

Structured Abstract

Background

Demineralized bone matrix (DBM) is widely used in anterior cervical discectomy and fusion (ACDF). However, biologic performance may vary due to donor heterogeneity. Bioactive glass (BAG) has been proposed as an adjunct to enhance graft handling and osteogenic activity. This prospective comparative study evaluated clinical and radiographic outcomes of BAG-augmented graft versus matrix alone in patients undergoing two-level standalone procedures.

Methods

Ninety-one consecutive patients undergoing primary two-level standalone procedures with PEEK interbody cages were prospectively enrolled and followed for a minimum of 24 months. The augmented graft (BAG+DBM; NanoFuse) was used in Group 1 (n=46), and graft alone was used in Group 2 (n=45). Outcome measures included the Visual Analog Scale (VAS) for neck pain, the Neck Disability Index (NDI) for disability, and radiographic fusion assessed by dynamic radiographs and computed tomography at 6, 12, and 24 months. Between-group comparisons were performed using standard statistical methods with a significance threshold of $p < 0.05$.

Results

At 12 months, mean VAS improved from 7.29 to 2.50 with this approach compared with 7.77 to 4.81 with graft alone, indicating significantly greater pain reduction ($p < 0.0001$). NDI decreased from 54.5% to 18.2% with this approach versus 51.1% to 26.9% with graft alone. Radiographic fusion at 12 months was observed in 91% of patients treated with this strategy compared with 72% with graft alone ($p = 0.028$). By 24 months, fusion was achieved in all patients in both cohorts. No increase in complications was observed with the addition of bioactive glass.

Conclusion

The addition of bioactive glass in two-level standalone procedures was associated with higher early fusion rates and greater short-term improvement in pain and function compared with graft alone, without added complications. These findings support further evaluation in randomized controlled trials.

Keywords: cervical fusion; bioactive glass; demineralized bone matrix; anterior cervical discectomy and fusion; biologics; prospective cohort; NanoFuse

Level of Evidence: 2