Use of Recombinant Human Bone Morphogenetic Protein-2 at the C1-2 Lateral Articulation in Posterior Atlantoaxial Fusion in Adult Patients with or Without Conventional Structural Bone Graft

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Introduction

Posterior atlantoaxial fusion is an important armamentarium for neurosurgeons to treat several pathologies involving the craniovertebral junction as well as the upper cervical region. Although the potential advantages of rhBMP-2 over autograft and/or allograft alone are well-documented in the lumbar spine, its indication in posterior atlantoaxial fusion has not been well-characterized. In our institution, for selected adult cases of posterior atlantoaxial fusion, we apply rhBMP-2 to the C1-2 joint, either (A) alone or with hydroxyapatite and/or locally harvested autograft chips, or (B) with conventional structural autogenic/allogenic bone graft (SAABG). Here, we will compare clinical outcomes of the two groups with special attention to their fusion rates to elucidate feasibility of the techniques.

Methods

Single-center, retrospective data review from 2008 to 2014 identified 58 patients who underwent posterior atlantoaxial fusion with rhBMP-2: (A) 34 patients without SAABG and (B) 24 patients with SAABG. Clinical records of these 58 patients were collected and statistically analyzed. P values <.05 were regarded as statistically significant.

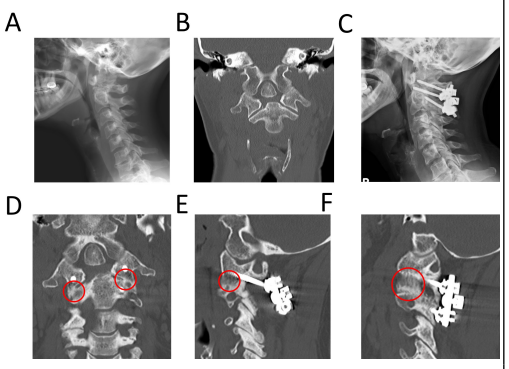
Results

Baseline characteristics such as age, sex, BMI, and smoking status, no statistically significant differences were identified. The overall fusion rate was 94.8% (55/58), which was comparable to other conventional techniques documented in the literature. The (A) group had significantly shorter operative time (p=0.03) and less estimated blood loss than the (B) group (p=0.003). Long-term complication rates were similar between the two groups: one-year C1-2 instability/pseudoarthrosis rate, (A)5.8% versus (B)4.2%, p=1; one-year instrumentation failure rate, (A)8.8% versus (B)12.5%, p=0.68; one-year revision surgery rate, (A)8.8% versus (B)16.7%. p=0.43.

Conclusions

Albeit retrospective, single-center nature of the study, it was demonstrated that the use of rhBMP-2 at the C1-2 joint without conventional SAABG was a safe, reasonable alternative with the long-term outcomes comparable to rhBMP-2 with SAABG or historical controls in the literature.

Representative images

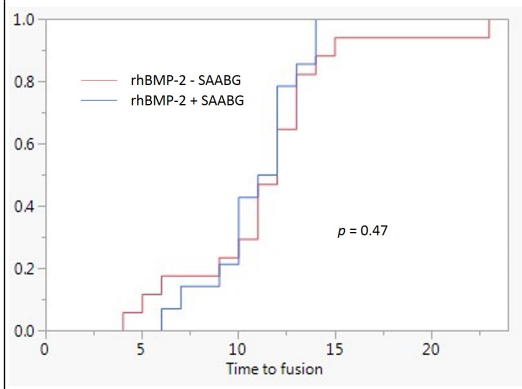


A 52-year-old female with osteoporosis presented with hand clumsiness. Preoperative lateral X-ray (A) and reconstructed CT scans (B) at the time revealed instability at the C1-2 joint caused by os odontoideum. She underwent posterior instrumented arthrodesis from C1-C2 with bilateral C1 lateral mass screws, C2 right translaminar screw, and C2 left pedicle screw alongside rhBMP-2 at the C1-2 lateral articulation. One year postoperatively, lateral X-ray (C) and reconstructed CT images (D, E, and F) demonstrated the instrumentations in adequate positions and the solid bony fusion at the C1-2 joint.

Learning Objectives

By the conclusion of this session, participants should be able to:
1) Describe the importance of ...,
2) Discuss, in small groups

Time-to-fusion analysis using Kaplan-Meier curves.



Time-to-fusion analysis using Kaplan-Meier curves. No statistically significant difference was identified between the rhBMP-2 without SAABG group and the rhBMP-2 with SAABG (p = 0.47).