INTRODUCTION: Unicameral bone cysts (UBC’s) are benign tumor-like lesions which occur primarily within the metaphyses of growing long bones of children (Fig 1). Although the etiology remains elusive, the fluid within UBC’s contains an abundance of potent osteoclastic stimulators including IL-1, TNFα, PGE2, and MMPs (1, 2). Local bone resorption is responsible for cyst enlargement resulting in thin weak cortices and pathological fracture through the lesion. The treatment of UBC’s has included intra-lesional steroid injections, bone marrow aspirates with or without demineralized bone matrix, multiple drill holes, open curettage with bone grafting, and more recently intramedullary rods (3). In most series, multiple treatments are necessary due to recurrence or persistence of the cyst. Of all these treatments, only intramedullary rods provide any mechanical stability at the site of the lesion. Calcium phosphate materials have become available which are injectable as a paste and harden in-situ (4,5). Once set, these materials have considerable compressive strength and appear to undergo osteoclastic resorption and replacement with host bone (4-6). We hypothesized that a calcium phosphate bone substitute (α-BSM®, ETEx Corp & Depuy Orthopedics) would be a novel and effective method to treat UBC’s with a single injection, provide mechanical support to the lesion reducing patient morbidity, and decrease the incidence of cyst persistence or recurrence after treatment.

METHODS: This study was IRB approved. Diagnosis of the UBC was made from radiographs and cyst aspirations at the time of injection of α-BSM®. Treatment consisted of fluoroscopically placing two large bore needles (8ga. Jamshidi cannulae) into the proximal and distal aspects of the cyst cavity to allow for saline lavage followed by injection of the cement. The α-BSM® was supplied as a powder in 2.5 to 20 gram plastic injection bulbs. Sterile saline was added to the injection bulb at 0.8 ml per gram of powder and thoroughly mixed into a wet paste. The α-BSM® was expressed into 10 ml syringes which were attached to one or two Jamshidi canulae with plastic injection bulbs. Sterile saline was added to the injection bulb at 0.8 ml per gram of powder and thoroughly mixed into a wet paste. The α-BSM® paste was observed exiting the venting cannula, this cannula was closed and injection continued to pressurize the paste to help assure complete filling of the cyst. Postoperative fluoroscopic images were obtained to document cyst fill with α-BSM®. Sterile dressings were applied over the injection portals. Patients returned for follow-up clinical and x-ray examinations at 3 to 6 month intervals postoperatively.

RESULTS: To date, eleven patients have been enrolled and treated using α-BSM® with a mean follow-up of 12 months (range 4-24 months). There were 6 females and 5 males with ages ranging from 5 to 19 years. The UBC’s were located within the proximal humerus (n=6), proximal femur (n=3), calcaneus, (n=1), and fibula (n=1). Eight patients had prior or current pathological fractures involving their cyst. Three patients had previously undergone open curettage and bone grafting, and 5 patients had failed intra-lesional steroid injections. Local pain at the site of the UBC was often a presenting complaint. The α-BSM® was easily injected into the cyst cavities in most patients. In two cases showing radiographic evidence of partial consolidation of their UBC’s, greater injection pressures were required. The mean volume of α-BSM® administered was 12 grams (range 3 - 25 gms). Most patients reported pain relief post-operatively. At 3 months, radiographs demonstrated early remodeling of the α-BSM® around the periphery of the cyst wall. At six months, the radiodensity of the α-BSM® appeared to decrease slightly and the cement/ cyst wall interface became less distinguishable. By one year, the overall radiodensity of the lesions became more homogenous and consolidated suggesting a mixture of residual α-BSM® and new host bone (Fig 2). At two years post treatment, radiographs continue to demonstrate cyst consolidation and remodeling of residual α-BSM®. All pathologic fractures healed uneventfully. There was no radiographic evidence of cyst recurrence and all patients have returned to previous levels of physical activity.

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REFERENCES: