



Recombinant Human Bone Morphogenetic Protein-2 (rhBMP-2) as an Alternative to Autologous Bone Graft in Pediatric Craniofacial Reconstruction: A Systematic Review

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BACKGROUND & AIMS

Pediatric craniofacial reconstruction is often accomplished through autologous bone grafts from sites such as the iliac crest. The off-label use of recombinant human bone morphogenetic protein (rhBMP-2) infused allografts as an alternative may spare patients from increased OR time and donor-site morbidity. This review assesses whether rhBMP-2 can serve as an appropriate alternative.

METHODS

Literature search was conducted via Pubmed/Medline, Ovid, and Web of Science for publications between January 2008 and May 2023. Included were RCTs, prospective or retrospective case series, and case reports on pediatric craniofacial reconstruction with rhBMP-2 grafting. Reviews, animal studies, and basic science studies were excluded.

Overall, 211 articles were screened, 21 of which met inclusion criteria. rhBMP-2 grafting was utilized for alveolar cleft repair in 18 studies, calvarial defect repair in 2 studies, and mandibular continuity defect repair in 1 study. In alveolar cleft repair studies, iliac crest bone graft (ICBG) patients were included as controls. rhBMP-2 and ICBG were compared based on osteogenesis, complications, OR time, hospitalization time, and cost.

CONCLUSIONS

With regards to osteogenic efficacy, complications, hospital resource burden, and costs, rhBMP-2 grafting appears to be a comparable, if not favorable, alternative to ICBG in pediatric alveolar cleft repair. However, long-term follow-up data remains lacking to definitively recommend rhBMP-2 infused allografts. Also, its use in other pediatric craniofacial reconstruction procedures, such as calvarial or mandibular defect repair, warrants further study.

RESULTS

FIGURE 1: Osteogenic Efficacy (n=12)

