timepoint, samples demonstrated a significantly greater mean of available space occupied by bone (23.33 ± 3.4% vs 14.35 ± 3.72%; p<0.01). When bone and scaffold were considered together, there was no significant difference in mean space occupancy (6-Week: 56.86 ± 5.88%, 3-Week: 63.27 ± 12.98%; p=0.43), suggesting a stable rate of scaffold degradation/osseous remodeling over time.

CONCLUSION: 3DBC scaffolds composed of β-TCP are capable of inducing bone growth in an undisturbed osseous environment. This osteogenic influence is continually exerted over time, necessitating longer-term follow-up to determine the temporality of the bone-forming capacity of this tissue engineering construct.

*Christopher D Lopez and Jonathan M Bekisz contributed equally to this work.

Dipyridamole Enhances Osteogenesis of 3D-Printed Bioactive Ceramic Scaffolds in Calvarial Defects

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INTRODUCTION: The objective of this study was to test the osteogenic capacity of dipyridamole-loaded, 3D-printed bioactive ceramic (3DPBC) scaffolds utilizing a translational, skeletally-mature, large animal calvarial defect model.

METHODS: Custom 3DPBC scaffolds designed to present lattice-based porosity only towards the dural surface were either coated with collagen (control) or coated with collagen and immersed in a 100 µM concentration dipyridamole (DIPY) solution. Sheep (n=5) were subjected to 2 ipsilateral trephine-induced (11 mm diameter) calvarial defects. Either a control or a DIPY scaffold was placed in each defect and the surgery was repeated on the contralateral side 3 weeks later. Following sacrifice, defects were evaluated through micro-computed tomography and histologic analysis for bone, scaffold, and soft tissue quantification throughout the defect. Parametric and non-parametric methods were utilized to determine statistical significance based on data distribution.

RESULTS: No exuberant or ectopic bone formation was observed and no histologic evidence of inflammation was noted within the defects. Osteogenesis was higher in DIPY-coated scaffolds compared to controls at 3 weeks (p=0.013) and 6 weeks (p=0.046) in vivo. When bone formation was evaluated as a function of defect radius, average bone formation was higher for DIPY relative to control scaffolds at both time points (significant at defect central regions at 3 weeks and at margins at 6 weeks; p=0.046 and p=0.031, respectively).

CONCLUSION: Dipyridamole significantly improves the calvarial bone regeneration capacity of 3D-printed bioactive ceramic scaffolds. The most significant difference in bone regeneration was observed centrally within the interface between the 3DPBC scaffold and the dura mater.

Dipyridamole Releasing 3D Printed Bioactive Ceramic Scaffolds with Osseoconductive Geometries Promote Craniofacial Bone Regeneration

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INTRODUCTION: The standard of care for critical-sized bony defects is autologous bone tissue transfer. However, its limitations (e.g., morbidity, secondary procedures, cost) have driven progress in alternatives such as tissue engineering-based treatments. We explored the bone regenerative
capacity of customized, 3D printed bioactive ceramic (3DBC) scaffolds with dipyridamole (DIPY), an adenosine A2A receptor (A2A R) indirect agonist known to enhance bone formation, at the ramus of the rabbit mandible.

METHODS: Critical-sized bony defects (10mm height, 10mm length, full thickness) were created at the inferior aspect of the right mandibular rami of rabbits, adjacent to the angular process (n=15). Each defect was replaced by a custom-to-defect, 3DBC printed porous scaffold composed of β-tricalcium phosphate. Scaffolds were either uncoated (control), collagen-coated (COLL), or collagen coated and immersed in 100µM dipyridamole (DIPY). At t=8 weeks, animals were euthanized and the rami retrieved. Bone growth was assessed exclusively within scaffold pores, and evaluated by microCT/advanced reconstruction computer software. MicroCT quantification was calculated in segments as a function of distance from proximal to distal scaffold insertion. Bone morphology was assessed by histology. One-way ANOVA analysis was performed to compare group means, and 95% confidence intervals (CI) were included.

RESULTS: Qualitative analysis did not show an inflammatory response. On 3D analysis, the control and COLL groups (12.3±8.3% and 6.9±8.3% bone occupancy of free space, respectively) had less bone growth, while the most bone growth was in the DIPY group (26.9±10.7%), a statistically significant difference (p<0.03 DIPY vs. control and p<0.01 DIPY vs. COLL). Evaluation of scaffold presence resulted in a significantly higher presence of material for the COLL group relative to the DIPY group (p<0.015), whereas the control group presented intermediate values (non-significant relative to both COLL and DIPY). A general linear mixed model was performed for bone growth as a function of distance from the most proximal (deepest) aspect scaffold insertion site to the most superficial (distal at the mandibular border) aspect, for which DIPY-treated scaffolds demonstrated the most bone growth at the thinnest region of ramus bone at the proximal defect. Highly cellular and vascularized intramembranous-like bone healing was observed in all groups.

CONCLUSION: COL-DIPY significantly increased the 3DBC scaffold’s ability to regenerate bone. Irrespective of treatment group, all scaffolds demonstrated bone regeneration with predominant focal growth at bone-scaffold interfaces.

Indocyanine Green Angiography Use in Breast Reconstruction: A National Analysis of Outcomes and Cost in 110,320 Patients

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INTRODUCTION: Indocyanine Green (ICG) angiography was first used in breast reconstruction in 2007 and has gained popularity due to its ability to assess the viability of both mastectomy skin and tissue flaps. We aim to analyze trends, disparities and outcomes associated with the use of ICG in breast reconstruction.

METHODS: Using 2012 - 2014 data from the National Inpatient Sample, breast reconstruction cases that were performed with or without the use of ICG angiography (International Classification of Diseases: Ninth Revision code 17.71). Trends over time in ICG use were assessed using the Cochran-Armitage test. Outcomes of interest included reconstruction modality, debridement rates, hospital charges and length of stay (LOS). Hospital charges and LOS were assessed using a generalized linear model with log link and gamma distribution.

RESULTS: Overall, 110,320 patients underwent breast reconstruction over the study period: 107,005 (97.0 percent) without the use of ICG and 3,315 (3.0 percent) with the use of ICG. ICG use increased over time: 750 patients (1.9 percent) underwent breast reconstruction with ICG in 2012, increasing to 1,275 patients (3.7 percent) in 2013 (p<0.001). Black and Hispanic patients were more likely than White patients to undergo ICG use (p<0.001). Smokers (p=0.018), hypertensive (p=0.046), obese patients (p<0.001) and those with a higher comorbidity index (p<0.001) were more likely to undergo ICG use. Large bed size hospitals (p<0.001), teaching hospitals (p<0.001) and Southern region (p<0.001) had significantly greater use of ICG. It was more frequently used in