Pediatric Versus Adult Outcomes in Supercharged Jejunum Esophageal Reconstruction: A Systematic Review and Meta-Analysis

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Background

Application: Supercharged jejunum is increasingly favored for esophageal reconstruction, particularly in long-segment defects where gastric pull-up or colonic interposition may not be ideal.

Purpose: Although vascular supercharging has demonstrated high surgical success rates with minimal flap loss, there is limited literature evaluating its outcomes in pediatric patients.

Methods

This systematic review includes 24 manuscripts, 19 pertaining to adult patients, 4 pertaining to pediatric patients, and one pertaining to both populations. A regression analysis was done to examine factors associated with all postoperative complications using various categories in the data. We used Python 3.11 with pandas for data management, scikit-learn for Ridge regression and imputation of missing values, and scipy for statistical analysis. Due to the limited sample size and missing data, we employed Ridge regression with regularization (alpha=0.1) to mitigate multicollinearity issues while examining the relationship between these patient and surgical factors and overall complication rates.

Limitations

This study is limited by the availability of reported data and variability in operative techniques and post-operative care. The lack of individual patient data restricts analysis and may result in generalized attributions that do not fully capture true associations.

Comorbidity							
Complication	**N**	**HTN**	**Diabetes**	**Smoker**	**Reoperation**	**Radiation**	**R^2**
Wound Infection	9	-0.236	-0.257	0.043	0.000	0.374	0.44
Pneumonia	12	-0.124	-0.126	-0.071	-0.174	0.158	0.68
Other Pulmonary	10	-0.110	-0.086	-0.003	0.051	0.010	0.92
Leakage	18	-0.147	-0.078	-0.252	-0.080	0.226	0.45
Stenosis	5	0.009	0.003	0.000	0.005	0.000	0.99
Stricture	9	-0.022	0.078	-0.244	-0.034	0.375	0.92
Fistula	5	0.011	-0.025	-0.002	-0.002	0.119	0.99
Dysphagia	7	-0.322	-0.146	0.000	-0.012	-0.020	0.78
Dumping	6	-0.062	-0.079	-0.629	-0.412	0.205	0.52
Dehiscence	8	0.009	-0.074	0.177	-0.012	0.356	0.79
Necrosis	9	-0.106	0.031	-0.025	0.210	0.080	0.76
Global Infection	7	-0.073	-0.005	-0.130	0.055	0.203	0.59
Flap Failure	12	-0.158	-0.048	-0.001	0.000	0.025	0.89
Reoperation	15	0.093	0.208	-0.653	0.036	0.208	0.63
Nerve Injury	5	0.000	0.000	0.000	0.000	0.003	0.99
Thrombosis	5	0.008	0.002	0.010	0.000	-0.001	0.99

Table 1: *Displays protective and risk factors for complications in* ***adults*** *undergoing supercharged jejunum esophageal reconstruction. Red denotes factors positively correlated with increased complications, while green highlights comorbidities associated with a protective effect. LOS, Age, Operative Time, and Cancer status have been excluded from the table due to negligible associations with postoperative complications.*

Patient Demographics

Adult Patients

N = 442 adult patients
36% adult patients had a diagnosis of diabetes
46% of adult patients had preoperative radiation
95% of adult patient reconstruction was for cancer

Pediatric Patients

N = 62 pediatric patients
87% had reconstruction for LGEA
13% had reconstruction for toxic ingestion
1.7% experienced postoperative leakage

Conclusions

Adult vs Pediatric Outcomes

1. There was stark asymmetry in the data between adults and pediatrics due to a lack of pediatric cases. Despite this limitation, analysis revealed that adults had a **greater than 8x increased odds ratio of leakage** compared to pediatric patients. Leakage was the only complication in which outcomes were statistically different between pediatric patients and adults.

Adult Outcomes

1. **Radiation** was the most significant risk factor for developing any postoperative complication, with a disproportionately strong association with wound infection, dehiscence, and stricture formation, surpassing all other comorbidities.

2. **Length of stay, age of adult patient, and operative time** had the smallest effect on outcomes, and as such, are not included in the table.

3. **Smoking** was found to be **"protective"** against postoperative dumping symptoms, and the need for reoperation. This may be due to nicotine-induced bowel hypomotility that can be seen in chronic smokers[1].

References

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