Particulate Bone Allograft Incorporation in Regeneration of Osseous Defects; Importance of Particle Sizes

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Abstract: Packing of bone defect with particulate allografts is a commonly performed clinical procedure. However, the ideal size of bone particles used to fill bone defects is ill-defined. For this reason the study of biology of bone allografts with different particle sizes has been performed. Standard size bone defects in the femur and the tibia of experimental animals were filled with freeze-dried cortical bone allografts with particle sizes of 1-2mm, 800-500μm, 500-300μm, 300-90μm, 250-125μm, 125-106μm, 106 to 75μm and 75-25μm. Unfilled defects and those filled with autologous bone served as controls. Cortical bone was chosen because it produced better clinical results than did cancellous bone. Likewise freeze-dried particulate bone effected more rapid healing than did frozen bone. Numerical scores were assigned to each defect based on the gross, radiographic and histomorphometric studies. Particles in the range of 300 to 90 microns produced rapid healing by direct ossification. Particles below 100μm had a significantly reduced osteogenic potential. Particles in the range of 75-25μm failed to heal the defects all together. Healing of defects packed with particles larger than 300μm was slower than with 300 – 90 μm grafts. Rapid healing of bone defects packed with particulate bone allografts in the range of 300 to 90μm indicates such allografts can be used effectively in the filling of bone defects. This is of clinical relevance. The Open Orthopaedics Journal, 2007, 1, 19-24