Predictive Tooth Placement in Obturator Prostheses Utilizing Volumetric Healing Patterns

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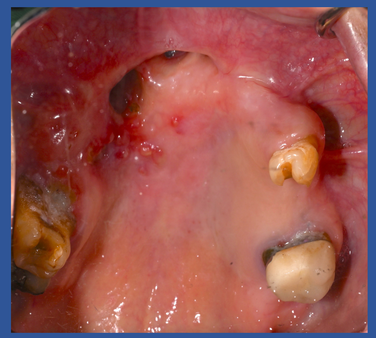
References

Introduction

Hard palate cancer (HPC) is an uncommon malignant tumor affecting less than 54,000 people per year. Squamous cell carcinoma is the most common type and accounts for over 90% of all cases diagnosed per year. Ablative surgery of the maxilla results in maxillofacial defects of varying volume and dimensions. A "guessing algorithm" must be empirically developed to account for the hard and soft tissue changes that occur. At present, conventional methods of altering casts have been satisfactory in the workflow of fabricating obturator prostheses but involve somewhat arbitrary strategies. The use of digital technology in conjunction with analog methods may help bridge the gap between guessing and prediction.

Pre-sx Presentation



7 Weeks Post-op

Patient Presentation

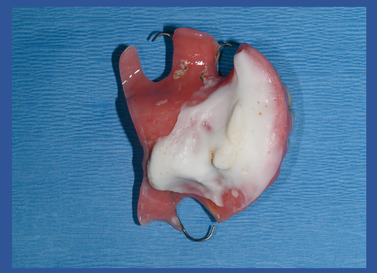
An 88 year old Caucasian male presented to the medical center with invasive keratinizing squamous cell carcinoma of the hard palate. He underwent partial anterior maxillectomy without nodal dissection. Due to age and comorbidities contributing to the patient's condition, fibular reconstructions was not performed. A surgical obturator was fabricated and ligated on the day of surgery and stayed in place for 2 weeks.

Laboratory Procedures

Pre-sx: Resection Margins

Post--op 2 weeks

1st Interim: 2 Weeks Post-op



2nd Interim: 7 Weeks Post-op

Delivery & Reline of 1st Interim Obturator

Delivery & Reline of 2nd Interim Obturator

Volumetric Analysis

Ablative surgery heals with a significant amount of variability and shrinkage which creates unique challenges in the pre-maxilla where teeth must be placed for esthetic, phonetic, and masticatory purposes. Intraoral digital scans were taken following tumor resection and were analyzed for their 3 dimensional changes.

Superimposition of Pre-sx Presentation and 7 Week Post-op Intraoral Scan

Discussion

With the advent of digital scanning and collaborative data sets, artificial intelligence (AI) may prove to have valuable insight on the volumetric changes which occur during wound healing following ablative surgery of the maxilla. With enough data sets, a predictive tool can offer restorative solutions for the fabrication of maxillofacial prostheses with special consideration to the spatial setting of where artificial teeth must be set. A protocol for scanning at various time points during healing may further aid in the tracking of volumetric change and ultimate success of restorative treatment.