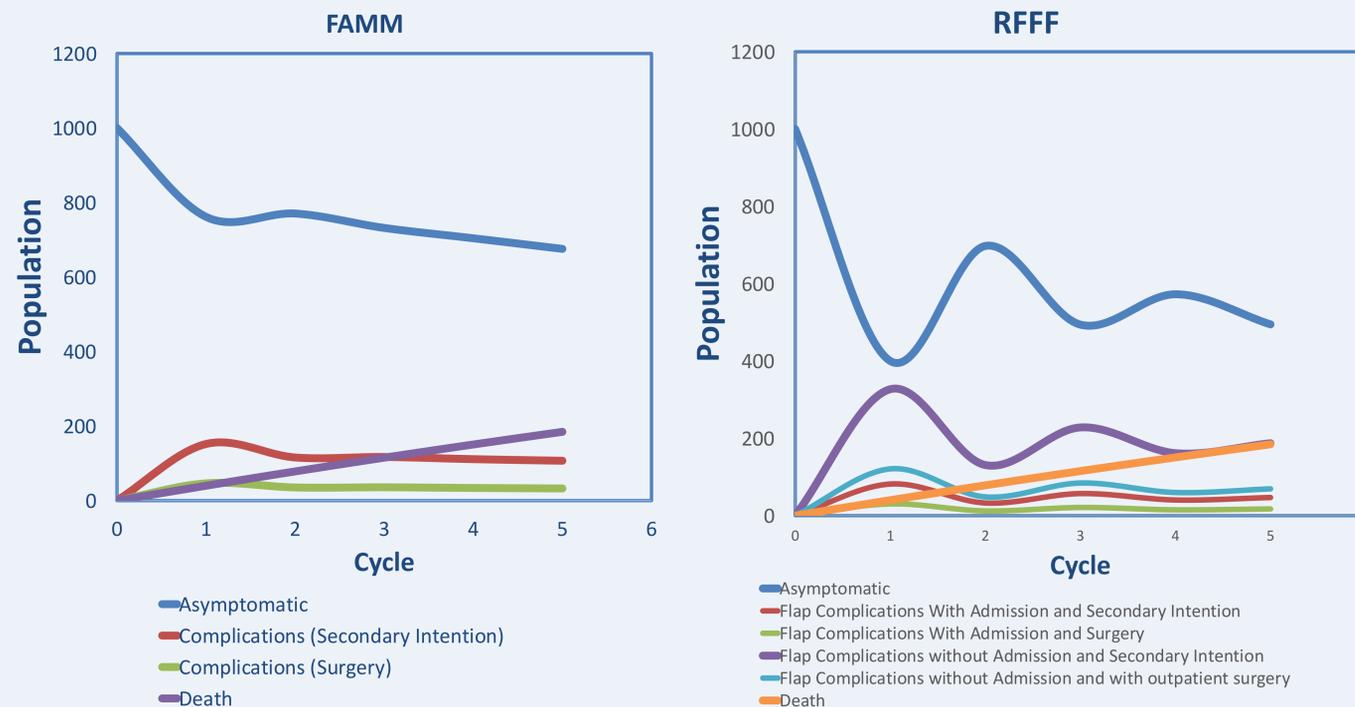
Inputs/Results

Costs	Values	5% CI	95% CI
RFFF Flap + Skin graft	879.29	762.81	1056.62
RFFF Flap	2334.97	2073	2932
Tracheostomy	309.83	273.57	395.23
Neck Dissection	1496	1330	1882
Complex Closure, 2.5-7.5 cm	494.62	426.39	610.25
24-hour ICU stay, first hour	281.87	252.28	356.98
Outpatient Visit Complication	250	201	299
Outpatient Visit No Complication	104	84	124
Wound Issue Healing Secondary Intention	7650	4651	10649
Salvage	14587	8869	20305
Skilled Nursing	6668	5336	8027
FAMM	1051	912	1271
Revision FAMM Flap	1061	936	1316
Washout (Free Flap)	156	140	199.47
Total Free Flap Costs Physician	11436.64	10230.03	14552.6
Total Regional Flap Costs Physician	9273.38	8306.22	11834.98

Transition Probabilities	Value
Flap Complications In General	0.56
Flap Complications That Need Re-Admission	0.20
Flap Complications That Do Not Need Re-Admission	0.80
Flap Complications That Need Surgery	0.27
Flap Complications That Do Not Need Surgery	0.73
Mortality	0.04
No Flap Complications or Issues	0.40

Health Utilities	Value
Oral Cavity Carcinoma	69.8
Health Utility of Regional Flap For Oral Cavity Carcinoma	84.3
Fistula Toll/Flap Complication	-0.06
Healthy Utility of Free Flap For Oral Cavity Carcinoma	73.32

Tables 1a-1c. The costs, transition probabilities, and health utilities utilized in this analysis. Costs have a gamma distribution while transition probabilities have a beta distribution. RFFF = Radial Forearm Free Flap. FAMM = fascial artery musculomucosal flap.



Figures 1a-1b. These figures shows the trace of the patients who underwent either a FAMM (left) or a RFFF (right) with their separate health states.

Base Case Result

OUTPUTS	COMP.	INT.	DIFF.
Total Costs	24913093.27	39216972.87	14303879.6
Total QALYs	3682.137582	3128.348455	-553.789127
ICER (Incremental Cost Eff. Ratio)			-25829.1088

Table 2. Depicted output for the base case model for 1000 patients in each cohort.

- The cost per QALY for those who underwent a FAMM was \$6765 per QALY
- The cost per QALY for those who underwent an RFFF was \$12536 per QALY.
- There was a -\$25829 change for a 1 change in QALY over 5 years.
- RFFF was strongly dominated by FAMM.

Conclusions

- In patients amenable to either a FAMM or RFFF, a FAMM procedure is a cost-effective strategy.

Future Directions

- Sensitivity analysis
- Probabilistic Sensitivity Analysis

References

1. Ward ZJ. Amua: An open source modeling framework. 2019. <https://github.com/zward/Amua>
2. Acevedo, Joseph R., et al. "Reconstruction after salvage total laryngectomy: a cost-effectiveness analysis." *Otolaryngology-Head and Neck Surgery* 164.1 (2021): 139-145.
3. Patel, Urjeet A., et al. "Impact of pharyngeal closure technique on fistula after salvage laryngectomy." *JAMA otolaryngology-head & neck surgery* 139.11 (2013): 1156-1162.
4. Withrow, Kirk P., et al. "Free tissue transfer to manage salvage laryngectomy defects after organ preservation failure." *The Laryngoscope* 117.5 (2007): 781-784.
5. Fung, Kevin, et al. "Prevention of wound complications following salvage laryngectomy using free vascularized tissue." *Head & Neck: Journal for the Sciences and Specialties of the Head and Neck* 29.5 (2007): 425-430.
6. Dzebo, Senada, Jasmina Mahmutovic, and Hasiba Erkocevic. "Quality of life of patients with oral cavity cancer." *Materia socio-medica* 29.1 (2017): 30.
7. Meier, J. K., et al. "Health-related quality of life: a retrospective study on local vs. microvascular reconstruction in patients with oral cancer." *BMC oral health* 19 (2019): 1-8.