

# Biological Vertebral Augmentation in Osteoporotic Compression Fractures: CT Evidence of Osseous Healing

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## Introduction

Biological vertebral augmentation (BVA) is an emerging technology for the management of osteoporotic vertebral compression fractures (VCF). Early reports have demonstrated that BVA can provide clinical results equivalent to vertebral augmentation with methylmethacrylate.<sup>1&minus;2</sup> In an attempt to address concerns regarding long-term stability and osseous integration, we undertook a retrospective radiological review of osteoporotic fractures treated by BVA (Spineoplasty™).

## Methods

A retrospective chart review was performed on 18 consecutive osteoporotic patients undergoing BVA with allograft/DBM placed in a polymeric, porous mesh containment device (Optimesh®, Spineology Inc, St. Paul, MN). An immediate post-op CT was obtained on all patients and repeated on those that returned for 6 and/or 12 mo follow-up. CT scans were assessed for graft subsidence, migration, resorption, and evidence of osseous union of the graft with native VB. All patients received concurrent medical management for osteoporosis with teriparatide or raloxifene.

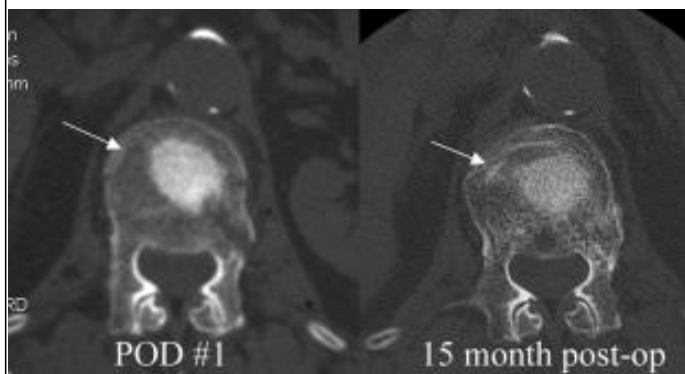


Figure 1: Fracture in a 79 y.o. female on chronic steroids for pulmonary fibrosis. DEXA T-score of -1.4. Comparable CT axial views from POD #1 and 15 mo post-op show evidence of bone graft incorporation circumferentially around the mesh. The access tunnel appears to be filled in with new bone. White arrow depicts original fracture line, which appears healed on the 15 mo CT.

## Results

Of the 18 patients treated, 8 patients (44%) had reached their 6mo (n=2) or 12mo (n=6) follow-up. Preop DEXA scores were available on 16 of 18 patients and the T-scores averaged -2.81 (range -0.4 to -4.7). The typical CT findings at the 6-12 mo follow-up interval showed a dense area of bone immediately adjacent to the allograft pack on axial, sagittal, and coronal imaging. This dense area was interpreted as evidence of osseous union between the native vertebral bone and the allograft pack. On 2 patients, small areas of lucency adjacent to the graft were identified on axial imaging. This lucency is not seen rostral or caudal to the graft (on sagittal or coronal views) and the lucency seen lateral to the graft pack may represent either a fibrous union that developed in areas of the least biomechanical stress (i.e. Wolff's Law), or simply a demineralized phase of delayed osseous incorporation. No evidence of allograft resorption, migration, graft containment failure, or significant subsidence of the graft pack was noted when compared to the immediate post-op CT scans.

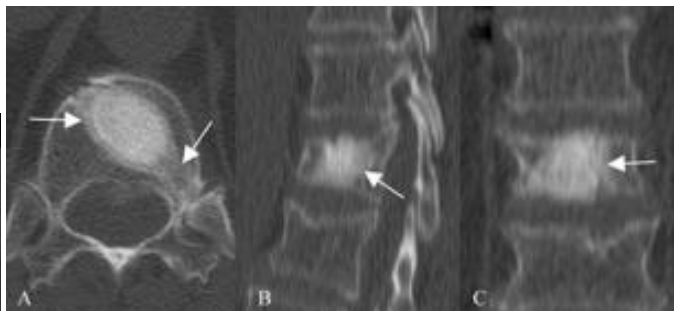


Figure 2: L1 fracture in a 73 y.o. female, DEXA T-score of -2.0. In all 6 month CT views, demarcation of the mesh border is blurred and there is a zone in between the native vertebral bone and the dense graft pack in the middle of the mesh. This zone appears to be incorporated graft and new bone (arrows), particularly in the access tunnel for mesh insertion seen in Fig. A.

## Conclusions

BVA utilizing allograft bone/DBM placed in the OptiMesh device, along with aggressive medical management, provides a biologic scaffold that appears capable of osseous integration and structural stability. In this small patient sample, resorption, collapse, and non-union were not radiographically evident. Longer-term radiographic follow-up on a larger cohort of patients would be beneficial to confirm the interpretation of the CT findings reported herein, and to validate the durability of this treatment for osteoporotic VCF.

## Learning Objectives

1. Identify biological filler alternatives for vertebral augmentation procedures. 2. Become familiar with CT appearance of allograft integration within VB. 3. Identify the potential disadvantages of BVA.

## References

1. Schultz K, Stewart T, Chandler G, Muhanna N. Early experience with a minimally invasive vertebral reconstruction technique utilizing contained bone graft. Presented at North American Spine Society 20th Annual Meeting. Philadelphia, Pennsylvania, September 2005. 2. Stechison MT. Biologic vertebral augmentation in thoracic and lumbar fractures using OptiMesh. Presented at American Association of Neurological Surgeons 74th Annual Meeting. San Francisco, California, April 2006.

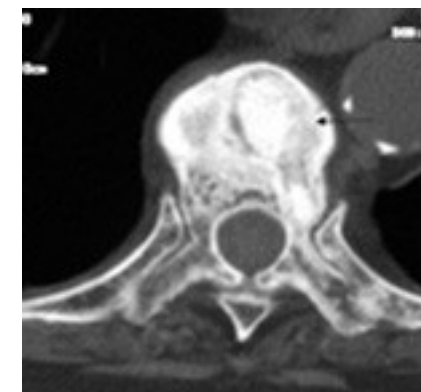


Figure 3: 70 y.o. female, DEXA T-score of -2.7, with T-9 fracture. The arrow points to an area where the mesh and allograft pack appear to be integrated with new bone.