The all-on-four treatment concept: a systematic review

Patzelt SB, Bahat O, Reynolds MA, Strub JR

CRD summary
This review assessed the effectiveness of dental implants placed according to the all-on-four treatment concept. The authors concluded that this approach seemed promising in the short-term, but the evidence was limited by trial quality and paucity of data on long-term clinical outcomes. The authors’ conclusions reflect the limitations of the evidence and seem appropriate.

Authors’ objectives
To assess the effectiveness and long-term success of oral dental implants placed according to the all-on-four treatment concept (using use four implants in the front part of a jaw without teeth to support a prosthesis).

Searching
MEDLINE and The Cochrane Library were searched through to August 2012 for publications in English or German. Search terms were reported. In addition, Google was searched and reference lists of relevant journals (not specified) and systematic reviews were handsearched.

Study selection
Eligible for inclusion were clinical trials that assessed the success rates of placing two anterior and two posterior tilted dental implants in humans either in the maxilla or mandible according to the all-on-four treatment concept. The primary outcome of interest was the failure rate of implants (loss of function or removal). Secondary outcomes were failure of fixed dental prosthesis applied on the implants, and marginal bone loss/bone level changes around the implants (assessed through radiological examination). Eligible trials had to have a minimum follow-up period of one year. Data on related complications were also reported in the review.

Included studies were conducted in Italy, Portugal, USA, Brazil, and Germany in a university dental clinic or private practices. Four trials were multicentre. Several included studies had the same authors. Nine different implant systems were used in the studies. Most trials used acrylic provisional fixed prostheses. Prostheses were incorporated within 48 hours after surgery, or at three to eight months following implant surgery. Methods used to measure bone level changes differed across trials.

Three reviewers independently screened studies for inclusion.

Assessment of study quality
Three reviewers independently assessed trial quality using a specifically designed form based on seven criteria, such as trial design, specification of inclusion/exclusion criteria, and completeness of follow-up. Trials were rated as being at high-risk or low-risk of bias; trials were considered high risk if they scored over 33 and evaluated bone level changes, or scored over 24 and did not evaluate bone level changes.

Data extraction
At least two reviewers independently extracted outcome data to calculate the mean number (standard deviations) of implants and the mean (%) success rates for implants and prostheses. Primary authors were contacted were necessary.

Methods of synthesis
Means (standard deviations) for failure rates were presented as a narrative and in tables by follow-up time point (12, 24 and 36 months). Success rates were also presented by type of implant and area of bone loss.

Results of the review
Thirteen trials (1,201 participants; 4,804 dental implants) were included in the review, comprising nine prospective, three retrospective, and one longitudinal trial. None of the included trials were randomised controlled trials, and only one was considered to be at low risk of bias. Follow-up ranged up to 132 months.
Seventy-four implants failed (37 axially placed and 37 tilted placed) for different reasons; most failures (74%) occurred at 12 months. The mean (SD) cumulative survival rate for combined implants (maxilla and mandible) was 98.6% (1.3%) at 12 months, 99.1% (1.1%) at 24 months, and 99.0% (1.0%) at 36 months.

Out of 1,201 prostheses, 57 failed but all were repairable. The mean (SD) number of cumulative survival rates for combined prostheses was 100% at 12 and 24 months, and 99.9% (0.3%) at 36 months.

The average combined bone loss (maxilla and mandible) was 0.9mm (0.5mm) at 12 months, 0.9mm (0.4mm) at 24 months, and 1.3mm (0.4mm) at 36 months. Other complications and results were reported in the review.

**Authors' conclusions**
The all-on-four treatment concept seemed to be a promising approach in the short-term, but evidence was limited by trial quality and paucity of data on long-term clinical outcomes at five years and beyond.

**CRD commentary**
The review question and supporting inclusion criteria were broadly stated. A limited number of databases were searched for relevant data, and as the search was restricted by language, potentially relevant data may have been missed. Each stage of the review process was performed in duplicate, which reduced the potential for reviewer error and bias.

Trial quality was assessed and results were fully reported in the review. Only one trial was considered to be at low risk of bias, although none were randomised controlled trials; the authors acknowledged that this limited the meaningful interpretation of results. Due to heterogeneity between trials, a narrative synthesis was presented, although this was somewhat limited.

Despite the potential for missed data and lack of formal meta-analysis of proportions, the authors' conclusions reflect the limitations of the evidence and seem appropriate.

**Implications of the review for practice and research**
**Practice:** The authors stated that a careful patient selection and an experienced surgical and restorative team are essential for successful treatment outcomes.

**Research:** The authors stated that RCTs that follow the CONSORT statement were needed and should incorporate well-defined clinical and radiographic outcome criteria to evaluate the long-term success of the all-on-four treatment concept.

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