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Bioactive Glass as a Bone Substitute for Spinal Fusion in Adolescent Idiopathic Scoliosis: A Comparative Study With Iliac Crest Autograft

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Abstract

Background: Iliac crest autograft is currently the gold standard material for spinal fusion. However, its use is limited by additional operative time, increased blood loss, and morbidity. Recently, a synthetic osteoconductive bone graft material composed of bioactive glass has been described, with high effectiveness in animal models. Its ability to achieve spinal fusion in human has never been reported. The aim of this study was to compare bioactive glass and iliac crest autograft as bone substitutes in the treatment thoracic adolescent idiopathic scoliosis (AIS).

Methods: Eighty-eight consecutive patients underwent posterior spinal fusion for progressive thoracic AIS. There were 2 study groups based on the type of bone graft used: iliac crest autograft (n = 40) or bioglass (n = 48). A minimum 2-year follow-up was required. Medical data and radiographs were retrospectively analyzed and compared using unpaired *t* test and Mann-Whitney *U* test.

Results: Mean follow-up was 40 months in the autograft group and 38 months in the bioglass group. In the autograft group, there were 2 infections (5%) and 3 mechanical failures (7.5%). One infection (2%) and 1 early mechanical failure (2%) occurred in the bioglass group. Loss of correction of the main thoracic curve between immediate postoperative and latest follow-up averaged 15.5% for autograft group and 11% for the bioglass group ($P = 0.025$).The mean (±SD) gain of frontal balance between immediate postoperative latest follow-up was 0.8 (±9.3) mm in the autograft group and 8.1 (±12) mm for the bioglass group ($P = 0.005$).

Conclusions: Results of this retrospective study suggest that bioglass is as effective as iliac crest graft to achieve fusion and maintain correction in AIS. Less complications were seen in the bioactive glass group, but the difference did not reach statistical significance. Bioactive glass can be proposed in the treatment of AIS, avoiding the morbidity of iliac crest harvesting. However, clinical and radiological outcomes need to be confirmed at long-term follow-up.

Level of Evidence: Level III