Surgical Repair of a Tibial Metaphyseal Defect Using ViviGen Formable® Cellular Bone Matrix

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CASE STUDY

Pilon fractures typically occur due to high-energy trauma and cause the comminuted metaphyseal bone to collide against the tibial articular surface.[1] Metaphyseal bone defects, which remain after the stabilization of the fractures, can pose a challenge for treatment.[2] One bone-grafting option for fusing defects is autograft bone. Autograft bone can provide the osteoconductive, osteoinductive, and osteogenic properties needed for successful bone fusion; however, its retrieval can cause pain and morbidity at the harvest site.[3] Even in cases in which autograft is desired, there is a limit to the volume that can be harvested without compromising the donor site. Allograft bone can be used as an autograft extender or even eliminate the need for a second surgery site altogether. One particular allograft, ViviGen®, also provides all three properties necessary for bone fusion. ViviGen contains viable lineage-committed bone cells embedded in cortico-cancellous chips as well as demineralized bone particles or fibers. Preclinical studies involving porous ceramic scaffolds seeded with either osteoblasts or mesenchymal stem cells (MSCs) have suggested that bone cells may provide a higher degree of bone deposition than MSCs.[4,5] Findings from these studies suggest that viable bone allografts may have greater relevance in cases where bone fusion is anticipated to be challenging.

The following describes the use of ViviGen Formable to treat challenging tibial metaphyseal defect in a pilon fracture.

Patient

54-year-old, poorly controlled non-insulin-dependent, diabetic male.

Fell five feet off a ladder at work and sustained bilateral displaced pilon fractures. The patient was placed into spanning external fixators on the day of injury. The right side was amenable to open reduction and internal fixation (ORIF). The left side sustained significant swelling, comminution, displacement, and bone loss, which precluded primary ORIF **(Figure 1).**

Procedure

A circular external fixator was placed with limited ORIF to reduce the talus and tibia **(Figure 2).** The fixator also allowed for bone stock and alignment for an ankle fusion in the future, while minimizing soft tissue trauma. The metaphyseal bone void was filled with 15 cc of ViviGen Formable (the graft is visible medially), where the handling characteristics allow for ViviGen Formable to be formed and placed with ease.

Results

The external fixator was removed four months post-operative, with radiographs and a CT scan showing consolidation of metaphyseal ViviGen Formable bone graft **(Figure 3).**

Conclusion

This case highlights the use of ViviGen Formable as a bone graft to fill a metaphyseal defect in a pilon fracture.

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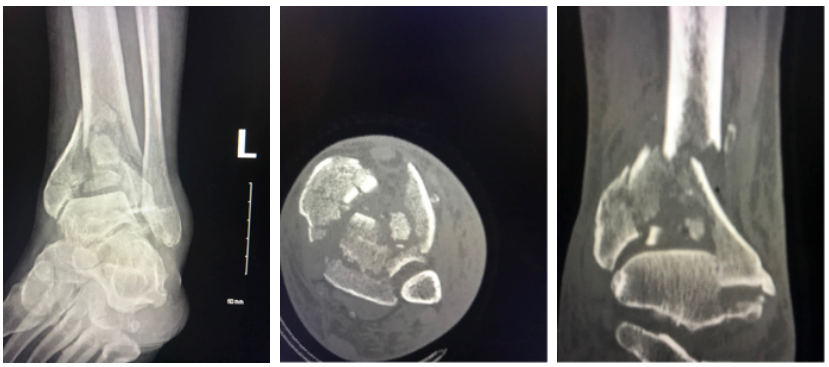

Figure 1. *Radiograph and CT images showed the significant swelling, comminution, displacement, and bone loss of the left ankle and tibia.*

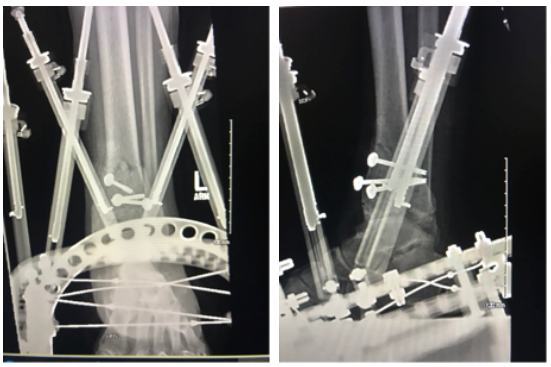

Figure 2. *A circular external fixator was placed with limited ORIF to reduce the talus and tibia.*

Figure 3. *Radiograph and CT images showed consolidation of metaphyseal Vivigen Formable bone graft at four months post-operative.*

References

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