



OSTEOAMP: Complex Spinal Fusion Series

OSTEOAMP CASE REPORTS:

- **Cervical Corpectomy**
- **Thoracolumbar Corpectomy**
- **Lumbar Corpectomy**

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OSTEOAMP Case Report

CERVICAL CORPECTOMY

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OSTEOAMP IS A UNIQUELY PROCESSED ALLOGRAFT THAT HAS BEEN SHOWN TO RETAIN UP TO 23 DIFFERENT GROWTH FACTORS THAT SUPPORT NEW BONE FORMATION.²



Patient

Presented with spinal cord compression and severe myelopathy



Procedure

Anterior C4-C5 corpectomy with reconstruction (autograft and OSTEOAMP sponges). Posterior C2-T1 instrumented fusion, C3-C5 laminectomy



Outcome

Postoperative CT at 16 months confirms fusion

Patient

68-year-old female with history of hypertension and rheumatoid arthritis presented to the emergency room with quadriparesis from spinal cord compression and severe myelopathy (3/5 bilateral upper extremities, 4/5 bilateral lower extremities, urinary retention). Due to severe gait instability, she had suffered multiple falls (**Figure 1**).

Procedure

The objective of the surgery was to decompress the spinal cord, reconstruct C4-C5 and stabilize the cervical spine. This was achieved by performing anterior C4-C5 corpectomies with expandable cage reconstruction and posterior supplementation including laminectomies. Due to the potential poor quality of local autograft (the patient's bone was mostly composed of fatty replacement of marrow), an XL OSTEOAMP compressible sponge was utilized.

Surgery was uneventful and was followed by a benign postoperative course.

Outcome

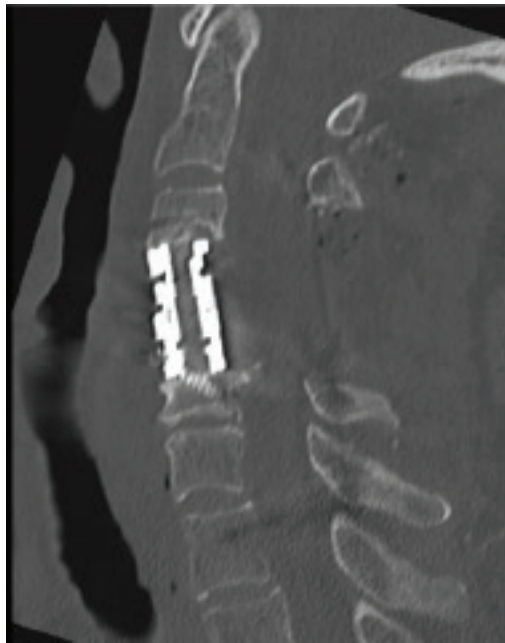
The patient had an excellent clinical outcome. Immediate postoperative imaging demonstrated excellent decompression of the cord with optimal reconstruction of the cervical spine (**Figure 2**).

The patient made an excellent clinical recovery with resolution of quadriparesis and sensory deficits. Repeat radiographic evaluation at her long-term follow-up appointment (16 months post-surgery) demonstrated complete bony fusion throughout the cage. The OSTEOAMP compressible sponge material allows for expansion within the cage and bone-to-bone contact, establishing a successful osteoconductive bridge. (**Figure 3**).



Preoperative

(left) Figure 1: Preoperative sagittal T2 MRI demonstrating severe cord compression with cord signal change from spondylolisthesis and deformity.



Immediate postoperative

(right) Figure 2: Immediate post-operative sagittal noncontrast CT scan demonstrating surgical correction and placement of expandable titanium cage.



16 months postoperative

Figure 3: 16 month postoperative sagittal noncontrast CT scan demonstrating complete osseous fusion throughout the expandable titanium cage.



