

## Application of nanocrystalline hydroxyapatite (NanoBone® Bone Graft) in an open tibial fracture with bony defect

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### Preoperative

A 20-year-old male athlete presented with after a soccer related injury in which he suffered a Type 3B open right tibia fracture with a bony defect. He was treated initially with intravenous (IV) antibiotics, an initial operative debridement, and irrigation of his open fracture with reduction and external fixation. When he was physiologically stable, he underwent a reduction and IMN fixation of his tibia.



Fig. 1. Pre-Operative Images

### Surgical Procedure

After initial debridement, irrigation, and external fixation, patient underwent operative treatment with IMN of his tibia in a hospital setting. He received preoperative IV antibiotics and two additional doses of postoperative antibiotics. The surgical approach utilized for intramedullary nail insertion was a semi-extended approach. Progressive reaming was performed from 9 mm to 11.5 mm. The nail used had a 10-mm diameter and was statically locked proximally and distally. The bony defect was not filled with any substance. Immediately after his orthopaedic stabilization, he underwent a free tissue muscle transfer to cover his open soft tissue defect.

### Postoperative Course



Fig. 2. Immediate Post-operative Images

The patient was made weight bearing as tolerated with limitation of strenuous activities for six weeks.



Fig. 3. Prior to application of NanoBone Bone Graft

## Bone Graft Substitute Clinical Case Series

At 8-weeks after full maturation of his soft tissue transfer graft, his tibial defect was tested for infection with an open bone biopsy and deep cultures. His biopsy pathology and deep cultures were negative for osteomyelitis and infection. After final pathology and microbiology results were known, he underwent bone defect filling with 10 ml of NanoBone SBX Putty of his right tibia in an outpatient setting. He received preoperative IV antibiotics and one additional dose of postoperative antibiotics for both procedures.



**Fig. 4. Healed tibia three months after NanoBone application**

The patient continued to be weight bearing as tolerated. At 3-months post-grafting with NanoBone, he was clinically and radiographically healed.

### Discussion

Although there are different methods of dealing with an open fracture bony defect, most bony defects are treated with autologous bone grafting. The advantages of autologous bone grafting include utilizing the patient's own bone graft, the availability of precursors required for bony healing, and lowest risk of bone graft rejection. The disadvantages when using autologous bone graft include possible complications such as bony nonunion, bony fracture, chronic pain, infection, and cosmetic scar.

In this case, the real benefit of using NanoBone came from full bony defect healing without having the complications associated with autologous bone grafting. We chose to utilize NanoBone as compared to autologous bone grafting, as the patient's defect did not require a large volume of graft to fill and allowed the grafting procedure to be performed in an outpatient setting. In addition, the patient is an athlete that did not want to suffer potential complications from autologous bone grafting and/or additional downtime from his sport from recovering from an autologous bone graft harvest. Our patient returned to sport after he healed and was satisfied with his outcome.