A Combined Retrospective and Prospective Case Series Evaluation of Ultraporous Beta Tricalcium Phosphate for Curetted Benign Cavitary Bone Lesions in Adults

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ABSTRACT INTRODUCTION:
Numerous studies of bone graft materials and substitutes include a broad range of patient ages. However, it is generally held that pediatric patients generally do well regardless of the material used. Adults, on the other hand, are thought to typically heal less well and more frequently have adverse co-morbidities that can negatively impact healing. The purpose of this study was to evaluate clinical and radiographic results of incorporation of a single osteoconductive bone void filler (ultraporous beta tricalcium phosphate- UPTCP) with and without bone marrow aspirate in the setting of benign cavitary defects following open curettage of benign tumors in a population of exclusively adult patients using clinical assessment for complications and minimum two year CT scan parameter endpoints. Our hypothesis was that UPTCP would be safe and efficacious for the adult population and that the graft material would be completely incorporated by the two year or later follow-up CT.

METHODS:
Twenty-eight subjects ≥ 21 years of age who underwent open curettage for benign cavitary defects from 2001 to 2014 with minimum 2 year follow-up CT scans representing an amalgam of retrospectively and prospectively enrolled patients (from the initiation of the study in 2012) were included in the study population. Average follow-up time for the 24+ months CT scan was 106 months from index date of surgery (26-157 months). Anatomic site included predominately long bones of the lower extremity more than the upper extremity. There were 5 males and 23 females with mean age of 43.6 years (range 21-64) and mean BMI 30.9 (range 23.0-42.7). UPTCP alone was utilized in 21 and UPTCP combined with bone marrow aspirate (BMA) in 7. Radiographs were obtained at each time point of follow-up and CT scans were obtained at 12 months and 24+ months post-operatively. Two experienced radiologists (JL, HC) performed a blinded review for primary and secondary endpoints as previously published.1,2 Primary effectiveness endpoint for the study was percentage of UPTCP resorption into the native bone derived from the 24+ month CT. Secondary endpoints included presence of graft within soft tissue, presence of a rim of radiolucency surrounding the grafted defect, size of the defect, bone trabeculation through the defect, and persistence of graft material through the lesion. Covariates included presence or absence of BMA, diabetes, history of smoking, autoimmune disease, and metabolic bone diseases. Complications were also evaluated.

RESULTS SECTION:
There was a broad distribution of resorption percentage seen on the 24+ month CT scans but the median was 25% (44.8% of subjects). Graft within soft tissues was seen on post-operative 24+ months CT only in a single patient, a male smoker. Median radioluency around the graft defect and size of the remaining defect were each 0% at 24+ months CT follow-up (48.3% of subjects). Median trabeculation through the defect was equally distributed between 75% and 100% groups at 41.4% of subjects for each. Median persistence of graft material was 75% (37.9% of subjects). UPTCP alone was utilized in 21 and UPTCP combined with bone marrow aspirate (BMA) in 7. Radiographs were obtained at each time point of follow-up and CT scans were obtained at 12 months and 24+ months post-operatively. Two experienced radiologists (JL, HC) performed a blinded review for primary and secondary endpoints as previously published.1,2 Primary effectiveness endpoint for the study was percentage of UPTCP resorption into the native bone derived from the 24+ month CT. Secondary endpoints included presence of graft within soft tissue, presence of a rim of radiolucency surrounding the grafted defect, size of the defect, bone trabeculation through the defect, and persistence of graft material through the lesion. Covariates included presence or absence of BMA, diabetes, history of smoking, autoimmune disease, and metabolic bone diseases. Complications were also evaluated.

DISCUSSION:
Incorporation of graft material within defects following curettage of tumors has been reported to be less optimal for adult patients, underscoring the importance of a separate analysis of this more challenging subset of patients. This ultraporous beta-tricalcium phosphate bone filler following curettage of benign bone tumors in skeletally mature patients shows a variable resorption and incorporation profile on CT scan after minimally invasive open curettage. The purpose of this study was to evaluate clinical and radiographic results of incorporation of a single osteoconductive bone void filler (ultraporous beta tricalcium phosphate- UPTCP) with and without bone marrow aspirate in the setting of benign cavitary defects following open curettage of benign tumors in a population of exclusively adult patients using clinical assessment for complications and minimum two year CT scan parameter endpoints. Our hypothesis was that UPTCP would be safe and efficacious for the adult population and that the graft material would be completely incorporated by the two year or later follow-up CT.

REFERENCES:

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IMAGES AND TABLES:
None