NeoMTX™
Case Series

EXTREMITY MEDICAL

Reliable Fusion Outcomes in Foot and Ankle Arthrodesis Utilizing NeoMTX™ Viable Bone Matrix

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Introduction

Arthrodesis of the foot and ankle remains a cornerstone surgical treatment for patients with severe arthritic change, deformity, instability, or failed prior reconstructions. Despite advances in fixation and technique, the biological environment at the fusion site remains a critical determinant of successful osseous union, pain relief, and functional restoration. Autologous bone graft is considered the clinical "gold standard" because it combines a scaffold, growth factors, and viable cells, but autograft harvesting is limited by donor-site morbidity, finite supply, and variable biologic quality[1].

Cancellous bone grafts have biologic advantages in arthrodesis procedures: their porous trabecular architecture provides an osteoconductive scaffold that facilitates vascular growth and cellular repopulation, and cancellous grafts are generally revascularized more rapidly and completely than cortical grafts—features that support faster remodeling and incorporation in the host bed[2,3].

Successful bone regeneration depends on three essential properties: osteoconduction (a physical scaffold for new bone ingrowth), osteoinduction (biologic signals that recruit and stimulate cells toward osteogenic differentiation), and osteogenesis (the presence of viable osteogenic cells capable of forming bone). Modern graft substitutes aim to achieve these properties to mimic autograft performance[4].

Bone morphogenetic proteins (BMPs) and other endogenous growth factors (for example, PDGF, VEGF, FGF family members, and osteopontin) play well-established roles in coordinating progenitor recruitment, angiogenesis, and osteoblastic differentiation during bone repair; combined or sequential activity of these factors have been shown to enhance regeneration in preclinical and clinical models[5,6].

NeoMTX™ viable bone matrix was developed to address these clinical and biologic challenges by providing a mineralized cancellous scaffold with preserved growth factors and viable vertebral bone-adherent cells (vBA). NeoMTX offers a mineralized cancellous matrix (osteoconductive scaffold), physiologic levels of naturally occurring growth factors including BMP family members and angiogenic factors (osteoinductive signals), and a validated population of viable donor cells (osteogenic component) with high post-thaw viability and quantified cell counts per cc. These characteristics are designed to mimic the key functional components of autograft while avoiding donor-site morbidity[7].

The present study reports clinical outcomes of foot and ankle arthrodeses in 10 patients treated with NeoMTX as the graft material. In this cohort we observed a 100% fusion rate, supporting the biologic rationale that a graft combining an osteoconductive cancellous scaffold, preserved osteoinductive factors, and viable osteogenic cells can reliably promote union in this challenging anatomic region.

In this paper, we describe the surgical methods for fusion site preparation used in these cases, detail the demographic and clinical characteristics of the patient population, present radiographic and clinical outcome data, and discuss the implications of these findings for graft selection in foot and ankle arthrodesis.

Methods

Study Design

This was a prospective, single-center clinical study evaluating outcomes of midfoot and hindfoot fusion procedures utilizing NeoMTX™ viable bone matrix. A total of 10 patients were enrolled consecutively.

Patient Selection

Inclusion criteria required patients to be medically cleared for surgery without undue risk. Patients were eligible if they were undergoing any primary or revision midfoot or hindfoot fusion procedure with fixation. There was no age restriction, and prior midfoot or hindfoot surgeries or non-unions did not preclude participation. NeoMTX combined with local bone was the only graft material permitted. Patients were required to demonstrate compliance with the postoperative protocol, including adherence to weight-bearing restrictions, and be willing and able to attend all scheduled follow-up appointments.

Exclusion criteria included active infection (although a history of prior infection did not exclude participation), known allergies to antibiotics contained in NeoMTX, use of graft materials other than NeoMTX or local bone, and Charcot arthropathy.

Surgical Technique and Graft Application

All procedures involved standard preparation of the arthrodesis site, including thorough removal of cartilage and preparation of bone surfaces. NeoMTX was stored frozen in accordance with manufacturer instructions and thawed in warmed sterile saline immediately prior to implantation. Fixation was performed based on the indication and patient anatomy.

Clinical and Radiographic Evaluation

Patients underwent standardized radiographic and clinical follow-up. Radiographs were obtained preoperatively, immediately postoperatively, and at 6 weeks and 12 weeks. If radiographic healing was not seen at 3 months, Computed tomography (CT) scans were obtained after 4 months.

Results

Patient Population and Procedures

A total of 10 patients (6 males, 4 females) underwent midfoot, hindfoot, or ankle arthrodesis procedures utilizing NeoMTX™ viable bone matrix. The mean body mass index (BMI) across the cohort was 33.9 kg/m^2 (range 24.1–44.9 kg/m^2), reflecting a population with a substantial prevalence of elevated BMI—a known risk factor for delayed union and postoperative complications in lower-extremity reconstruction.
Procedures encompassed a broad spectrum of reconstructive and salvage fusions. Surgeries performed included triple, subtalar (STJ), talonavicular (TN), naviculocuneiform (NC), tarsometatarsal (TMT), and ankle arthrodeses, often accompanied by tendon transfers, gastrocnemius recession, Steindler stripping, or hardware removal, depending on individual deformity correction needs. A complete list of patient demographics and procedures are outlined in Table 1.