OSTEOAMP Case Report

THORACOLUMBAR CORPECTOMY

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Patient

Presented with traumatic
T12 burst fracture



Procedure

T11-L1 laminectomy, T12 corpectomy with reconstruction (rib autograft plus OSTEOAMP sponge), posterior T9-L3 instrumented fusion with rod placement



Outcome

Postoperative CT at 16 months confirms fusion

Patient

A 49-year-old heavy smoker with a history of hypertension fell 20 feet from a crane. He went home because his back hurt, took some ibuprofen, and went to bed. After waking up 3 hours later, he went to the doctor because his back still hurt. He drove himself to the nearest hospital where he presented with a traumatic T12 burst fracture (**Figure 1**).

Procedure

The objective of surgery was to decompress the spinal cord and reconstruct the thoracolumbar spine, thus stabilizing the T12 burst fracture. This was achieved by performing a T11-L1 laminectomy with wide bilateral decompression and pedicle screw placement without using rods. During surgery, the patient was repositioned for a left retropleural approach. This enabled a T12 corpectomy with spinal column reconstruction by titanium expandable cage placement and fixation. Lastly, posterior rods were placed and arthrodesis/fusion was performed. A rib allograft taken by retropleural approach was used in combination with 2 XL OSTEOAMP compressible sponges to fill the expandable cage.

Surgical intervention was uneventful. The patient's postoperative course was significant for a pleural effusion with mild atelectasis, which was managed by chest tube placement.

Outcome

The patient had an excellent clinical outcome. Intraoperative and immediate post-operative X-rays showed excellent spinal column reconstruction and neural decompression (**Figure 2**). After chest tube removal, the patient had an uneventful post-hospitalization course with rapid recovery.

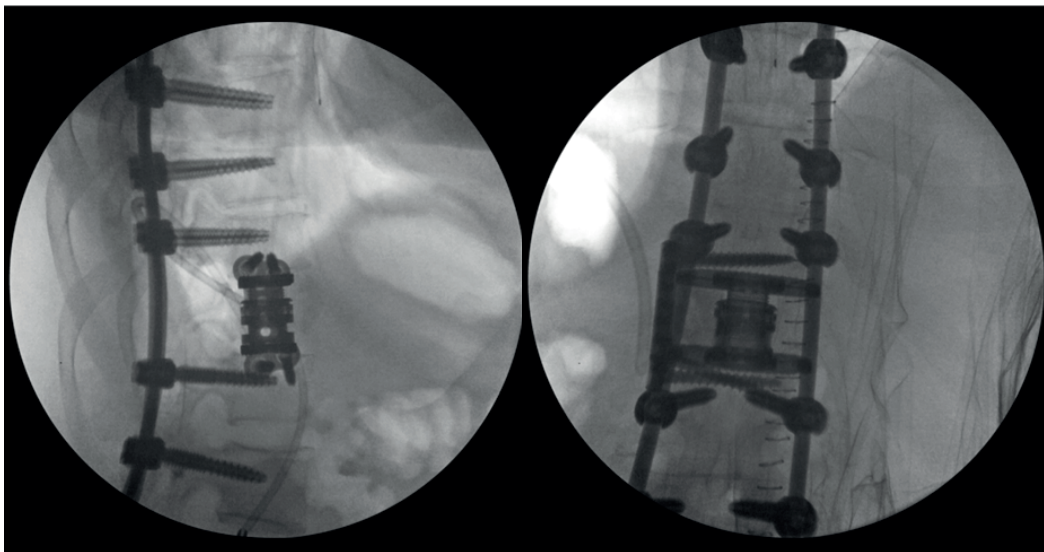
A 16-month X-ray demonstrated complete bony fusion through the cage (**Figure 3, 4**).

The patient returned to work full time as a truck driver and crane operator with complete resolution of his symptoms and no neurologic deficits.