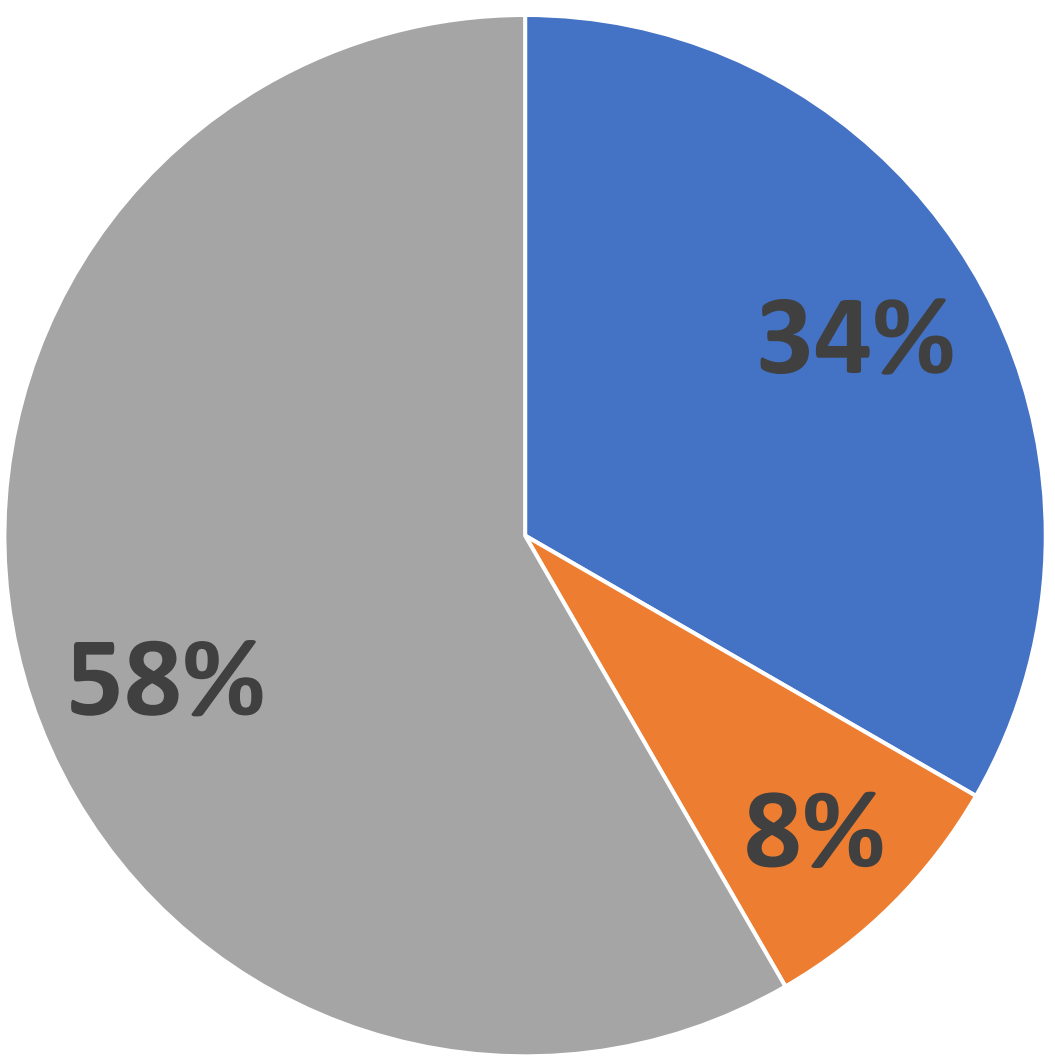
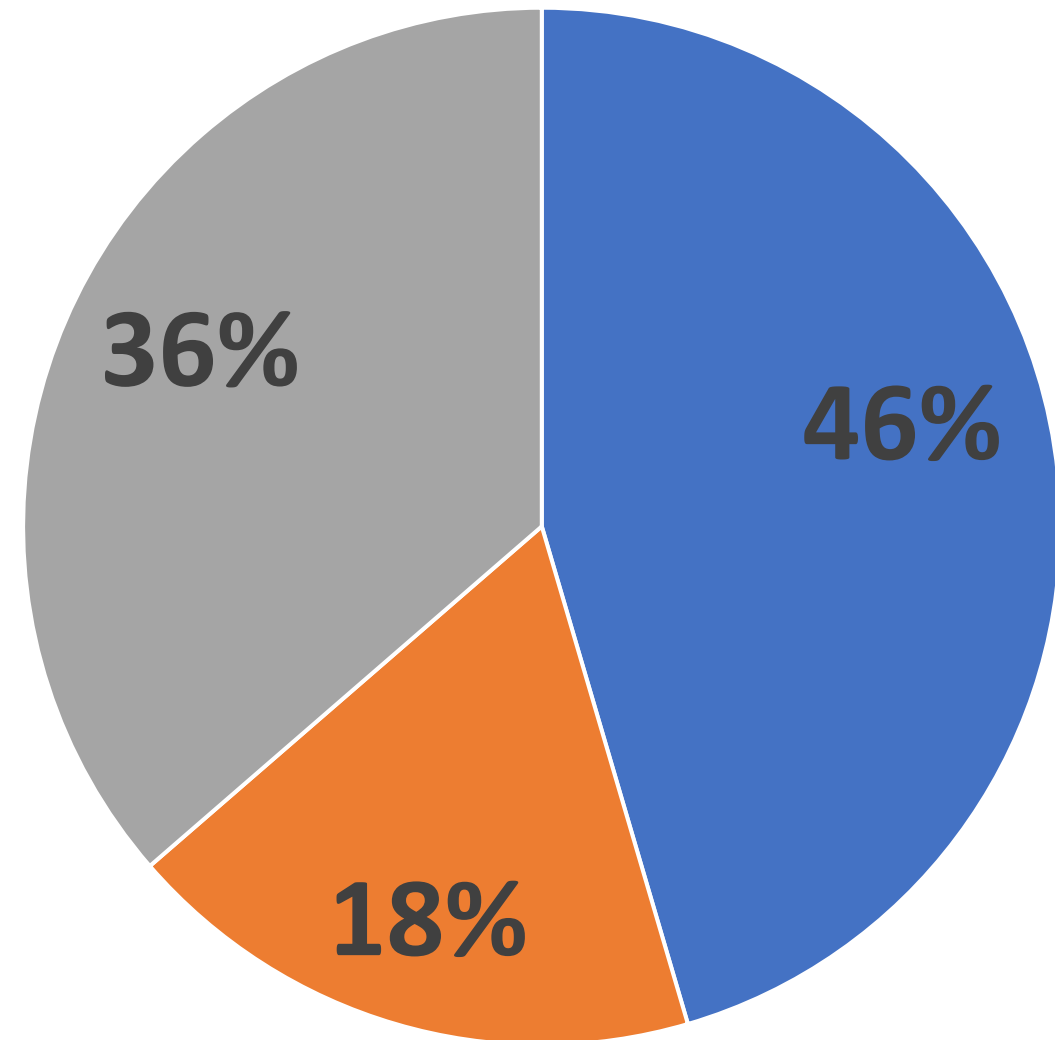