Radiographic and Clinical Outcomes

All patients (100%) achieved radiographic fusion as confirmed by the reviewing surgeon, as well as, an independent radiologist, demonstrating osseous bridging across the fusion sites. The mean time to radiographic union was consistent with typical arthrodesis healing timelines, with no evidence of delayed union, nonunion, or hardware failure.

Clinically, all patients demonstrated improved alignment, stable fusion sites, and improved VAS pain scores. No adverse reactions, graft-related complications, or infections attributable to NeoMTX were reported.

Table 1: Summary of Patient Procedures, Comorbidities, and Fusion Results

Patient	DOS	BMI	Indication	Procedure(s)	Union confimed
1	12/6/2024	33.67	Rigid flatfoot	Triple arthrodesis + TAL + tendon transfer	YES
2	12/13/2024	26.18	Flexible flatfoot	Evans/Calc Slide/Cotton + tendon transfer	YES
3	12/26/2024	44.32	Failed ankle ORIF	Ankle arthrodesis + HW removal	YES
4	12/27/2024	24.09	Rigid flatfoot	STJ/TN arthrodesis + Gastroc + tendon transfer	YES
5	3/7/2025	44.92	STJ arthritis	STJ arthrodesis + Steindler + Gastroc + Tenolysis	YES
6	3/13/2025	31.48	STJ arthritis/Pes planus	STJ and NC arthrodesis	YES
7	3/14/2025	35.13	Cavus foot recon/Non union repair of CCJ	Triple arthrodesis + tendon transfer + Steindler	YES
8	5/1/2025	29.98	Cavus foot deformity	STJ arthrodesis	YES
9	5/22/2025	40.10	Lisfranc tear/dislocation	1-3 TMT arthrodesis	YES
10	4/5/2025	29.04	Ankle arthritis	Ankle arthrodesis	YES

Representative Case Observations

NeoMTX demonstrated consistent performance across both complex primary and revision procedures. Fusion was achieved in patients with prior nonunions, elevated BMI, and multiple comorbidities—circumstances often associated with impaired healing. Radiographs revealed uniform incorporation of the graft material and restoration of osseous continuity at the arthrodesis sites.

Figure 1: Patient 7 Pre-operative and Post-Operative Radiographs

Radiographic and clinical imaging of Patient 7 before and after revision arthrodesis of a previously attempted fusion performed by another surgeon. NeoMTX™ viable bone matrix was used in combination with Extremity Medical fixation hardware. Preoperative AP (1a) and lateral (1c) radiographs demonstrate malalignment. Corresponding postoperative AP (1b) and lateral (1d) radiographs show correction and stabilization of the deformity. Preoperative (1e) and postoperative (1f) clinical photographs illustrate improved foot and ankle alignment following reconstruction.

Discussion

This prospective, single-center evaluation demonstrated a 100% radiographic fusion rate among 10 patients undergoing foot and ankle arthrodesis procedures utilizing NeoMTX™ viable bone matrix. These findings underscore the biologic effectiveness of NeoMTX in promoting reliable osseous healing across a wide range of indications, including complex reconstructions and revision procedures.

Achieving fusion in the foot and ankle presents a biologic challenge, particularly in patients with elevated BMI or a history of prior surgery. Despite these risk factors, all patients in this study achieved radiographic and clinical union, suggesting that NeoMTX provides a favorable environment for bone healing. The graft's combination of a mineralized cancellous scaffold (osteoconductive), viable vertebral bone–adherent cells (osteogenic), and preserved native growth factors such as BMP-2, BMP-7, VEGF, and PDGF-BB (osteoinductive) supports a comprehensive biologic response conducive to fusion.

These results align with the established principles of bone graft biology, which emphasize the importance of combining osteoconductive structure with osteogenic and osteoinductive potential for successful arthrodesis[1-3]. The high rate of union across varying procedures—from triple and subtalar fusions to ankle and midfoot reconstructions—demonstrates the adaptability of NeoMTX to different anatomic sites and surgical demands.

Importantly, these outcomes were achieved without donor-site morbidity, positioning NeoMTX as an alternative to autograft for patients in whom autologous bone harvest may be limited or contraindicated. The favorable handling characteristics observed further support its practical application in both primary and revision settings.

Limitations

This study is limited by its small sample size and single-center design; however, the uniform 100% fusion rate observed across a diverse patient population provides compelling preliminary evidence of NeoMTX's clinical utility.

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