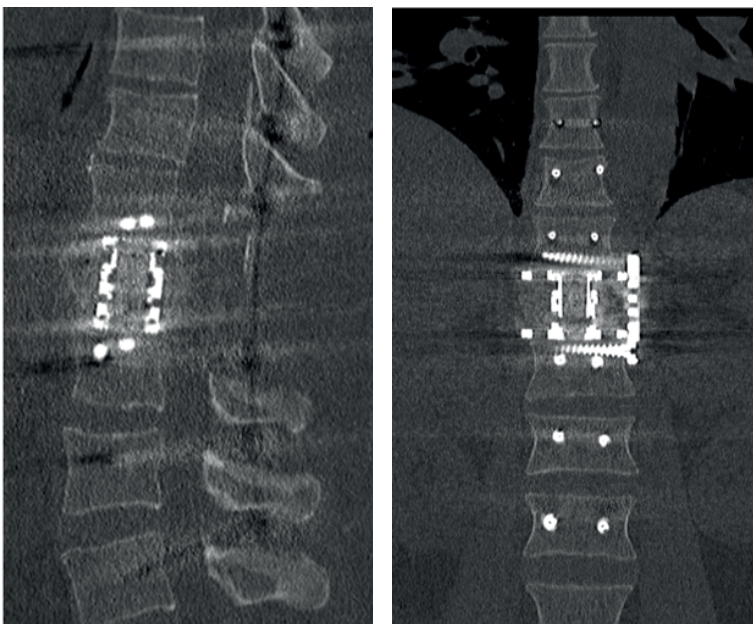
Preoperative

Figure 1: Preoperative sagittal MRI (left) and non-contrast CT scan (right) demonstrating unstable burst fracture with severe cord compression.



Immediate postoperative

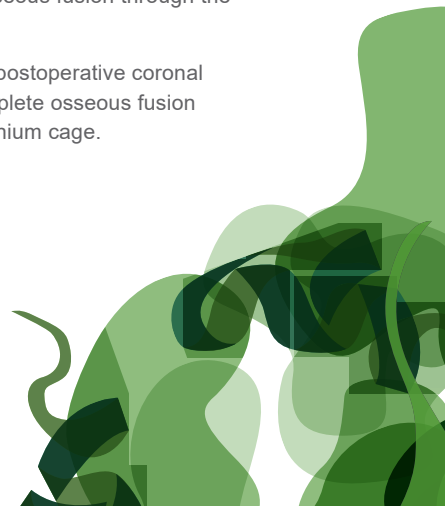
Figure 2: Immediate post-operative X-ray demonstrating surgical decompression with reconstruction of the thoracolumbar junction.



16 month postoperative

(left) Figure 3: 16 month postoperative sagittal CT demonstrating complete osseous fusion through the expandable titanium cage.

(right) Figure 4: 16 month postoperative coronal section, demonstrating complete osseous fusion through the expandable titanium cage.



OSTEOAMP Case Report

LUMBAR CORPECTOMY

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OSTEOAMP IS A UNIQUELY PROCESSED ALLOGRAFT THAT HAS BEEN SHOWN TO RETAIN UP TO 23 DIFFERENT GROWTH FACTORS THAT SUPPORT NEW BONE FORMATION.²



