

A Novel Algorithm for Pediatric Microsurgical Maxillomandibular Reconstruction Using Custom Endoprosthesis

Background

- With a critical role in mastication, speech, and facial contour, reconstruction following resection of maxillary and mandibular tumors pose distinct challenges for microsurgeons
- In pediatrics, jaw reconstruction is further complexed by the need to preserve **growth potential**, optimize functionality of the upper and lower jaw, and facilitate future **dental restoration**
- Current reconstruction options include **Non-Custom Plates (NCP)** and **Custom Endoprosthesis (CE)** in conjunction with **vascularized free flaps**
- Literature lacks a predictable **treatment algorithm** for reconstruction of the pediatric maxilla and mandible

Results

- Overall (n=51)**
 - 14 CE and 32 NCP reconstructions
 - Significantly **lower average number of revision surgeries** in **CE cohort** compared to NCP (0.789 ± 0.787 vs 2.000 ± 2.300 , $p = 0.009$)
- Mandible (n = 37)**
 - 14 CE and 23 NCP reconstructions
 - 50% revision rate in CE cohort vs 87% in NCP cohort ($p = 0.023$)
 - Logistic Regression: **NCP use is sole predictor of revisions** (Odds Ratio = 1.447, 95% Confidence Interval = 1.096-1.910, $p = 0.013$)

- Maxilla (n = 14)**
 - 5 CE and 9 NCP reconstructions
 - No significant difference in complication, revision, or donor site morbidity rates based on reconstruction type

Conclusions

- Pediatric upper and lower jaw reconstruction may benefit from CE with free tissue transfer, optimizing the reconstructive ladder
- Deviating from NCP**, we propose a free tissue selection algorithm based on surgical practice patterns considering anatomical location, extent of resection, and patient age (Figure 1)
- Factors determining type of Free Tissue Transfer
 - Maxillary Masses: **Patient Age**
 - Mandibular Masses: **Percent of Mandible Resected** and **Age**
- Incorporating the CE algorithm into microsurgical reconstruction can facilitate **improved form and function** following pediatric jaw resection

Objective

- This study aims to evaluate reconstructive outcomes of CE compared to NCP and introduce a novel algorithm using CE to optimize available **vascularized free flaps** in maxillomandibular reconstruction

Methods

- IRB-approved retrospective review of pediatric patients undergoing maxillary or mandibular reconstruction by **Plastic Surgery** at a pediatric tertiary-care referral center (January 2016 - July 2022)
- Patient demographics, comorbidities, perioperative data, complications, and revisions were recorded

