

Patient Reported use of Tracheoesophageal Speech after Laryngectomy

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ABSTRACT

Objective

Tracheoesophageal puncture (TEP) has been described as early as 1980 for the restoration of speech after laryngectomy. Studies have shown good speech outcomes irrespective of history of chemoradiation, or whether the speech prosthesis was placed primarily or secondarily. What is less clear, however, is whether the pharyngeal reconstruction method at the time of laryngectomy or the size of the pharyngeal defect plays a role in speech outcomes. This study seeks to examine these factors using patient-reported and observer-reported measures.

Method

This is a cross-sectional study where we examined voice outcomes for patients who have undergone laryngectomy from 2015 to 2020 at a single academic institution. 57 patients consented to and completed interviews for this study. Patient-reported outcomes were measured using a modified Harrison-Robillard-Schultz (mHRS) rating scale and success was defined by use of tracheoesophageal speech for communication over 50% of the time, with family, strangers, and on the phone, as well as the patients' own reported ability to produce full sentences. Observer-reported outcomes were measured by a Speech Language Pathologist (SLP) using a simplified voice quality scale. Details regarding each patient's pharyngeal defect and reconstruction at the time of laryngectomy, along with other patient factors, were gathered through chart review. Kruskal-Wallis and Chi-square tests were used to test for association, with significance defined as $p \leq 0.05$.

Results

Voice outcomes as measured by the mHRS scale were best for pharyngeal reconstructions using primary closure and the radial forearm free flap (RFFF), with average aggregate mHRS scores of 5.0 ± 1.6 and 5.2 ± 1.5 out of 6 respectively (higher is better). By comparison, pedicled pectoralis major and anterolateral thigh (ALT) free flaps scored 4.2 ± 1.8 and 3.4 ± 1.9 , respectively. Success on the mHRS scale, as defined in the Method section above, was 71% and 65% for primary closure and the RFFF respectively, compared with 50% for pectoralis major and 29% for ALT flap reconstructions. Voice outcomes as measured by the observer-reported quality scale mirrored the patient-reported results, with primary closure and RFFF scoring higher than pec major and ALT flaps. No association of speech outcome was seen with defect size. Despite the observed trends, none reached statistical significance due to the limited sample size. We did find statistically significant better speech outcomes with SLP clinic attendance and younger age, as reported in the existing literature.

Conclusion

This is an on-going study; however, the preliminary data suggests that patients undergoing laryngectomy and tracheoesophageal puncture may have better speech outcomes with primary closure or radial forearm free flap reconstruction as compared with pedicled pectoralis major and anterolateral thigh free flaps. The size of the pharyngeal defect did not appear to affect speech outcomes, though further study is needed.

INTRODUCTION

Restoration of alaryngeal speech has been a major factor in the quality of life of patients undergoing total laryngectomies dating back to the first operation in 1873 by Billroth.¹ The options for alaryngeal speech include an electrolarynx, esophageal speech, or tracheoesophageal voice restoration. Tracheoesophageal voice restoration was first described by Blom and Singer in 1980 in the placement of a one-way valve prosthesis through a surgically created tracheoesophageal puncture (TEP).² Tracheoesophageal voice restoration has become the speech rehabilitation of choice due the potential high quality of speech and the relative safety of the procedure. Other advantages of a TEP are immediate phonation, simple training, longer phonation time, greater volume and better intelligibility. The disadvantages include finger utilization required to occlude the tracheostoma, dependence on clinicians to change the prosthesis, and requiring a second surgery if the patient is to undergo a delayed insertion.²⁻¹⁰

TEP success has been studied in the context of primary versus secondary TEP placement, tumor characteristics, and multiple other medical comorbidities. However, less attention has been given to the type of reconstruction (e.g. primary closure, pectoralis rotational flap, free tissue transfer, etc.) for the pharyngeal defect or to the type of defect itself in respect to partial and circumferential.¹¹⁻¹³ LeBert et. al previously analyzed the TEP success with regard to reconstruction type; however the patient population was limited to TEP secondarily in the office.¹⁴ There has not been a multivariate analyses of TEP success previously published.

It is believed that there exists a need for TEP success for intention to treat rather than per protocol. In addition, multivariate analysis of size of defect, method of reconstruction, timing of the TEP placement, speech language therapy, addition of radiation or chemotherapy for treatment of disease, size of support source at home, functional status, age, BMI, and functional status would benefit patients and clinicians for counseling of alaryngeal speech outcomes.