Patient

Presented with L4/L5 discitis/
osteomyelitis



Procedure

Spinal reconstruction:
L4-L5 corpectomy,
posterior L2-S1 fusion



Outcome

Post operative CT
confirms osseous
integration

Patient

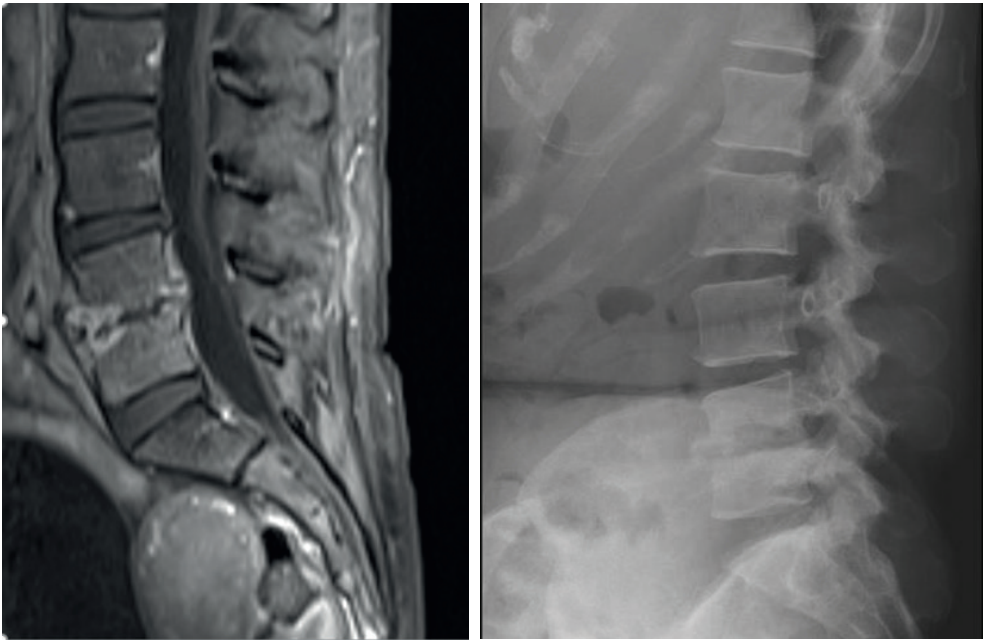
A 52-year-old female presented to the clinic with lumbar spondylosis and chronic MRSA-positive discitis/osteomyelitis at the L4-L5 level. She had significant comorbid illness, including diabetes mellitus and hypertension. Her lumbar infection had been treated with antibiotics for more than 3 months without success. After failure of the first round of antibiotics, the patient had surgical debridement, with biopsy to identify an appropriate intravenous antibiotic. Finally, the patient presented to our clinic with severe back pain and weakness. Her neurologic exam was significant for weakness and urinary retention. Further workup revealed elevated infection markers and imaging demonstrated progressive epidural abscess with neural compression. Preoperative MRI and X-rays demonstrated osseous destruction with collapse of the respective vertebral bodies. **(Figure 1)**. Surgical decompression and spinal reconstruction was performed.

Procedure

The objective of the surgery was to eradicate the infection and stabilize the lumbar spine. Utilizing an anterior approach, we performed L4-L5 corpectomies with expandable cage reconstruction followed by a posterior L2-S1 instrumented fusion. We utilized multiple XL OSTEOAMP compressible sponges for graft material within the expandable cage **(Figure 2)**. Because there was a refractory infection, no additional auto- or allografts were used. Postoperatively, the patient was braced and treated with 12 weeks of intravenous vancomycin.

