A 2-stage Approach to Craniofacial Reconstruction in an Infected Ovine Mandibular Defect Model

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INTRODUCTION: Reconstruction of infected mandibular defects is challenging due to the size and possible irregular shapes of defects, presence of pathogens, and the availability of suitable donor tissue. We have developed a 2-stage tissue engineering approach in which: (1) an antibiotic-releasing space maintainer is inserted in the mandibular defect to support the formation of a healthy soft tissue envelope and locally eliminate infection and (2) the implantation of a 3-dimensional–printed bioreactor in the ribs to grow a vascularized autologous bony tissue flap of customized geometry. In a second surgery, the space maintainer is removed and replaced with tissue from the bioreactor.

OBJECTIVE: The objective of the current work is to evaluate the effects of treatment of an infected mandibular defect on (1) the presence of pathogens at the mandibular defect and (2) the quality of the bone formed in the bioreactors containing autograft (morselized sheep rib) or a commercially available synthetic allograft (Bio-Oss; Geistlich). We hypothesized that the presence of an untreated mandibular infection will result in an increased number of clinical complications (ie, mucosal dehiscence) and may negatively affect the quality of the tissues generated in the in vivo bioreactor. Additionally, we hypothesized that both graft materials would be capable of supporting mineralized tissues.

METHODS: In the edentulous region of the mandible of 6 female sheep, a ≈2 cm defect was created superior to the mandibular canal. All animals were inoculated with 10^6 CFU of a bioluminescent strain of *Staphylococcus aureus*. A porous poly(methyl methacrylate)–based space maintainer loaded with vancomycin–containing poly(lactide-co-glycolide) microparticles (n = 3 sheep) or blank microparticles (n = 3 sheep) matching the geometry of the defect was inserted and secured via plate. At the bioreactor site, alternating ribs were exposed, and a ≈4 cm segment of each rib was removed, leaving the underlying periosteum intact. Each animal received two 3-dimensional–printed autograft and 2 allograft bioreactors matching the geometry of the mandibular defect. Blood and oral swabs were taken at 1, 2, 4, and 9 weeks postsurgery. At 9 weeks, animals were euthanized, and the tissues (bioreactors and mandibles) were harvested. Blood was analyzed for complete blood count and systemic vancomycin concentration, swabs for bacteria present, and mandibles and bioreactors for bone quality via microCT. Histologic evaluation and mechanical testing are ongoing.

RESULTS AND CONCLUSIONS: None of the 3 sheep that received vancomycin-loaded space maintainers demonstrated dehiscence, whereas all of the animals in the blank group had dehiscences of varied sizes (P < 0.05). The untreated animals had a significant increase in white blood cell count at 1 and 2 weeks postsurgery. Oral swabs yielded bioluminescent bacterial colonies only in the animals with blank space maintainers. MicroCT revealed significantly increased bone volume/tissue volume ratio in the untreated autograft groups relative to treated autograft groups (P < 0.05). This study demonstrated that the antibiotic-loaded space maintainer was capable of clearing the localized infection, and that the bioreactor strategy is capable of generating bone using either autograft or a commercially available synthetic allograft.

Intraoperative Frozen Section Analysis for the Excision of Nonmelanoma Skin Cancer: A Single-center Experience

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INTRODUCTION: Recurrence rates for nonmelanoma skin cancers (NMSCs) following Mohs’ micrographic surgery (MMS) are consistently lower than standard surgical excision. However, variations in the availability of MMS, waiting times, and costs continue to affect patient preference between treatment modalities. Furthermore, MMS commonly requires delayed reconstruction leading to additional surgeries that increases the risk of adverse outcomes. To achieve curative resection while ensuring optimal cosmetic outcomes, plastic surgeons may utilize intraoperative frozen section-guided excision to forego extensive or delayed reconstruction.

METHODS: Patients presenting with NMSCs undergoing wide local excision using intraoperative frozen section margin analysis (IFSA) at our institution from October...