ABSTRACT

Over 2 million long bone fractures are treated in the United States every year. Although most bone fractures heal spontaneously there is no “gold standard” for promoting bone regeneration in those segmental bone defect due to trauma or infection, devastating medical problems leading to significant disability. The cost of care for initial reconstructive procedures can surpass $50,000 and hundreds of thousands of dollars over time. The development of custom 3D printed biomaterial scaffolds that can fit and fill large bone defects may provide a novel solution and coating these scaffolds with agents designed to promote more rapid and complete bone healing may increase the efficacy of prosthetic scaffolds in healing segmental bone defects.

The application of 3D printing to fabricate personalized bone-forming degradable constructs, composed of calcium- and phosphate-based bioactive ceramic, which would allow rapid bone formation and regenerated bone growth along adjacent structures during skeletal development/remodeling would be an ideal treatment option for reconstructive surgeons, as it would: minimize or eliminate the need for procurement of donor bone and its associated morbidity; and limit increased cost of care. The development of such a treatment option for any skeletal defect would be an unprecedented advance in bone reconstructive surgery for both growing children and adults.

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