Long-term dental arch changes after rapid maxillary expansion treatment: a systematic review

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CRD summary
The review evaluated long-term dental arch changes after rapid maxillary expansion orthodontal treatment in patients with constricted arches. While the authors' conclusions may follow from the results presented, small data sets and uncertain methodological quality limit strong conclusions.

Authors' objectives
To evaluate long-term dental arch changes after rapid maxillary expansion (RME) orthodontal treatment in patients with constricted arches.

Searching
MEDLINE, the Cochrane Database of Systematic Reviews, DARE, the Cochrane Controlled Trials Register, ACP Journal Club, Web of Science and LILACS (from inception to March 2004) and EMBASE (inception to April 2004) were searched; the search terms were reported. References of relevant papers were also checked.

Study selection
Study designs of evaluations included in the review
Controlled clinical trials were eligible for inclusion.

Specific interventions included in the review
Studies of RME were eligible for inclusion. The RME treatments included in the studies were Haas-type appliances used as a retainer or followed by a fixed edgewise treatment. Studies in which surgical treatment was performed that might affect RME during the evaluation period were excluded.

Participants included in the review
Orthodontic patients with constricted dental arches were eligible for inclusion. Patients undergoing surgical or other simultaneous treatment during the active expansion phase were excluded.

Outcomes assessed in the review
Dental changes, including dental casts and changes through radiographs, were included in the review. Dental arch measurements were required to be made from cephalometric radiographs or dental casts. The casts included were model casts, posteroanterior cephalometrics and lateral cephalometrics.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected papers for inclusion in the review; any disagreements were resolved by consensus with a third reviewer.

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

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

The authors of the primary studies were contacted where additional information was required.
Methods of synthesis
How were the studies combined?
The studies were combined in a narrative, grouped by evaluation appliance.

How were differences between studies investigated?
Differences were considered in terms of participant age (adult versus adolescent) and view (frontal versus lateral).

Results of the review
Four studies (n=412) were included.

Dental casts.
Long-term follow-up (minimum 1 year) (21 adults) found a net gain of 4.8 mm in maxillary molar transarch width and a net gain of 0.7 mm in mandibular molar transarch width when treated with RME, compared with the control group, in one study. A net increase in transarch width was also found for the maxillary first premolar (4.7 mm), the maxillary canine (2.3 mm) and the mandibular canine (0.8 mm). All measurements were taken at the lingual cervical margin.

Significantly less indirect mandibular molar and cuspid expansion was found in young adults compared with adolescents.

No significant difference was found for maximillary molar and cuspid expansion when adults were compared with adolescents.

Cephalometric radiographs.

Frontal view.
Long-term follow-up (minimum 5 years) in one study (n=42) found significantly greater maxillary intermolar width with RME (Haas appliance) in the early maturation group (Um-Um +2.7 mm) and the late maturation group (Um-Um +3.5 mm) compared with controls. Significantly greater mandibular first intermolar width with RME was found in the late maturation group (Um-Um +2.3 mm) compared with controls. No other statistically significant between-group differences were found for mandibular intermolar width change. No statistically significant between-group differences were found for maxillary insical angle.

Lateral view.
One study found no statistically significant anteroposterior dental changes with RME (Haas type expander followed by fixed edgewise treatment) compared with controls.

Authors' conclusions
Significant long-term maxillary molar width increase can be achieved. A significant overall gain was found in the maxillary and mandibular arch parameter in adolescents treated with RME and edgewise appliances. More transverse dental changes were found after puberty than pre-puberty, although the difference might not be clinically significant. RME did not have a significant effect on anteposterior or vertical dental changes.

CRD commentary
The review question was supported by clear inclusion criteria in terms of the population, outcome and study design. A number of electronic databases were searched for relevant papers, and it appears that the search was not restricted by language. Methods employed for the study selection process were likely to have minimised error or bias, although the authors did not state how the data were extracted or whether the validity of the primary papers was assessed. A narrative synthesis was presented, which was appropriate given differences in the four studies in terms of the intervention and evaluation methods. While the authors’ conclusions may follow from the results presented, small data
sets and uncertain methodological quality limit strong conclusions.

**Implications of the review for practice and research**

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

**Research:** The authors stated that future research should include a clear statement regarding the retention protocol after completion of use of edgewise appliances, as relapse of expansion may be influenced by length of retention.

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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.