METHODS

Cross sectional study of 57 patients from a pool of 127 patients underwent total laryngectomy and either primary or secondary implantation of a TEP between 2015 and 2020 with the Department of Otolaryngology – Head and Neck Surgery at West Virginia University were identified via CPT codes. From medical records, the following patient characteristics were record: age, sex, body mass index, Eastern Cooperative Oncology Group (ECOG) performance status, primary or secondary TEP implantation, partial or circumferential pharyngeal defect, type of closure/reconstruction, whether they received radiation prior or after surgery, whether they received chemotherapy prior or after surgery, and number of family members in their household.

Patient-reported outcomes were measured using a modified Harrison-Robillard-Schultz (mHRS) rating scale (Example scale to the left).

Observer-reported outcomes were measured by a Speech Language Pathologist (SLP) using a simplified voice quality scale, either during clinical visits or over the phone with the patient themselves or a family member. A SLP also reviewed patients' records and determined if each patient had at least an adequate participation/trial of speech therapy.

RESULTS

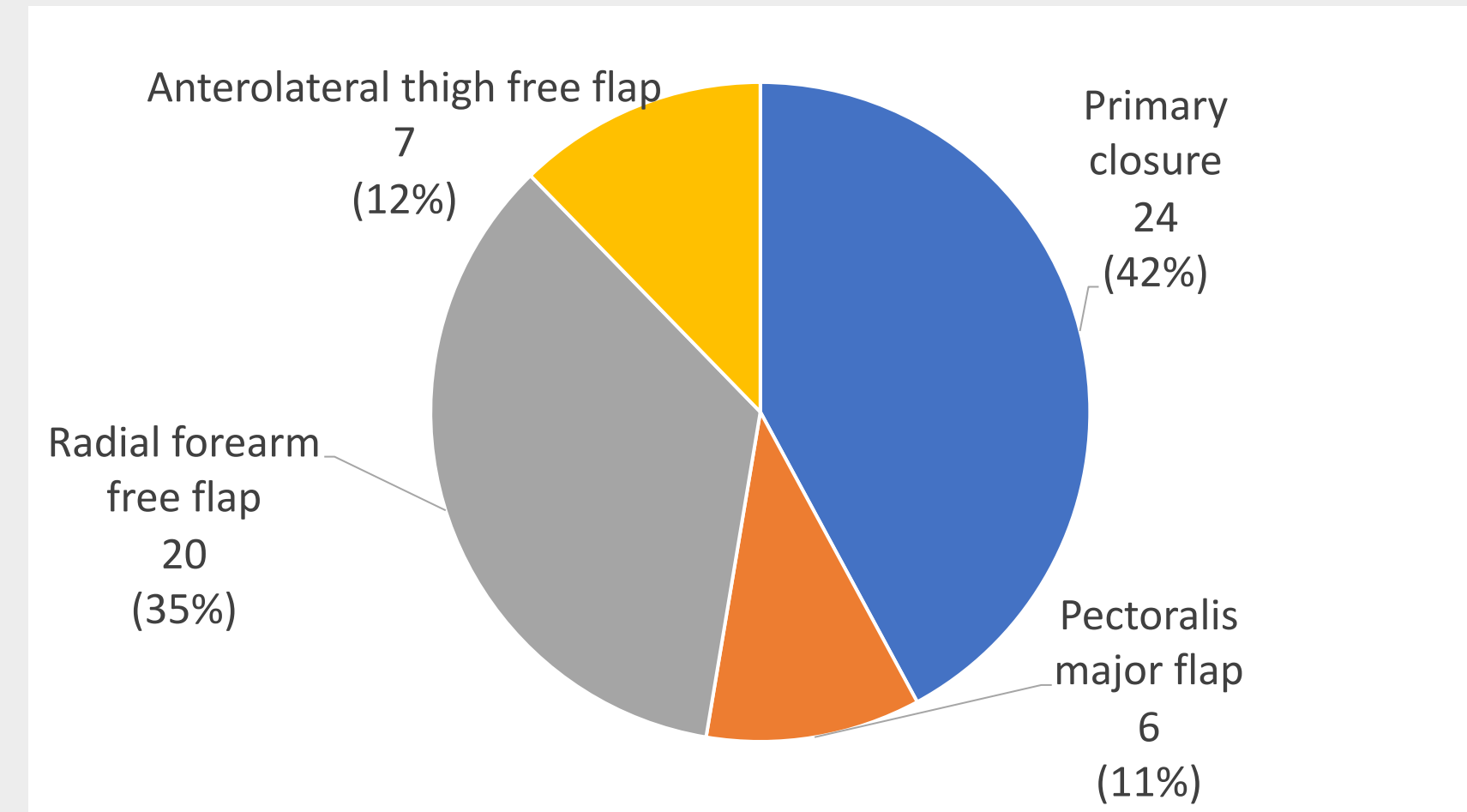


Fig. 1. Types of Reconstruction

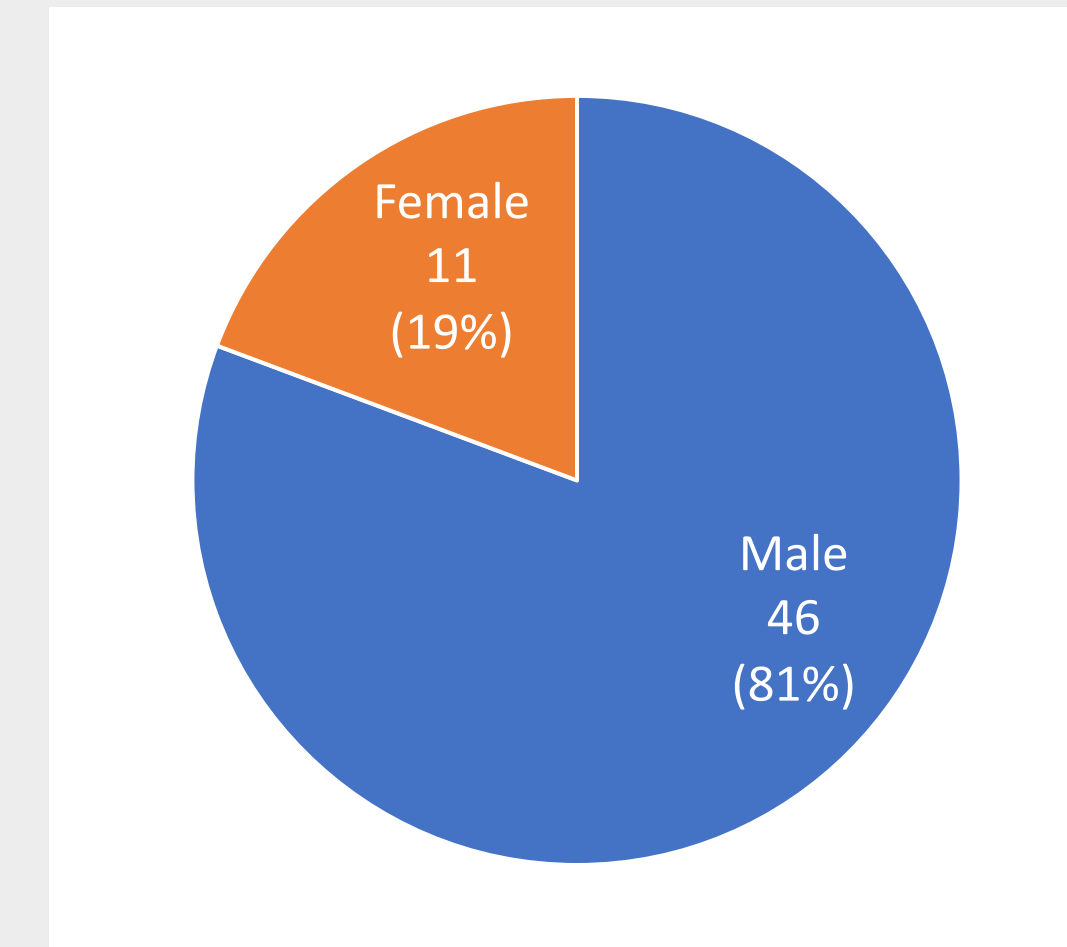


Fig. 2. Patients' Sex

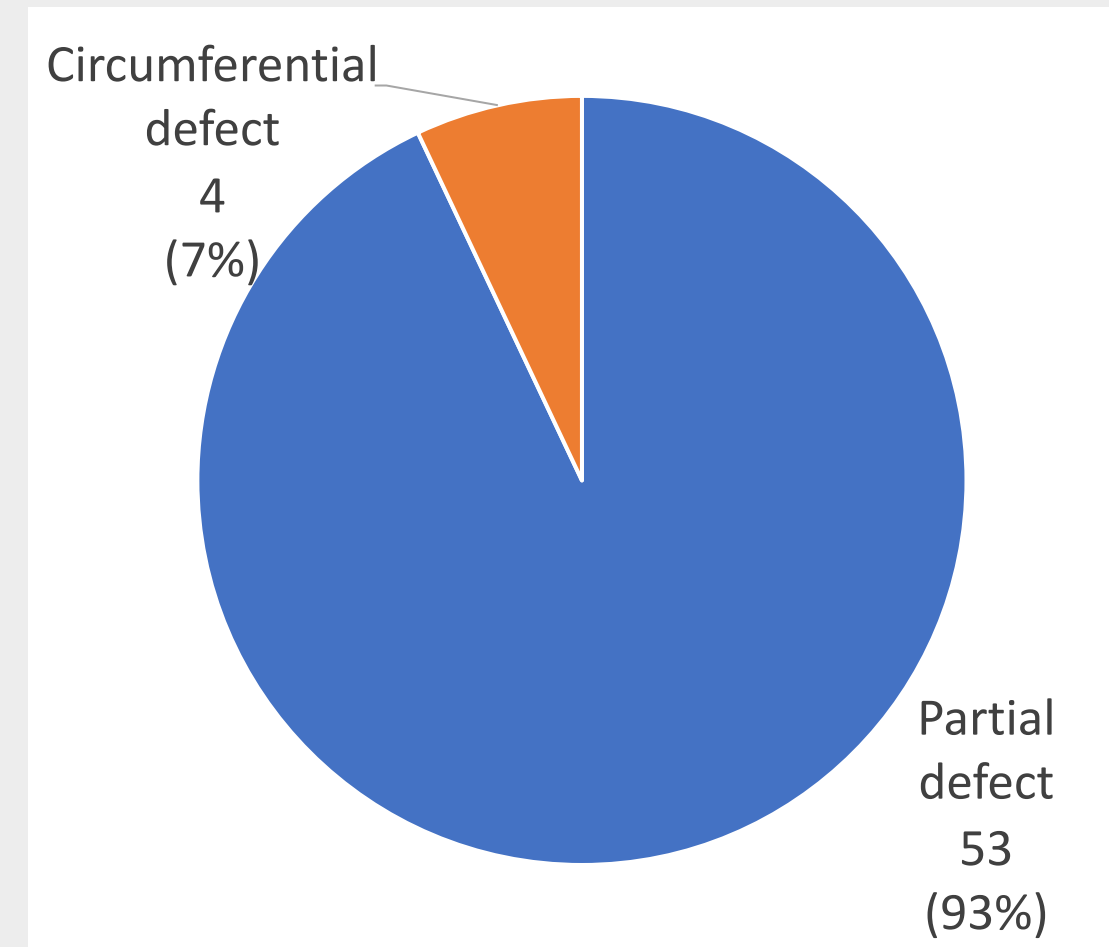


Fig. 3. Size of Defect

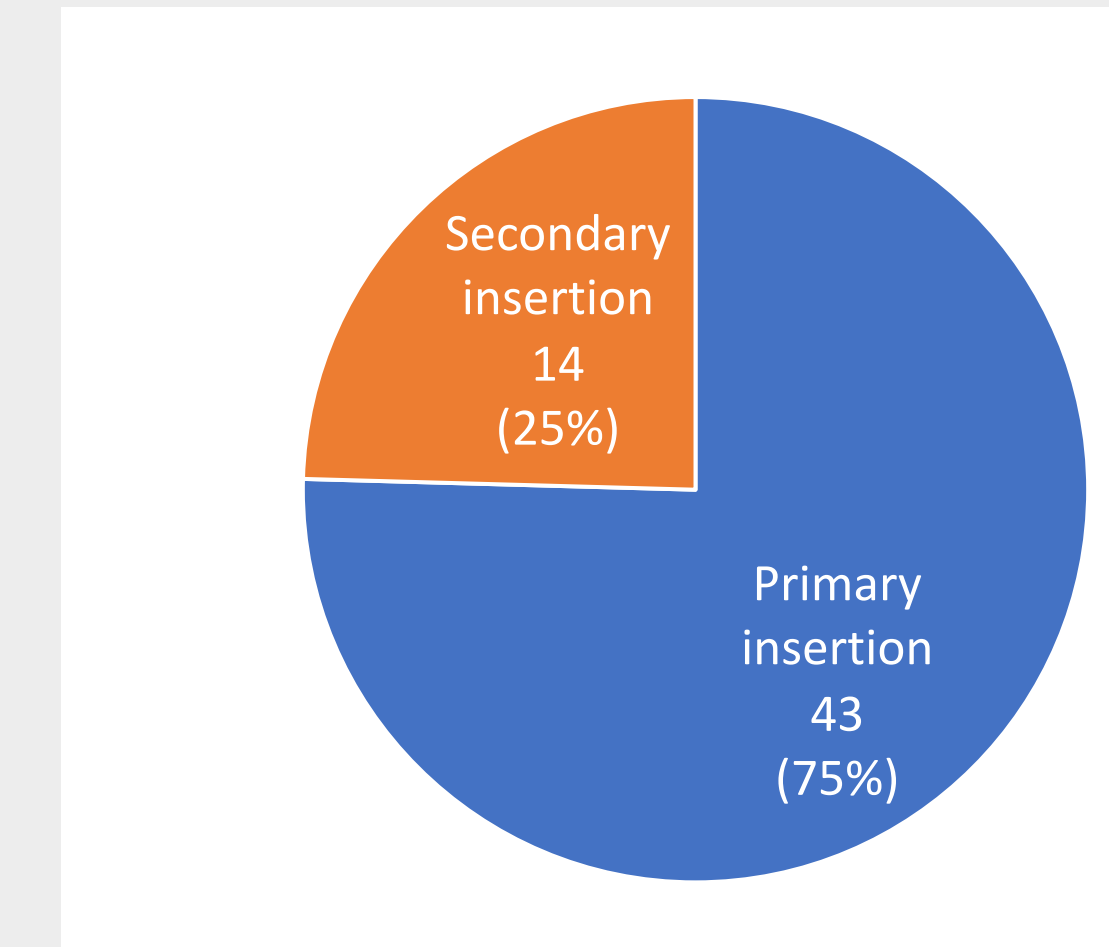


Fig. 4. Timing of TEP

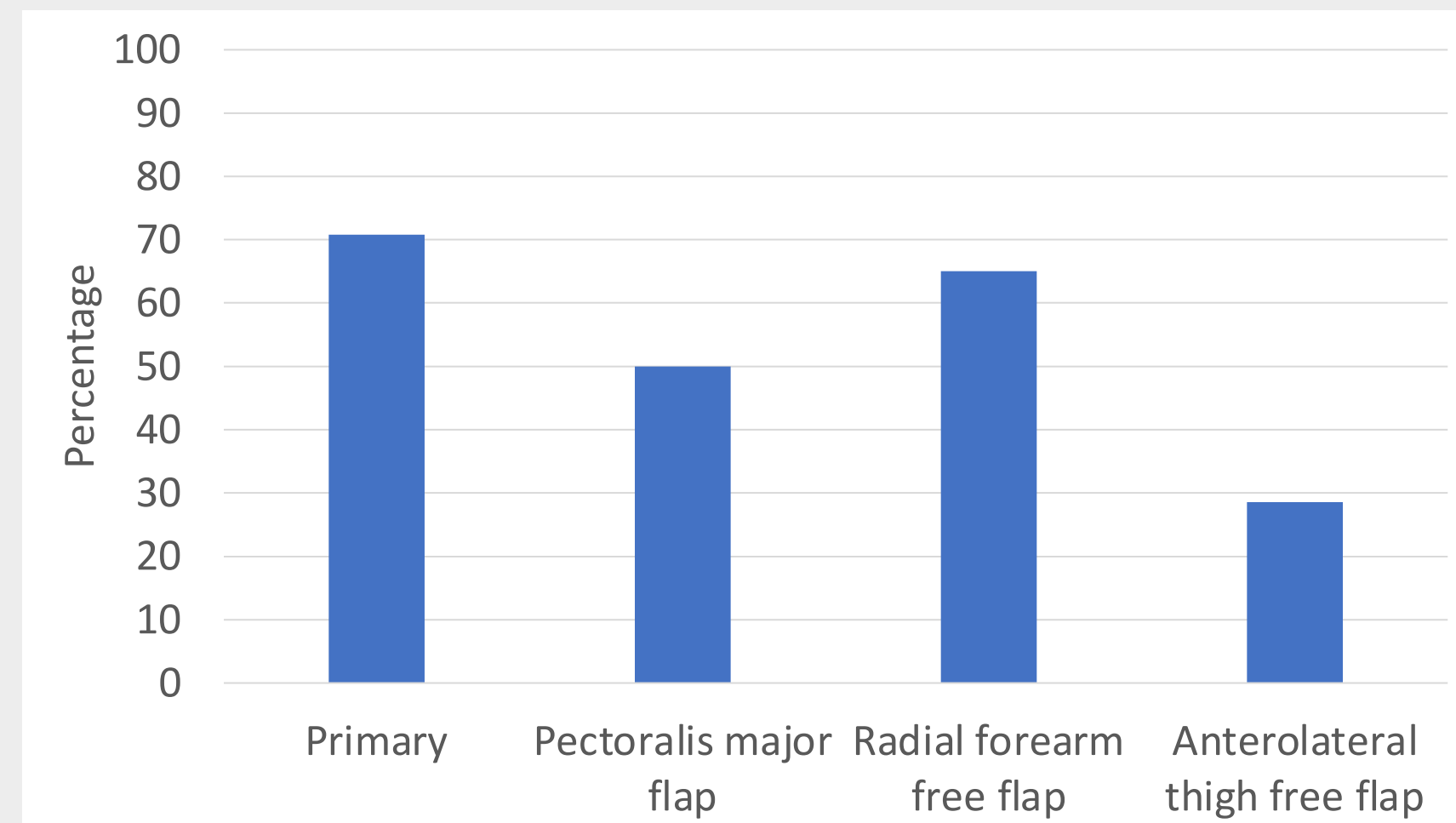


Fig. 5. mHRS Success Rates per Reconstruction

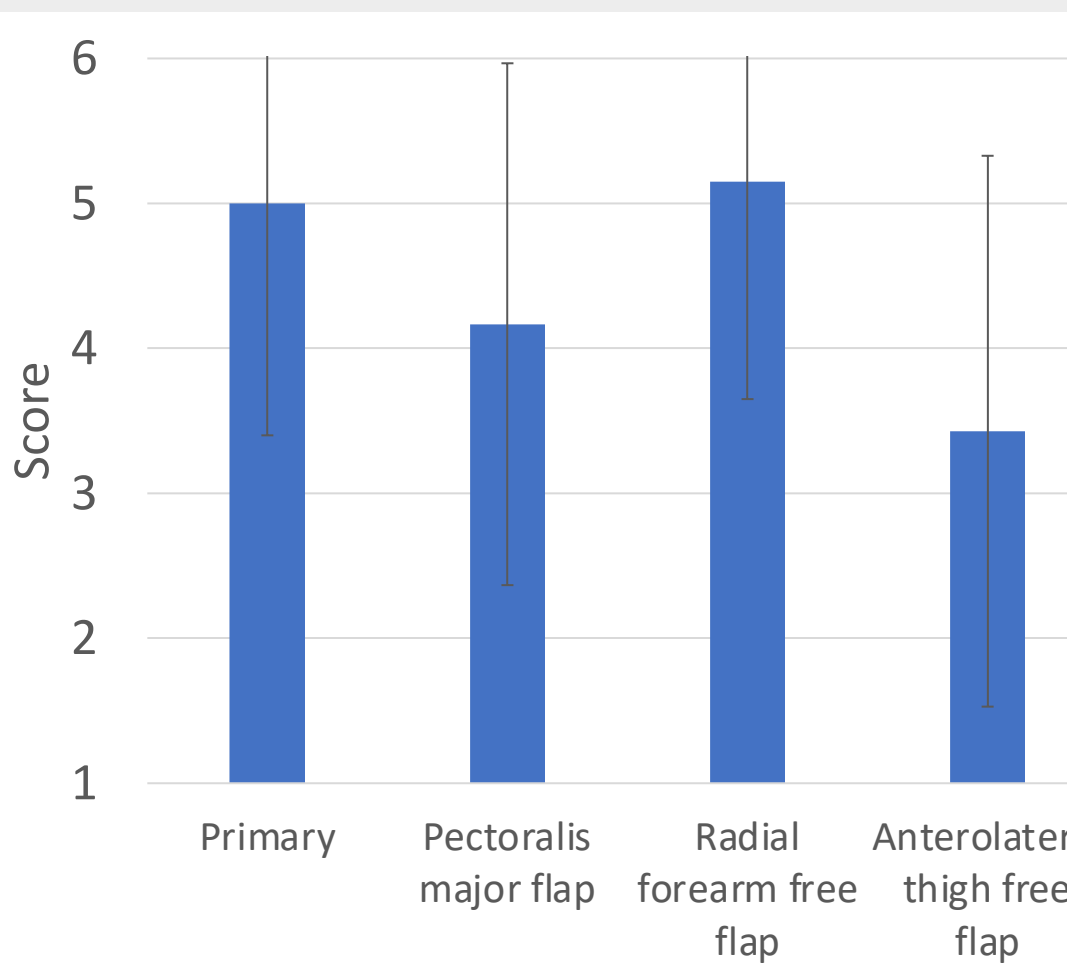


