

Outcomes of 1.5 cm. margins with 3D Models for Segmental Mandible Resection of Oral Cavity Squamous Cell carcinoma

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Background

Historically overall survival (OS) of Stage IV cancer is 30-40% and per AJCC 31.9% at 5 years^{1,2}. Margin status is important with OSCC where positive margins increase local recurrence and decrease survival³⁻⁵. Most surgical techniques consist of taking 1 cm. margin from the macroscopic tumor edge due to the microscopic tumor extension. The goal of this study was to investigate the outcomes with 1.5 cm. margins with segmental mandibular resections with assistance of virtual surgical planning with 3D models for mandibular cutting guides.

Methods

Retrospective chart review of patients from single surgeon who underwent mandibulectomy for OSCC at Baylor University Medical Center, Dallas. Inclusion criteria were patients with diagnosis of squamous cell carcinoma of the mandible who underwent segmental mandibulectomy between 2010-2018 with at least three years follow-up. Surgical technique involved excision of OSCC with a planned 1.5cm gross margin of both soft tissue and mandible based on 3D models.

All patients had a C.T. of the mandible with 1 mm. slice increments. Virtual surgical planning was performed by the primary surgeon with a technician from 3D Systems (Rock Hill, SC). A segmental resection was planned with a margin of 1.5 cm. from tumor extent on exam and imaging. Virtual planning was also performed for reconstruction with a fibula flap. Cutting guides for the mandible and fibula were then 3D printed and utilized intra-operatively (See *img. 1 and 2*).

Microsoft Excel 2018 and Stata v15 (College Station, TX) were used for statistical analysis. Descriptive statistics were used to describe demographic and clinical variables. Survival analysis was carried out using the Kaplan-Meier method.

Results

Of 154 patients, 27 met inclusion criteria. 22 were male (81.5%) and 5 were female (18.5%). All patients had bony free tissue transfer with 26(96%) utilizing a fibula free tissue transfer. Stage of cancer was IV in 24(89%) patients and 23(85%) had mandibular involvement. Average tumor size was 3.5 cm. A total of nine (33.3%) patients had cervical lymph node metastasis with one patient N1, six N2b and two N2c. All mandibular bone margins were clear. 16 (59%) patients had adjuvant radiation therapy and 5(18.5%) patients had adjuvant CXRT. 25 patients had survival data, and average follow up was 37 months with average disease free survival of 32.64 months. 1 and 3 year OS were 79% and 70.5%, respectively (*fig. 1*). 1 and 3 year Disease specific survival (DSS) were 75% and 70.5%, respectively (*fig. 2*). A total of five died of regional or distant metastasis, including one skull base recurrence, two lung metastases and two with dermal metastases. Local recurrence occurred in only one patient (3.7%) and they died of disease.

