

Surgical Repair of a Nonunion Fracture at the Fifth Metatarsal Using ViviGen® Cellular Bone Matrix

Case performed by: Ari Kaz, MD; Chicago, IL, USA

CASE STUDY

Fractures at the fifth metatarsal can cause pain and difficulty walking.¹ While conservative treatments can be attempted, operative treatments should be considered if nonunion occurs.² One bone grafting option for fusing fractures 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 amount 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 to treat a challenging nonunion fracture at the fifth metatarsal.

Patient

34-year-old, smoker, female with a vitamin D deficiency.

Sustained a closed, minimally displaced base fracture of the fifth metatarsal. X-rays (**Figure 1**) and a CT scan demonstrated no evidence of healing (**Figure 2**) six weeks after injury.

Procedure

Due to persistent pain and radiographic confirmation of nonunion, surgery was performed, consisting of nonunion takedown, open reduction and internal fixation (ORIF), and bone grafting with 1 cc of ViviGen.

Results

Fusion was confirmed at four months post-operative (**Figures 3 & 4**).

Conclusion

This case highlights the successful use of ViviGen as a bone graft in treatment of a nonunion, fifth metatarsal fracture.

Surgical Repair of a Nonunion Fracture at the Fifth Metatarsal Using ViviGen® Cellular Bone Matrix

CASE STUDY



Figure 1. X-rays demonstrated no evidence of healing six weeks after injury.

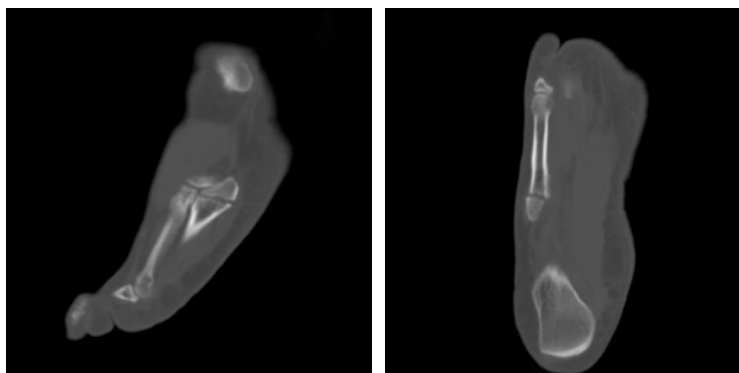


Figure 2. A CT scan demonstrated no evidence of healing six weeks after injury.



Figure 3. X-ray images confirmed fusion at four months post-operative.



Figure 4. A CT scan confirmed fusion at four months post-operative.

References

1. Hatch RL, Alsobrook JA, Clugston JR. Diagnosis and Management of Metatarsal Fractures. *Am Fam Physician*. 2007;76(6):817-826.
2. Bowes J, Buckley R. Fifth metatarsal fractures and current treatment. *World J Orthop*. 2016;7(12):793-800.
3. Khan WS, Rayan F, Dhinsa BS, Marsh D. An osteoconductive, osteoinductive, and osteogenic tissue-engineered product for trauma and orthopaedic surgery: how far are we? *Stem Cells Int*. 2012;2012:236231.
4. Reichert JC, Quent VM, Noth U, Hutmacher DW. Ovine cortical osteoblasts outperform bone marrow cells in an ectopic bone assay. *J Tissue Eng Regen Med*. 2011;5(10):831-844.
5. Tortelli F, Tasso R, Loiacono F, Cancedda R. The development of tissue-engineered bone of different origin through endochondral and intramembranous ossification following the implantation of mesenchymal stem cells and osteoblasts in a murine model. *Biomaterials*. 2010;31(2):242-249.

LifeNet Health helps to save lives, restore health and give hope to thousands of patients each year. We are the world's most trusted provider of transplant solutions, from organ procurement to new innovations in bio-implant technologies and cellular therapies—a leader in the field of regenerative medicine, while always honoring the donors and healthcare professionals who allow the healing process.

Results from case studies are not predictive of results in other cases. Results in other cases may vary.

LifeNetHealth.org

The LifeNet Health logo and ViviGen are registered trademarks of LifeNet Health. ©2019 LifeNet Health, Virginia Beach, VA. All rights reserved.

The DePuy Synthes logo is a registered trademark of DePuy Synthes, Inc. ©DePuy Synthes 2019. All rights reserved.

105086-190109 DSUS
68-20-227.00