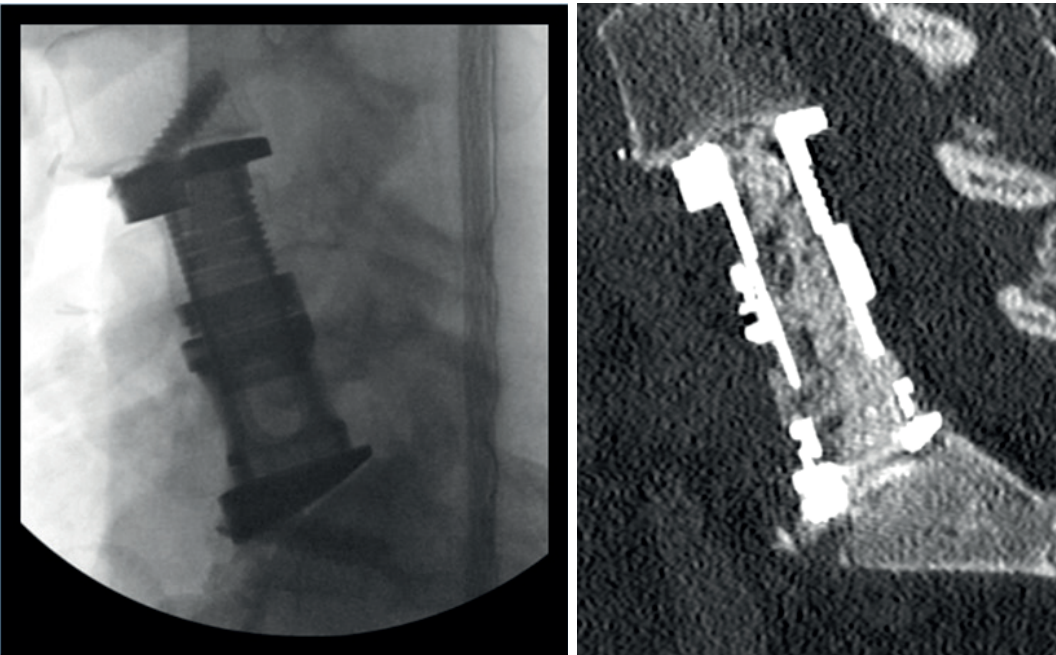
Outcome

The patient had an excellent clinical outcome. Immediate postoperative CT scan demonstrated excellent spinal reconstruction and neural decompression **(Figure 3)**. A ~12 month postoperative CT scan demonstrated excellent graft incorporation and osseous fusion across the expandable cage **(Figure 4)**. The patient did extremely well postoperatively.



Preoperative

Figure 1: Initial MRI with contrast demonstrating discitis/osteomyelitis on the left. Lateral lumbar X-ray on the right demonstrating development of instability and deformity post medical treatment.



Intraoperative

Figure 2: Intraoperative fluoroscopic image demonstrating corpectomy and reconstruction within the expandable titanium cage.

~12 months postoperative

Figure 3: Extended postoperative sagittal CT demonstrating osseous integration and fusion across the expandable titanium cage.



About OSTEOAMP

OSTEOAMP is an allogeneic bone graft developed to provide an alternative to an autograft, which is typically harvested from the iliac crest. Although autograft bone from the iliac crest is considered the “gold standard,” there are problems associated with it. There can be substantial morbidity at the donor site following the surgery to harvest the autograft, and sometimes insufficient graft is available for transplant.¹ Furthermore, the surgery involved in harvesting autograft from a separate surgical site increases operating time and inherent risks for the patient.

OSTEOAMP® is a differentiated allograft bone graft substitute that is uniquely processed with bone and bone marrow. The OSTEOAMP process is designed to retain essential endogenous growth factors that align with and support each phase of the body’s natural bone healing process. OSTEOAMP has been shown to retain up to 23 different growth factors.^{2*}

This unique production process makes OSTEOAMP different from demineralized bone marrow (DBM) products that strip away bone marrow during processing, which reduces their potential for initiating osteoinduction and angiogenesis. OSTEOAMP is also different from INFUSE, which is a recombinant, single growth factor provided in supraphysiological doses.

OSTEOAMP is available in three different formats; granules, putty, and compressible sponges. These formats make it possible to use OSTEOAMP in a range of different anatomic locations.

Peer-reviewed publications report that when OSTEOAMP was used, cervical spine fusion rates exceeded fusion rates reported in the literature for traditional DBMs.³ These publications also report that OSTEOAMP is a viable alternative to INFUSE, based on fusion rates and time to fusion in lumbar spine fusion, as well as showing favorable economic outcomes.⁴

For additional information, contact Bioventus Surgical at:
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*In vitro performance may not be predictive of performance in humans.

Harshpal Singh is a paid consultant of Bioventus LLC and received compensation from Bioventus LLC related to this article.