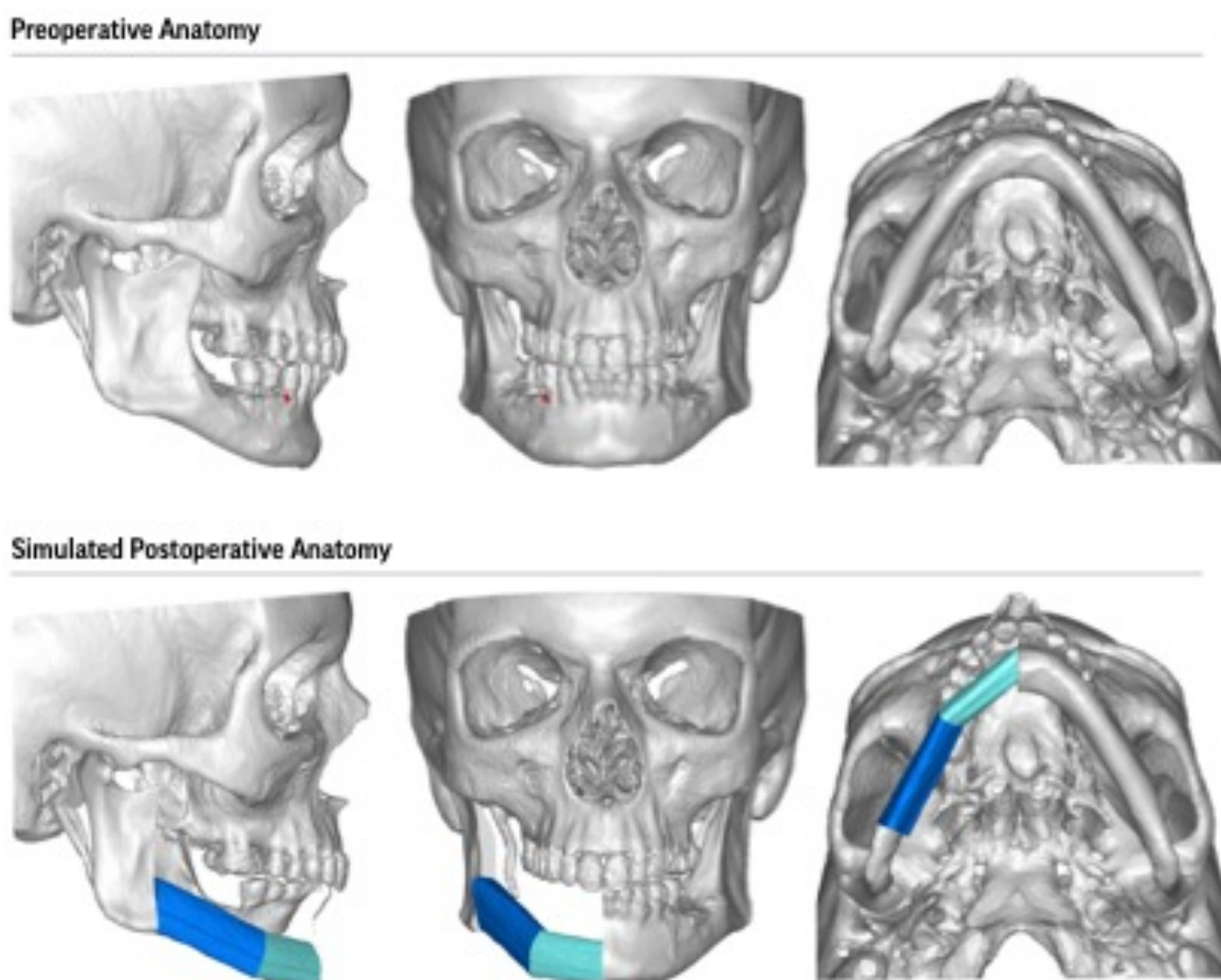


Image 1. Virtual bone modeling
Top row demonstrating preoperative anatomy with tumor location. Bottom row simulates post op anatomy.

