

SURGICALLY-DRIVEN PROSTHETIC DESIGN OF ADVANCED JAW RECONSTRUCTION

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Purpose: Over the past decade, there has been a shift in the Surgical and Prosthetic Design of the advanced Jaw Reconstruction Rehabilitation (JRR) used to treat head and neck tumors (HNT). The purpose of this observational study was to assess empirical and clinical outcomes in the Alberta Reconstructive Technique (ART), a digitally planned fibular free flap reconstruction with the primary installation of osseointegrated dental implants. The effects of implant diameter and spacing between implants in the fibular bone as well as changes to clinical services to improve clinical outcomes is also discussed.

Materials and Methods: Ethics approval was obtained for this retrospective analysis of adult head and neck tumor (HNT) participants treated at the Institute for Reconstructive Sciences in Medicine (iRSM). A chart review was conducted on ART cases between 2011 and 2016 that underwent a microvascular fibular free flap reconstruction involving the primary installation of implants (+/- chemoradiation). All treatment planning involved 3-dimensional surgical design and simulation and additive manufacturing guides for advanced JRR.

There are three parts to the observational study. The first section presents background information in Figure 1 and 2 (Walsh et al, 2017) illustrating 4.3 mm diameter implants and 5 mm spacing between implants had the lowest stress on the fibular bone. Figure 3 and 4 illustrate cortical bone loss and implant loss. The second, presents the outcome measures, cortical bone loss occurrence and implant loss between the 4.3 mm and 3.5 mm diameter implants in the ART cohorts. This is presented in Table 1 using descriptive statistics. The third section discusses the Surgically Driven Design principles implemented to improve the cortical bone vitality in the irradiated ART participants as outlined in Figure 6.

RESULTS

There was a higher occurrence of cortical bone loss and implant loss in the 4.3 mm diameter cohort compared to the 3.5 mm. In the non-irradiated ART cases, there were no occurrences of cortical bone loss or implant loss.

CONCLUSION

Implant diameter and spacing between implants may have an impact on the cortical bone vitality and implant success in the irradiated ART cases. Follow-up data of the modified protocol in the irradiated ART participants is needed to capture long-term clinical outcome data.

NEXT STUDY

This observational study is a starting point to assess trends in the data to support protocols for the successful completion of advanced Jaw Reconstruction Rehabilitation (JRR). Further investigation is needed to study the biological factors that impact the integrity of the osseous and vascular supply of the irradiated fibular bone after advanced JRR.