Skeletal Stem Cell in Iliac Crest Bone Graft and Clinical Implications in Fracture Nonunion Repair

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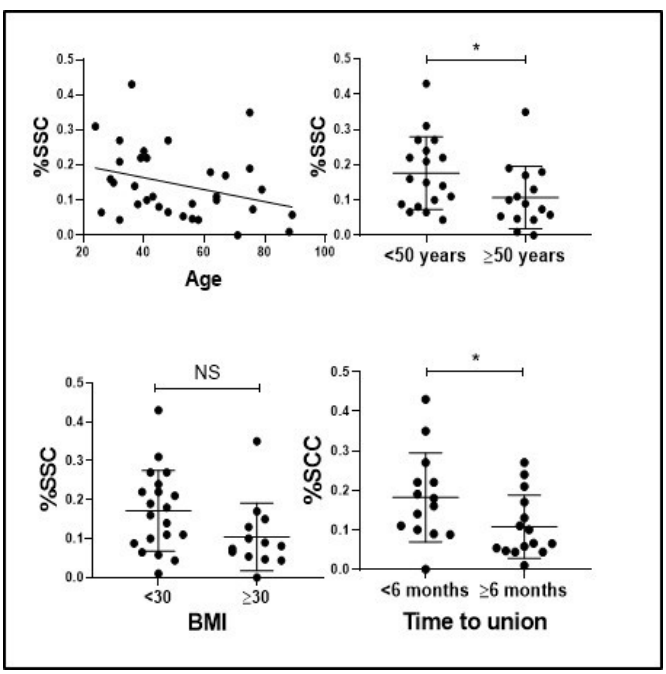
Purpose: Autogenous bone graft contains skeletal stem cells (SSCs) and is an essential tool in the treatment of fracture nonunions. The purpose of this study was to determine if SSC composition in iliac crest bone graft is related to patient characteristics and to determine its clinical significance in the healing of fracture nonunions.

Methods: Human skeletal stem cell analysis: Bone marrow was aspirated from iliac crest from subjects undergoing repair of fracture nonunions from the same site as autogenous graft harvest. Bone marrow samples were prepared for flow cytometric analysis by staining for CD45 and CD271 antibodies to quantify CD45- CD271+ cells. These markers have been used in previous studies for the identification of skeletal stem cells.
Radiographic analysis: Subjects who underwent operative repair of nonunions were prospectively followed with serial radiographs to monitor fracture healing. Radiographs were read by 2 independent observers, and time to union was determined by presence of bridging callus formation. Data are expressed as means ± SEM (standard error of the mean) and analyzed by unpaired, 2-tailed Student t-test.

Results: 33 subjects (15 females, 18 males) were enrolled into the study. Subjects younger than 50 years of age had a significantly higher percentage of SSCs compared to those older than 50 year (P = 0.0497). Obese patients with a body mass index (BMI) >30 had a lower percentage of SSsC than those with BMI under 30, although this difference did not reach significance (P = 0.0633). Of the 33 subjects, 29 (16 male, 13 female) were able to be assessed for radiographic union. Patients who healed in under 6 months had a greater percentage of SSCs in their bone marrow than those who those who took 6 months or longer to heal (P = 0.0495).



Conclusion: Our data demonstrate that there is a higher concentration of SSCs in iliac crest bone graft in younger patients than in older ones. Furthermore, stem cell frequency in bone graft may be a predictor for time to union following nonunion repair using autogenous bone graft.

See the meeting app for complete listing of authors' disclosure information.