FIGURE 2: Complication Rate (n=11)



■ rhBMP-2 favored ■ ICBG favored ■ No significant difference

- Figure 1: Among 12 studies comparing osteogenesis, 4 favored rhBMP-2, 1 favored ICBG, and 7 showed no difference.
- Figure 2: Among 11 studies evaluating complication rates, 2 observed more adverse effects with rhBMP-2, 5 observed more adverse effects with ICBG, and 4 showed no difference.

FIGURE 3: rhBMP-2 Adverse Effects (n=62)

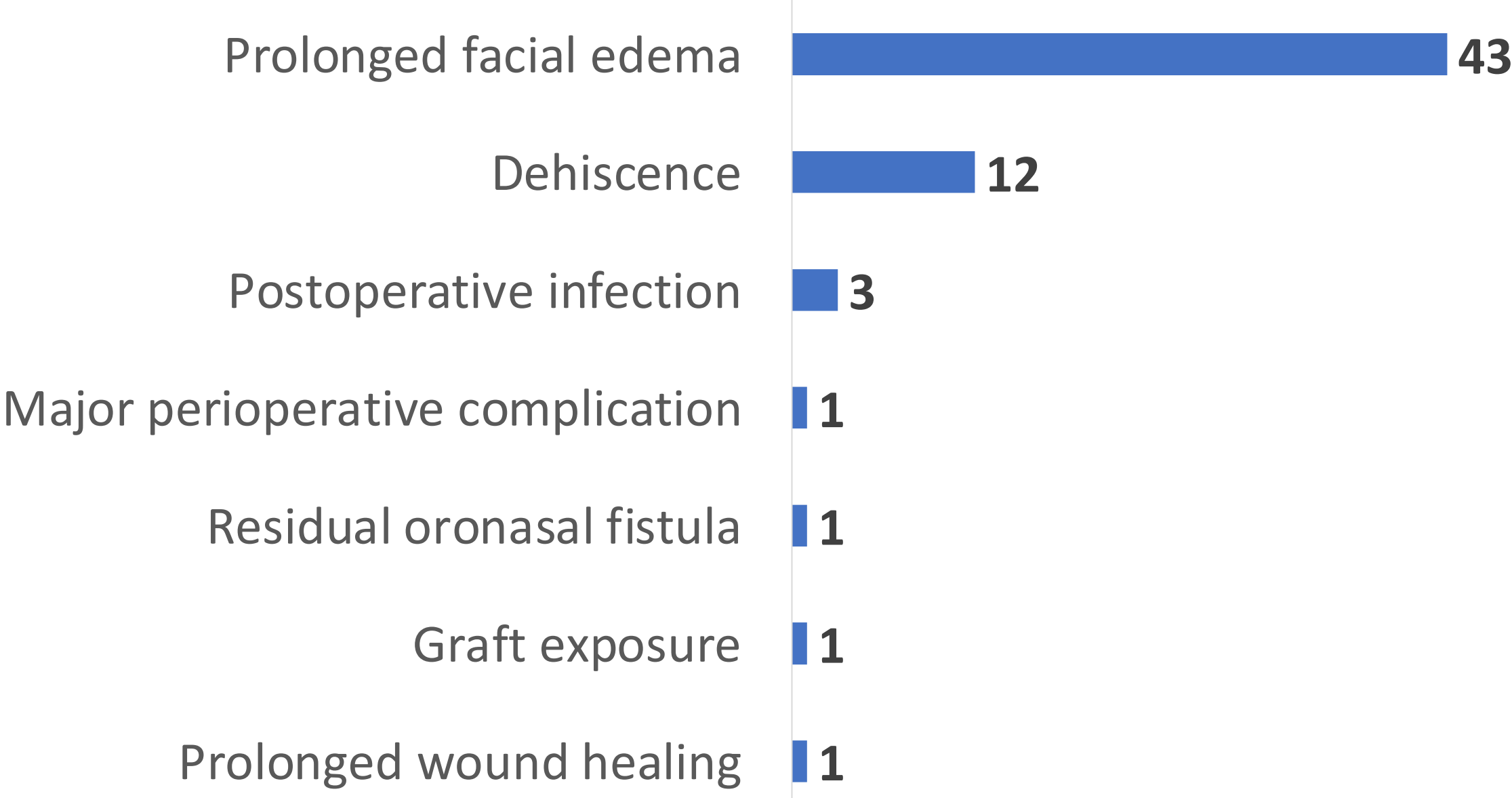
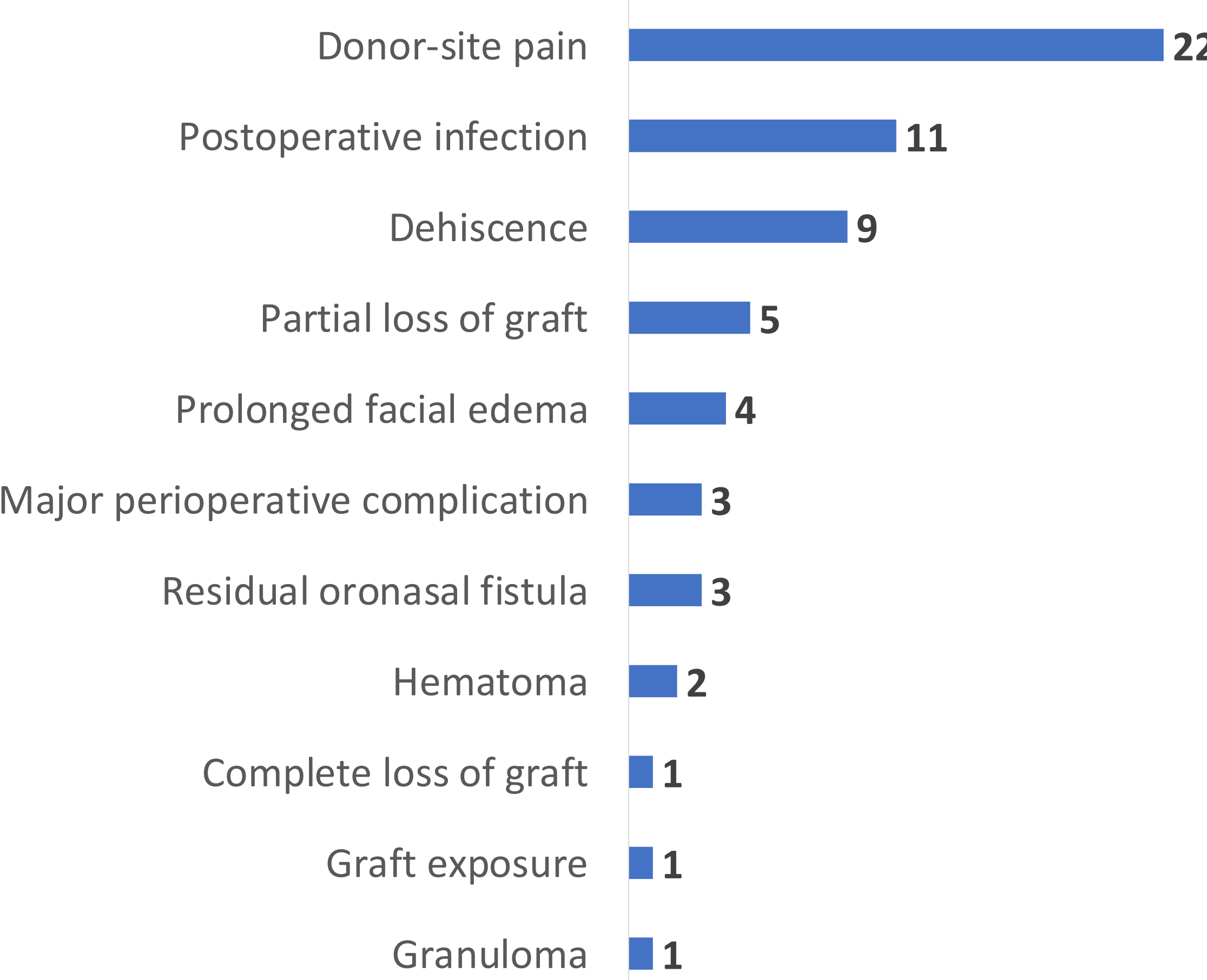


