Long-term skeletal changes with rapid maxillary expansion: a systematic review
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CRD summary
This review assessed the effects of rapid maxillary expansion on long-term transverse, anteroposterior and vertical skeletal changes. The authors concluded that evidence was limited and further research is required. The review was limited by poor reporting of the review methods and study details but, overall, conclusions about the limitations of the evidence and need for further research seem appropriate.

Authors' objectives
To evaluate the effects of rapid maxillary expansion (RME) on long-term transverse, anteroposterior and vertical skeletal changes.

Searching
MEDLINE, PubMed, LILACS, EMBASE, Web of Science and EBM Reviews (Cochrane Database of Systematic Reviews, ACP Journal Club, DARE and the Cochrane Controlled Trials Register) were searched from inception until September 2004; MEDLINE In-Process and Other Non-Indexed Citations was also searched (week 1 to week 2, September 2004). The search terms were reported. The reference lists of selected studies were also screened. Where required, authors were contacted for missing information.

Study selection
Study designs of evaluations included in the review
Studies with a control group were eligible for inclusion if they followed up patients for at least 1 year post-active treatment. All of the included studies followed up participants for more than 5 years following the end of full active treatment.

Specific interventions included in the review
Studies of RME were eligible for inclusion if they did not use surgical or other simultaneous treatments that could influence the outcomes. The included studies compared RME with control treatments and, in one study, full fixed appliances (no further details were reported).

Participants included in the review
Inclusion criteria were not specified in terms of the participants. Where stated, the mean age of the participants in the included studies ranged from 11.8 to 13.6 years (the age range in one study was 11 to 17.4 years). Overall, 53% of the participants were female.

Outcomes assessed in the review
Studies that measured long-term (at least 1 year) transverse, anteroposterior and vertical skeletal changes using facial radiographs (anteroposterior and lateral cephalograms) were eligible for inclusion. Studies that did not report the measurement error or specify the retention period or type, or in which the appliance was modified significantly compared with the traditional RME design, appear to have been excluded.

How were decisions on the relevance of primary studies made?
Two researchers screened abstracts and titles, while three researchers independently screened full papers for inclusion. Any disagreements were resolved through discussion.

Assessment of study quality
The studies were assessed on the basis of study design, study measurements and statistical analysis. Methodological criteria relating to study design included objective, description of sample, selection criteria, sample size, baseline...
comparability of the treatment groups, prospective design and randomisation. Criteria relating to study measurements covered measurement methods, blinding of the examiner and statistician, and reliability of the measures. Criteria relating to statistical analysis covered drop-outs, statistical analysis, treatment of confounders, and the reporting of the level of statistical significance and confidence intervals. The authors did not state how the validity assessment was performed.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
The studies were grouped by outcome and combined in a narrative.

How were differences between studies investigated?
Differences between the studies with respect to validity were recorded in a table.

Results of the review
Three non-randomised controlled trials (n=161) were included.

The three included studies scored positive on 9.5, 9.5 and 12 of the 20 possible validity items.

Transverse skeletal changes (one study, n=51): lateronasal width increased significantly (+1.5 mm) in the early-treated (before pubertal peak growth) and late-treated groups. Maxillary width increased significantly (3 mm) in patients receiving early treatment but not in patients receiving late treatment (0.9 mm).

Anteroposterior skeletal changes (two studies, n=99): neither study reported any significant changes in the anteroposterior position of the maxilla and mandible in the treatment group compared with the control group.

Vertical skeletal changes (two studies, n=99): one study reported a smaller mandibular plane angle reduction in patients treated with RME (-0.85 degrees) compared with full fixed appliance (-2.52 degrees) or control (-2.21 degrees). The other study reported a significant difference between RME and control in the SN-PP and SN-Gn angles. There was no significant change in the vertical measurement between the end of active treatment and follow-up (based on one study). The review authors stated that the reported changes were of little, if any, clinical significance.

Authors’ conclusions
There is greater long-term stability in the transverse skeletal maxillary increase when RME treatment is given before the pubertal growth spurt peak than when given after. There were no significant anteroposterior or vertical changes in the position of the maxilla or the mandible with RME. However, evidence was limited and further research is required.

CRD commentary
The review addressed a clear question that was defined in terms of the intervention, outcomes and study design; inclusion criteria were not defined in terms of the participants. Several relevant sources were searched but, since it was unclear whether any language restrictions had been applied, the potential for language bias could not be assessed. Methods were used to minimise reviewer errors and bias at the study selection stage, but it was not clear whether similar steps were adopted for the data extraction and validity assessment. Study validity was assessed using defined criteria and the results were reported. Few other details of the included studies were given: participant characteristics, interventions and control treatments, outcomes assessed and results were not reported clearly, which made it difficult to assess differences between the studies. The review was limited by inadequate reporting of the review methods and study details but, overall, conclusions about the limitations of the evidence and need for further research seem appropriate.
Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that long-term randomised controlled trials are required to assess the effects of RME on skeletal changes.

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Record Status
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.