Soft tissue changes following the extraction of premolars in nongrowing patients with bimaxillary protrusion: a systematic review

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CRD summary
This review aimed to quantify the amount of perioral tissue change following extraction of four premolars in patients with bimaxillary protrusion who had nearly completed active growth. The authors found small improvements in lip procumbency following extraction, but wide variation in outcome. The authors suggested caution in interpreting the results and conclusion, and this caution appears appropriate.

Authors' objectives
To quantify the amount of perioral tissue change following the extraction of four premolars in patients with bimaxillary protrusion who had nearly completed active growth.

Searching
The authors searched ISI World of Science, PubMed and HubMed without language restrictions from inception to March 2009. Keywords were specified. Reference lists of retrieved articles were manually searched. European Journal of Orthodontics, American Journal of Orthodontics and Dentofacial Orthopedics, British Journal of Orthodontics, International Journal of Adult Orthodontics and Orthognathic Surgery, Journal of Clinical Orthodontics, Clinical Orthodontics and Research were searched for relevant articles.

Study selection
Eligible studies were of patients aged at least 15 years and involved extraction of four premolars. Studies needed to report cephalometric measurements of upper lip retraction, lower lip retraction and nasolabial angle. Treatment had to have a duration of less than 36 months and not involve serial extractions.

Studies were excluded if patients had congenitally missing teeth (other than third molars) or crowding (tooth-size-arch-length discrepancies) or outcomes reported were long-term facial effects. Studies where the intervention combined orthodontic and surgical treatment or involved function appliances or headgear therapy were excluded. Case reports were excluded.

Mean age of participants appeared to range from 15 to 38 years. Ethnicity/nationality included Chinese, African American and ethnically diverse. Study populations ranged from all female to 42% male. Where reported, either the four first premolars or three first premolars plus one second premolars were extracted.

Two reviewers independently screened articles at both initial (title and abstract) and final (full paper) stages.

Assessment of study quality
The reviewers assessed included studies according to the criteria: defined objective of the study; whether the sample size was justified through power calculation; whether inclusion and exclusion criteria were clearly defined; description of the intervention; appropriateness of the control sample; and whether appropriate descriptive statistical analyses were presented. For each criterion, a score of between zero and 2 was assigned. These scores were summed to produce an overall study quality score and on the basis of this overall score studies were defined as being either of low, medium or high quality.

It was unclear how many reviewers were involved in this stage of the review.

Data extraction
More than one author extracted data on study characteristics, population characteristics, orthodontic techniques and author conclusions and recorded the ratio between upper lip retraction and upper incision retraction and between lower
lip retraction and low incision retraction.

**Methods of synthesis**
A narrative synthesis was performed.

**Results of the review**
Four studies (n=158 patients, range 28 to 50 patients) were included in the review: one case series and three retrospective studies. One study was assessed as having low methodological quality and three were medium methodological quality.

All articles showed that the upper and lower lips retracted and the nasolabial angle increased following premolar extraction. Upper lip retraction ranged from 2.0mm to 3.2mm (or from 2.4mm according to the text). Lower lip retraction ranged from 2.0mm to 4.5mm.

**Authors’ conclusions**
Lip procumbency improved following extraction of four premolars; however, the changes were small and did not dramatically modify the profile and individual variation in response was large.

**CRD commentary**
This review addressed a clear review question with relevant study selection criteria. A number of databases were searched without language restrictions supplemented by extensive handsearching of relevant journals, which reduced risks of publication and language bias. The study selection criteria were clearly stated, as was the study selection process. Only limited primary study characteristics were reported, which reduced review transparency. The validity assessment process was not described clearly and the possibility of error and bias at this stage could not be ruled out. An unconventional method of validity assessment was used. Few details were reported on which study satisfied which criteria, so the validity of this approach was unclear. The decision to use a narrative synthesis appeared appropriate.

The authors’ conclusions appeared to reflect the evidence available, but the evidence was very limited in terms of quality and quantity, and reflected only short-term effect. The authors suggested interpreting the findings with caution, and this should be borne in mind.

**Implications of the review for practice and research**
**Practice:** The authors stated that clinicians should think of factors such as interlabial gap, lip redundancy, quality of the lip musculature and outside growth changes in the body mass index as possibly masking, exaggerating or reducing labial changes.

**Research:** The authors stated that careful evaluation of patients with bimaxillary protrusion was needed to gain more information on the consequences of incisor retraction. Further studies were needed to evaluate and compare the effects of the above factors on intervention outcome.

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