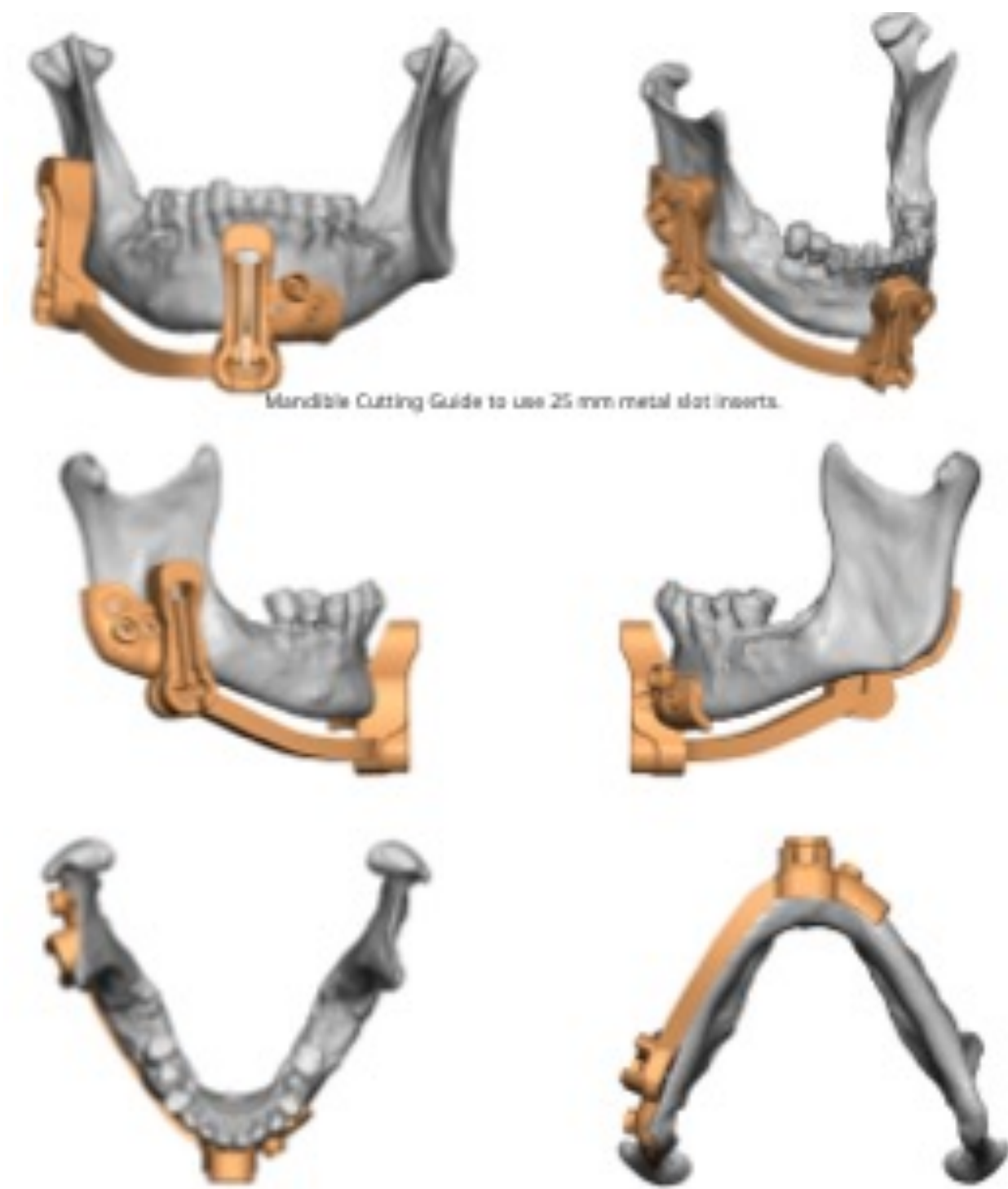


Image 2. Mandibular cutting guides

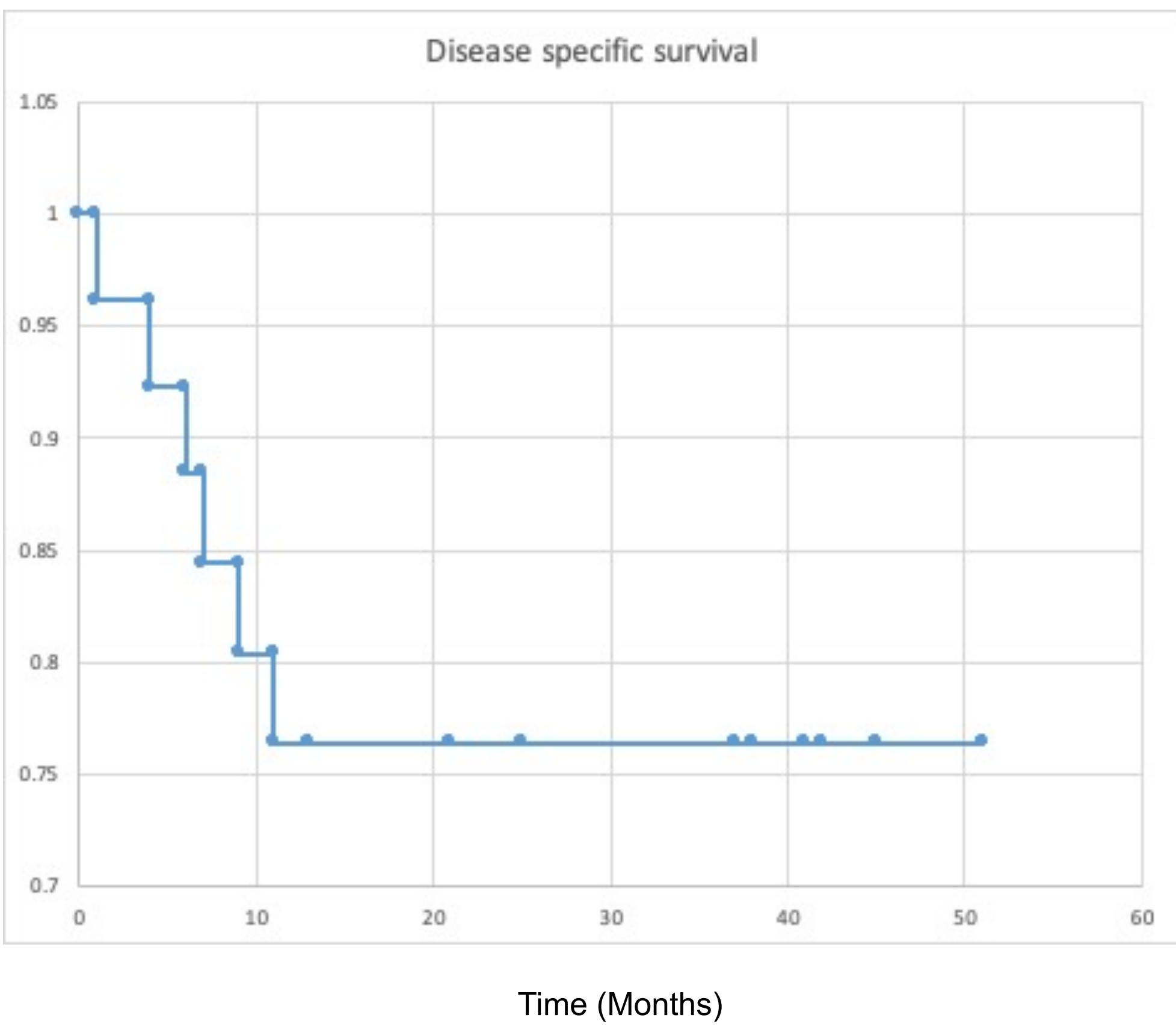


Figure 1. Kaplan-Meier curve for disease free survival. Survival across months.

