

## **Introducing the *Pearl-String-Technique in USA*: A new concept in the treatment of large bone defects**

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### **INTRODUCTION:**

The reconstruction of large bone defects caused by trauma, infection or tumor resection remains a significant challenge in musculoskeletal surgery. While smaller defects (<3 cm) can be managed with autografts or cancellous bone grafting, larger defects require complex techniques such as distraction osteogenesis or the induced membrane technique (IMT). The IMT, though effective, has limitations, including graft sedimentation and prolonged healing times. This study introduces the Pearl-String Technique (PST), a new modification of the IMT, emphasizing high primary stability through internal fixation and press-fit osteoconductive scaffolds.

### **METHODS:**

The PST combines thermosinfected decorticated femoral heads (TDFHs) with reamer-irrigator-aspirator (RIA)-harvested autologous cancellous bone. The TDFHs are sculpted into cylinders, coated with RIA bone, and press-fit into the defect, stabilized via intramedullary nailing or locking plates. A retrospective analysis was conducted on 41 patients with segmental defects (mean length: 9.7 cm, range: 5–22 cm). Postoperative protocols included early partial weight-bearing (20 kg) and progressive loading over 12 weeks.

### **RESULTS:**

Primary consolidation was achieved in 92.7% of cases, with three failures (7.3%) due to persistent infection requiring revision. Defect size did not significantly impact consolidation or time to full weight-bearing. Mechanical stability was maintained in all cases, enabling early mobilization. Radiographic follow-up confirmed graft integration without sedimentation.

### **DISCUSSION AND CONCLUSION:**

The PST addresses key limitations of traditional IMT by ensuring absolute stability and preventing graft displacement when applying the principles of the diamond concept. The use of TDFHs represents a cost-effective, viable alternative to other allografts/xenografts with superior osteoconductivity. Due to the high primary stability of the construct, early-weight bearing was possible. Complications were infection-related, which emphasizes the importance of thorough debridement and antibiotic therapy.

The PST is a promising alternative for large bone defect reconstruction, offering high consolidation rates, early functional recovery, and reduced complication risks. Prospective comparative studies are underway to validate its efficacy against conventional IMT.