**Circumferential Bone Graft Around an Absorbable Gelatin Sponge Core Reduced the Amount of Grafted Bone in the Induced-Membrane Technique for Critical-Size Defects of Long Bones**

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**Purpose:** The aims of the study were to introduce a circumferential bone graft around an absorbable gelatin sponge core using induced-membrane technique, to assess its ability to reduce the required amount of graft, and to maintain the bone graft.

**Methods:** This was a retrospective review of prospectively collected data at a urban university medical center. The central core of defect was filled with absorbable gelatin sponge. The gel foam core was surrounded with the harvested autogenous bone like a shell. The serial 3-dimensional (3D) model was configured by virtual 3D software to verify if the circumferential bone graft could be maintained properly. The volumetric measurements of defect size, proportion of gelatin sponge, and amount of grafted bone was done. The resorption of grafted bone were calculated comparing each serial CT scan and 3D model to verify if the circumferential bone graft could be incorporated well.

**Results:** The critical-size defect was located at the metadiaphyseal area of 11 tibias, 8 femurs, and 2 humeri. The average defect size was 8.9 cm in length and 65.2 $cm^3$ in volume. The absorbable gelatin sponge core replaced 21.4% (average) of the defect volume. There was no significant deterioration in the shape of grafted bone between serial 3D models. 18 patients (86%) were healed radiographically at 9.1 months.

**Conclusion:** Our study suggests that circumferential bone grafting in association with induced-membrane technique could reduce the required amount of bone graft and adequately maintain graft position and shape, with favorable clinical results.