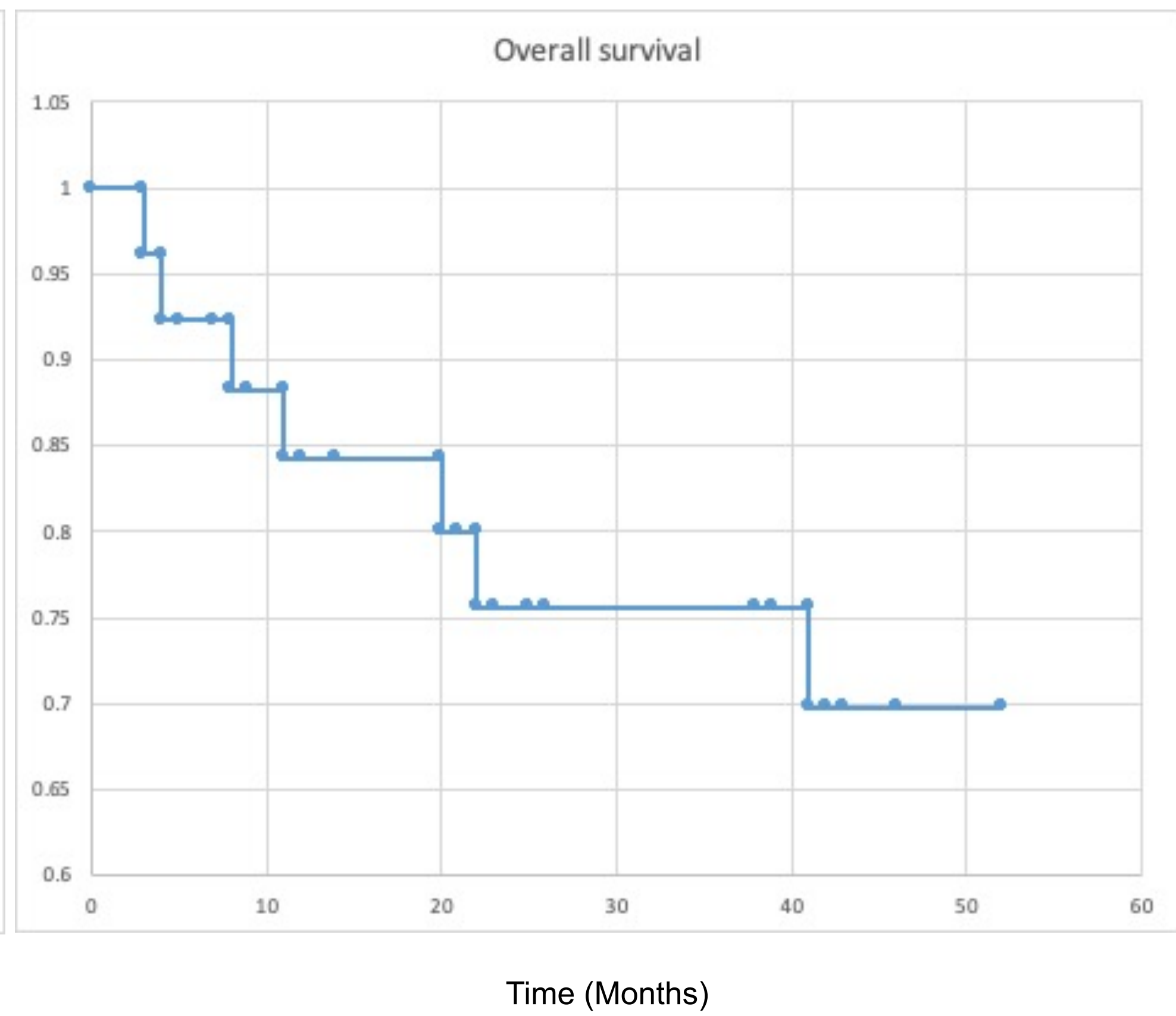


Figure 2. Kaplan-Meier curve for overall survival. Survival across months.

Discussion

We found that our local recurrence compared to multiple other studies was lower. Locoregional recurrence at one to three years was anywhere from 12.5% to 48%. Further our survival data, both DSS and OS were seen to be higher. From review of a few studies we found that three year disease free survival for segmental mandibulectomy ranged from 51-69.2%⁶⁻⁸. Most studies offered a 5 year OSS and/or DSS for mandibulectomies as well which, respectively, ranged from 26-59.3%^{4,9-11} and 39-71%^{6,7,12,13}.

Conclusion

Patients with advanced oral cavity cancer with presumed mandibular involvement have improved local control with wider initial resection margins regardless of final pathologic margins as well as OS and DSS at 3 years.

Limitations

We had a small, retrospective cohort of 27 patients in the analysis. A comparison of data within the literature and/or a prospective study would help better elucidate survival benefit in this patient population.

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