Fig. 6. mHRS Voice Outcomes per Reconstruction

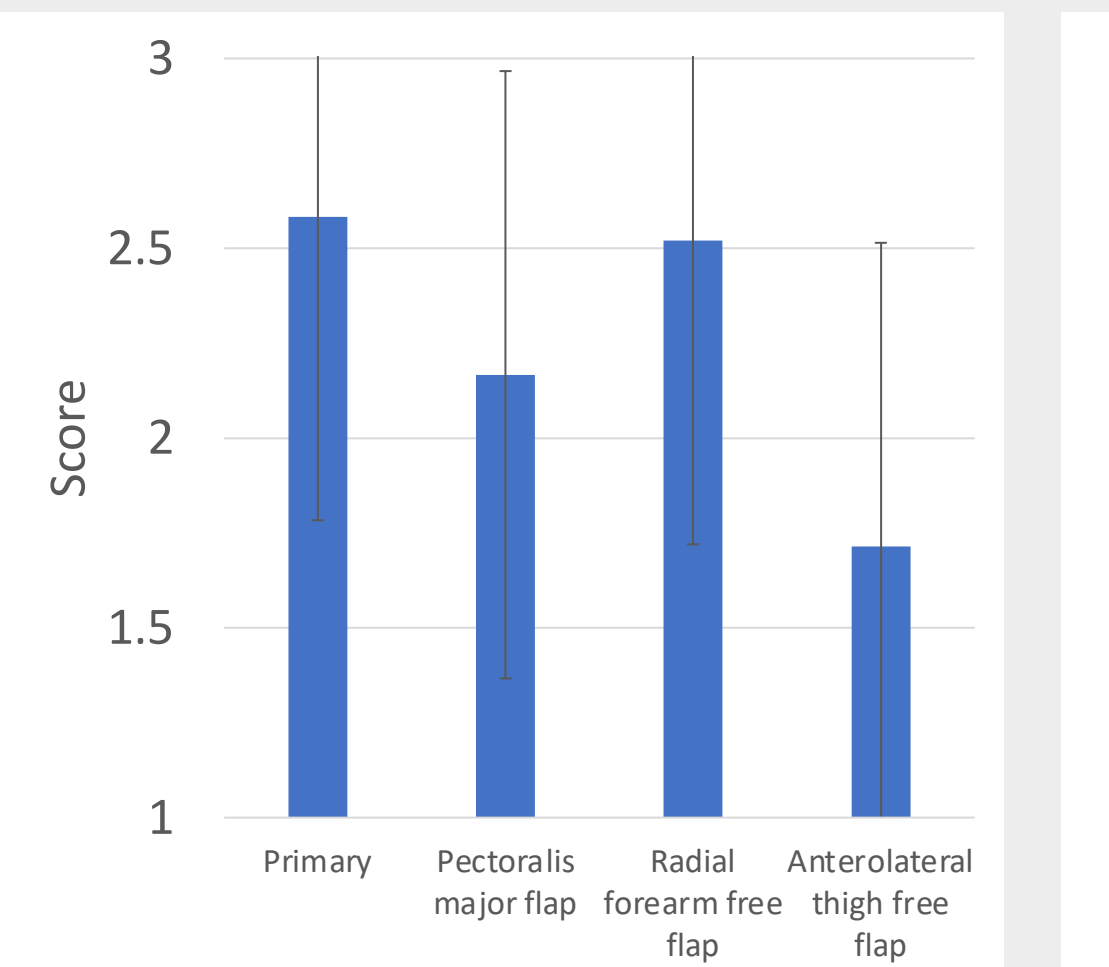


Fig. 7. SLP Voice Outcome Rating per Reconstruction

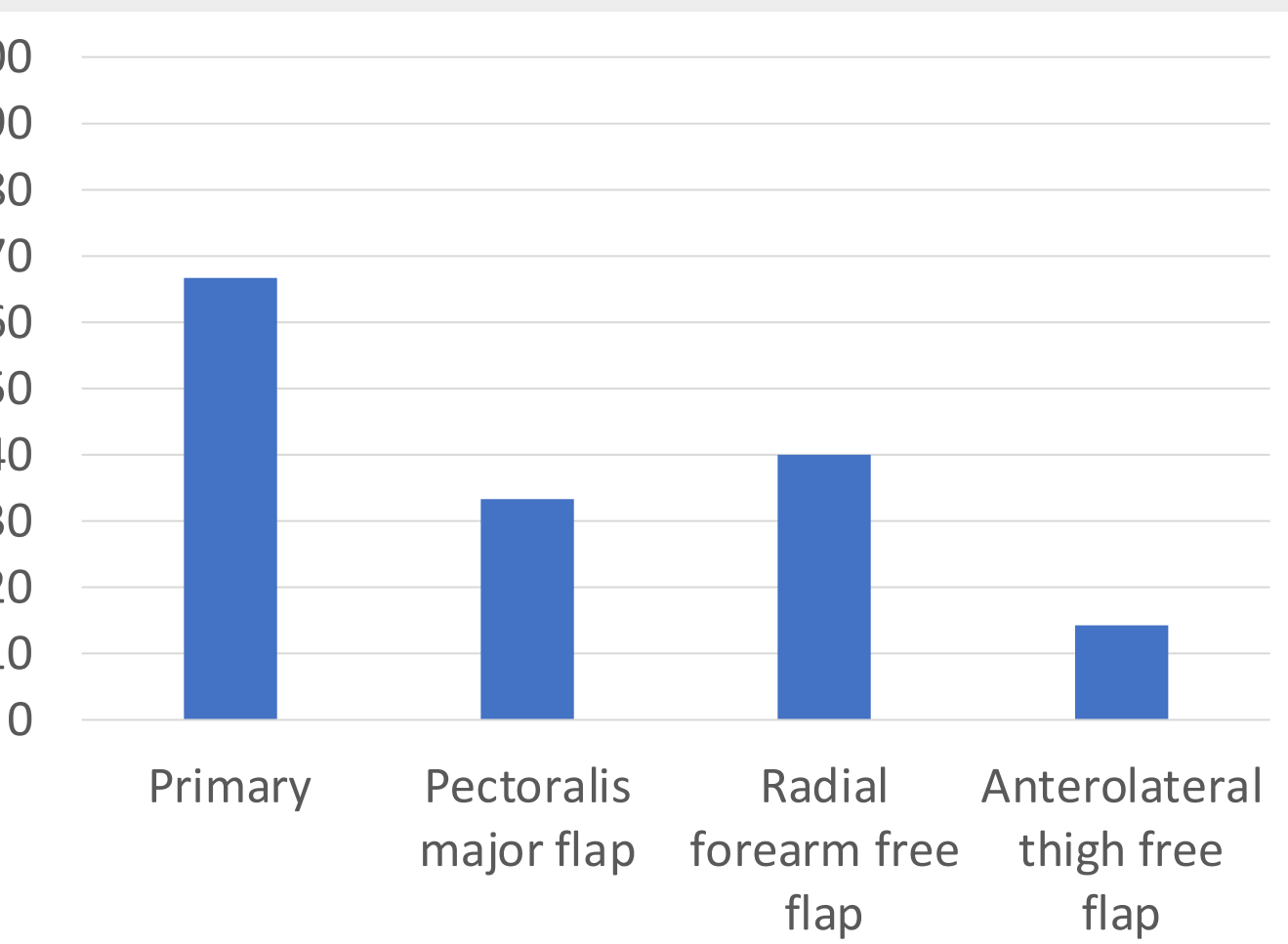


Fig. 8. Specific Scenario Success Rates per Reconstruction

DISCUSSION

Thin pharyngeal closures were observed to have better voice outcomes than thick flaps. While these findings were not significant, it raises the question as patients continue to be recruited. It is suggested that thinner tissue closures may have better vibro-acoustic properties. No association of speech outcome was seen with defect size; however only 4 of 58 patients had circumferential defects so conclusions from this data set should be limited.. We did find statistically significant correlation with better speech outcomes with SLP clinic attendance (R value=0.426, p=0.001) and younger age (R=-0.363, p=0.006), as reported in the existing literature.

CONCLUSIONS

Laryngectomy closure is largely defect driven; however, where there is a choice, thin closures like primary closure or RFFF result in better TEP voice outcomes. This is an on-going study and more data is needed.

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