FIGURE 4: ICBG Adverse Effects (n=62)



- Figures 3 & 4: The most common complications with rhBMP-2 were prolonged facial edema and dehiscence, and the most common complications with ICBG were donor-site pain, postoperative infection, and dehiscence.

FIGURE 5: Operative Time (n=5)

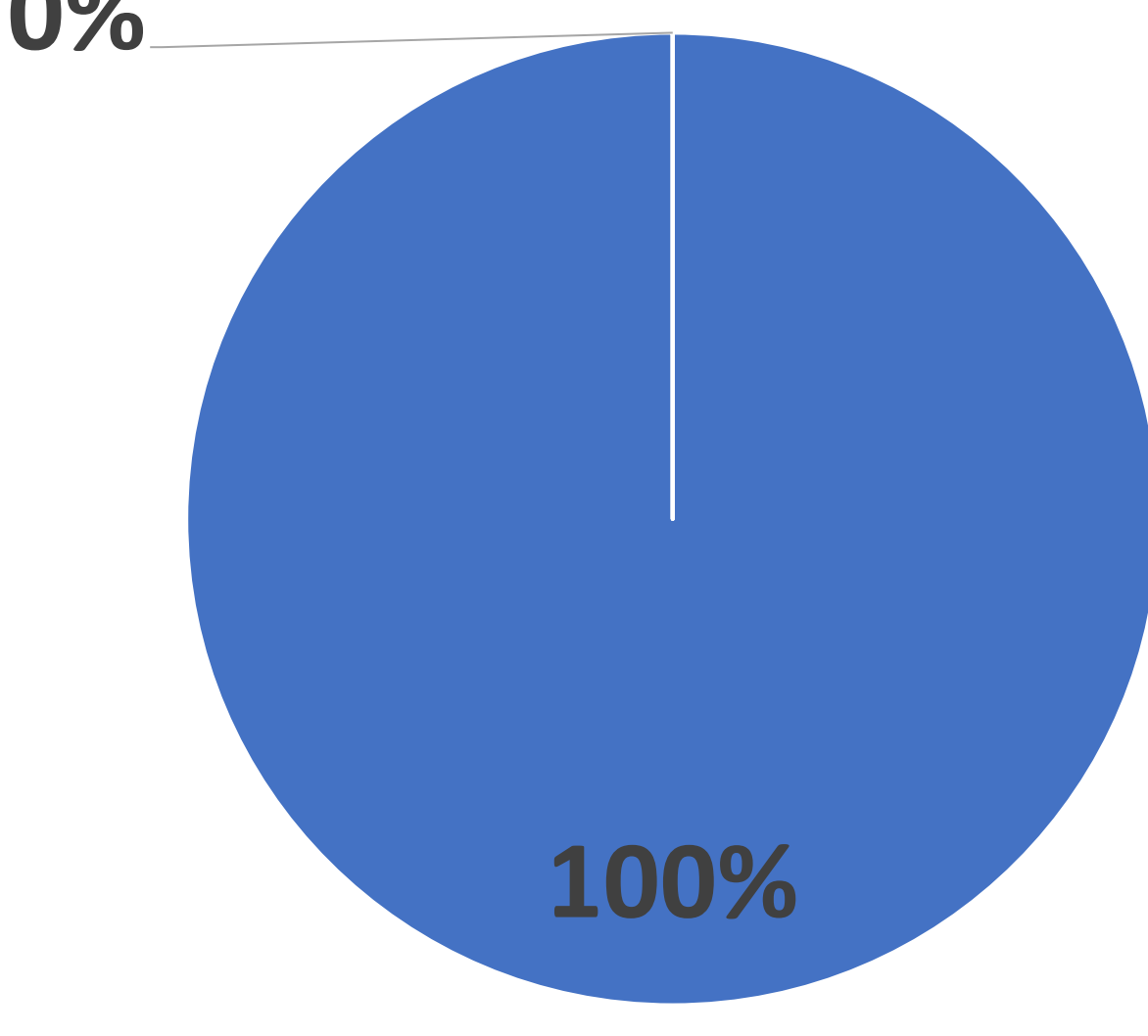


FIGURE 6: Hospitalization Time (n=8)