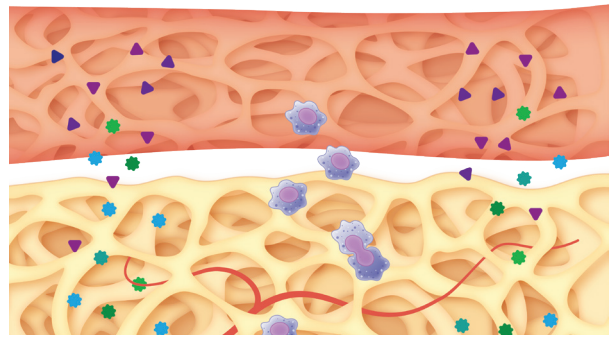
References:

1. Dimitriou R, Tsiroidis E, Giannoudis PV. Current concepts of molecular aspects of bone healing. *Injury*, 2005;36(12):1392-404.
2. Bioventus Surgical. Tidwell JL, Seaman SA, Vanderploeg EJ, Tom S. In vitro and in vivo characterization of OSTEOAMP allogeneic morphogenetic proteins. Data on file, Bioventus white paper; 2017.
3. Field JJ, Yeung C, Roh J. Clinical evaluation of allogeneic growth factor in cervical spine fusion. *J Spine* 2014;3:158.
4. Roh JS, Yeung CA, Field JS, McClellan RT. Allogeneic morphogenetic protein vs. recombinant human bone morphogenetic protein-2 in lumbar interbody fusion procedures: a radiographic and economic analysis. *J Orthop Surg Res*. 2013;8:49. doi:10.1186/1749-799X-8-49.
5. Park JJ, Hershman SH, Kim YH. Updates in the use of bone grafts in the lumbar spine. *Bull Hosp Jt Dis*. 2013;71(1):39-48.

OSTEOAMP may be used in situations where an autograft is appropriate. It should be restricted to homologous use for the repair, replacement, or reconstruction of musculoskeletal defects.

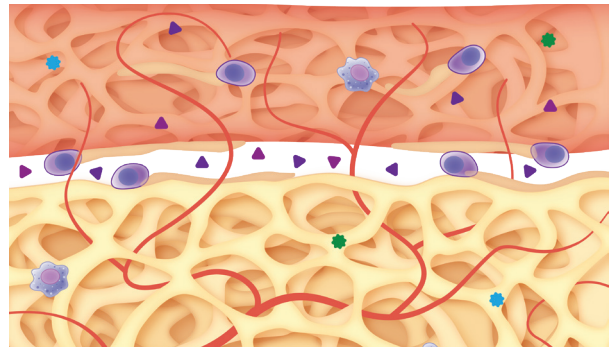
Please see instructions for use for a complete list of indications, contraindications, warnings, and precautions on the product label, at www.bioventussurgical.com or by calling 1-800-637-4391.

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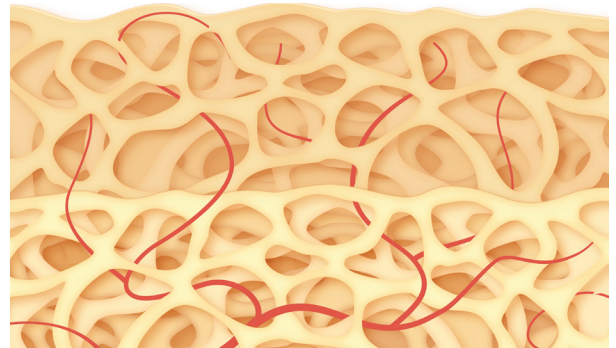
Step 1

OSTEOAMP is an osteoconductive, osteoinductive, and angiogenic bone graft substitute that can be placed at the desired fusion site. Host cells are then attracted by cytokines and endogenous growth factors present at the fusion site, as well as those present in OSTEOAMP.



Step 2

Osteoinductive growth factors such as BMP promote cell recruitment, cell proliferation, and bone cell differentiation, thereby promoting new bone formation.⁵ Angiogenic growth factors initiate new blood vessel formation, while osteoblasts deposit new osteoid matrix.



Step 3

OSTEOAMP is gradually incorporated into the healing bone. Mineralization of the osteoid matrix occurs, creating a solid fusion. This is followed by bone remodelling as OSTEOAMP is replaced by host bone.

