Assessment of the potential of growth factors for localized alveolar ridge augmentation: a systematic review

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CRD summary
The review examined the role of growth factors in localised alveolar ridge augmentation and concluded that data support the potential of bone morphogenetic protein 2 in promotion of extraction socket repair, maxillary sinus floor augmentation and lateral ridge augmentation. Several limitations of the review methodology and reporting mean that the authors' conclusions should be interpreted with caution.

Authors' objectives
To determine whether localised alveolar ridge augmentation is affected by the following growth factors: bone morphogenetic proteins (BMP-2, BMP-7); growth/differentiation factor-5 (GDF-5); and platelet-derived growth factor (PDGF) or parathyroid hormone (PTH).

Searching
MEDLINE was searched from 1966 to September 2007. Keywords used were listed in the review. Handsearches of reference lists of all selected articles and reviews published between January 2005 and September 2007 were performed. Only studies in English or German were eligible for inclusion.

Study selection
Prospective controlled cohort studies of at least 10 patients treated with one of five growth factors with a minimum of three months follow-up were eligible for inclusion. Randomised controlled trials (RCTs) and cohort studies were included in the review. Only studies with a primary outcome of localised alveolar ridge augmentation diagnosed clinically, radiographically or histologically were eligible. All of the included studies were of BMP-2. The review included data from animal studies, which were outwith the scope of this abstract.

Mean age of patients in the included studies was 51.92 years (range 47.4 to 55). Patients were treated for extraction socket augmentation, sinus floor augmentation, ridge preservation or lateral ridge augmentation. Dose of BMP-2 ranged from ranged from 0.5mg/mL to 1.75mg/mL or 0.12mg/patient to 3.4mg/patient applied using a carrier of absorbable collagen sponge or demineralised bovine bone mineral (DBBM). Control groups received absorbable collagen sponge, a bone graft or nothing. The outcomes assessed were bone height, ridge height, ridge width, defect depth, new bone volume, new bone density, newly formed bone, % mineralised bone and DBBM contact with bone.

Two reviewers selected the studies for inclusion in the review. Discrepancies were resolved by consensus.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Two reviewers independently extracted data using standardised tables. Disagreements were resolved by discussion.

Methods of synthesis
Studies were combined in a narrative synthesis. The authors stated that they did not use meta-analysis to combine the studies because of clinical heterogeneity of the studies.

Results of the review
Six studies (183 participants) were included in the review: four RCTs and two prospective cohort studies. Five studies had a follow-up of four months and one had a follow-up of six months.

Bone height increase/defect size decrease (five studies): There was substantial variation in the effect of BMP-2 on bone
regeneration. Bone height change varied from -2.1mm to 2.4mm. Two RCTs and one cohort study found a greater effect at higher compared to lower doses of BMP-2. In one other study with statistically significant results, there was a greater increase in ridge width in the control compared to the intervention group.

New bone formation (three studies): One study found a positive dose-response effect, one found no effect and one found an inverse effect of BMP-2 on new bone formation.

Authors' conclusions
Human data supported the potential of rhBMP-2 (with increasing dose levels) in promotion of extraction socket repair, maxillary sinus floor augmentation and lateral ridge augmentation.

CRD commentary
The review question was clearly stated and inclusion criteria were adequately defined. The search strategy was clearly stated. As only one database was searched, it was possible that relevant studies were missed. Use of two reviewers to perform study selection and data extraction reduced the risk of errors. The authors did not appear to make an effort to identify unpublished data. The authors did not appear to assess the results for publication bias. The language restriction was likely to have introduced language bias. Without a validity assessment of the included studies it was difficult to assess the reliability of the evidence. Use of a narrative synthesis was appropriate. The results presented were widely disparate, and the authors' conclusions did not reflect this. Several limitations of the review methodology and reporting mean that the authors' conclusions should be interpreted with caution.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.
Research: The authors stated that additional research was needed to assess the potential of growth factors for local alveolar ridge augmentation.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.