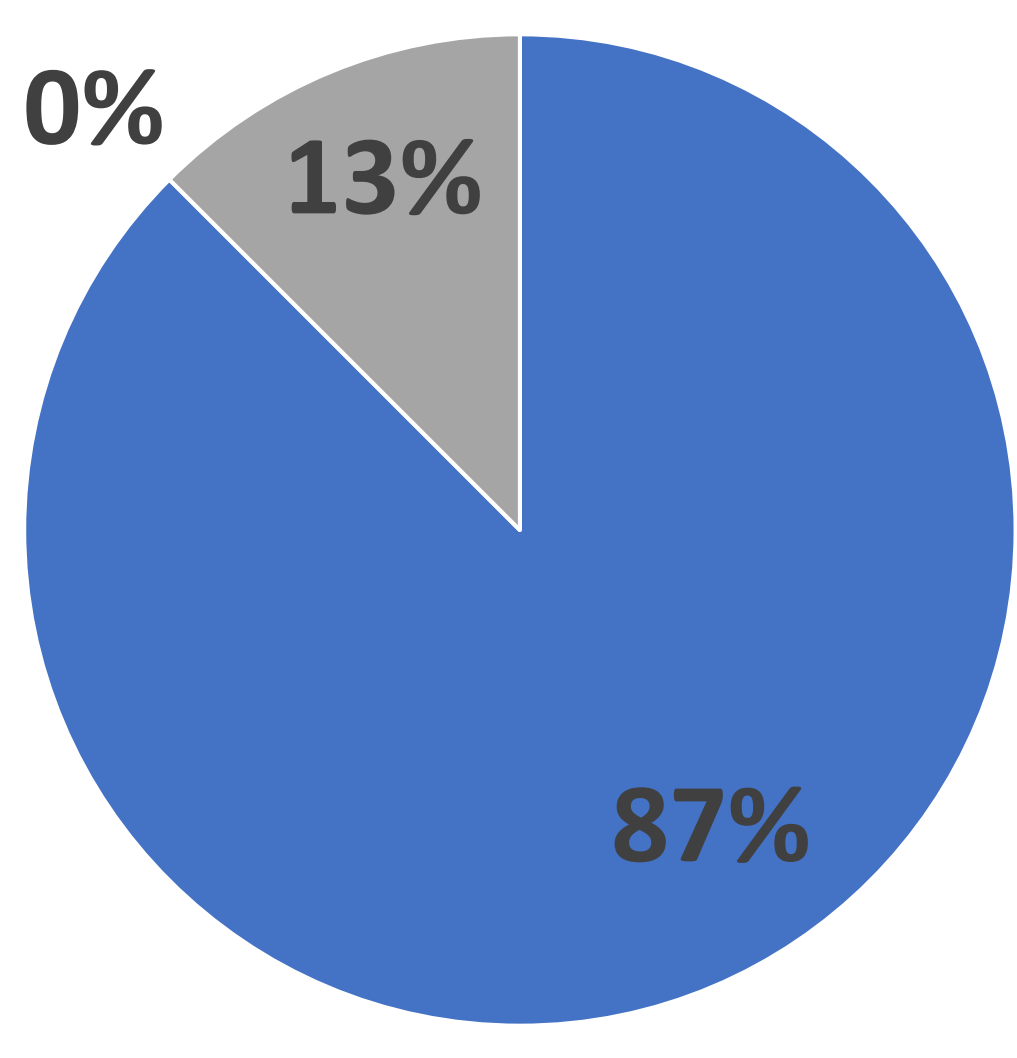
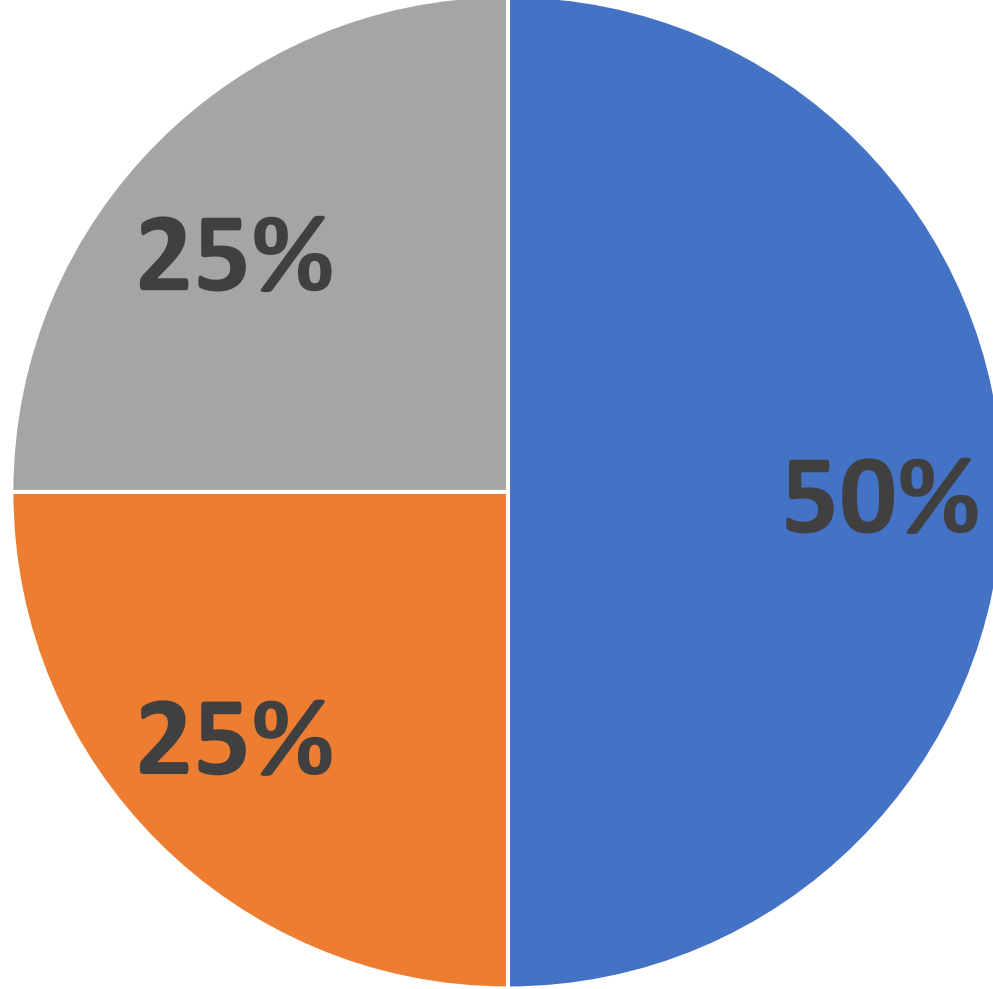


FIGURE 7: Cost Burden (n=4)



■ rhBMP-2 favored
■ ICBG favored
■ No significant difference

- Figure 5: 5 studies compared OR time, and all 5 revealed significantly shorter OR time in the rhBMP-2 group.
- Figure 6: Among 8 studies that compared hospitalization time, 7 reported significantly shorter length of stay in the rhBMP-2 group, and 1 showed no significant difference.
- Figure 7: Among 4 studies that compared cost burden, rhBMP-2 was more costly in 1 study, ICBG had increased cost in 2 studies, and there was no cost difference in 1 study.