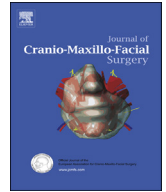




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## Effects of mandibular setback surgery on upper airway dimensions and their influence on obstructive sleep apnoea – A systematic review



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### ABSTRACT

**Background:** Mandibular setback used to be the traditional treatment of choice for correcting mandibular prognathism. Nowadays, bimaxillary surgery is preferred. Several authors have asserted that mandibular setback causes a relative narrowing of the upper airway (UA) that could trigger obstructive sleep apnoea (OSA); however, its potential role in OSA development is still much debated. Another controversial subject is whether changes in airway space caused by the procedure are permanent.

**Objectives:** To ascertain the consequences for UA size and shape of mandibular setback surgery in comparison with bimaxillary surgery (maxillary advancement with Le Fort I and mandibular setback), and to analyse the changes in oximetric indices and their relationship with OSA.

**Search methods:** A systematic review was made of the bibliography in 4 databases: Medline, Scopus, Embase and Cochrane.

**Selection criteria:** Systematic reviews, meta-analyses, clinical trials and cohort and case–control studies of adults published in the past 15 years were included.

**Data collection and analysis:** The initial search yielded 668 articles, of which 498 were eliminated because of duplication and 123 on the basis of their titles and abstracts or summaries. The remaining 47 papers were read in their entirety, and 14 were included in the final selection.

**Results:** According to our observations, the nasopharyngeal space does not undergo significant changes after either of the two surgical procedures. In the oropharynx and hypopharynx, none of the measurements changed significantly with maxillary advancement; however, persistent and significant decreases in the area, horizontal linear dimensions, and volume of these spaces are encountered after mandibular setback alone. No long-term changes in oximetric indices were found.

**Conclusions:** Morphological changes are more pronounced following exclusively mandibular surgery. A decrease in the UA does take place but appears not to affect the patient's sleep quality. This study found no evidence to confirm that bimaxillary or mandibular orthognathic surgery predisposes to obstructive sleep apnoea development.

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### 1. Introduction

Traditionally, the surgical procedure of choice to correct mandibular prognathism has been mandibular setback (Kawamata et al., 2000), but nowadays this is used in only 10% of cases (Degerliyurt et al., 2009). Some authors have indicated that it leads to a relative narrowing of the upper airway (UA) (Turnbull and Battagel, 2000; Foltán et al., 2009; Mattos et al., 2011; Gokce et al., 2012). The preferred choice currently is bimaxillary surgery

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(Gokce et al., 2012), as it achieves a better aesthetic effect and the airway anatomy is affected to a lesser degree (Park et al., 2012; Lee et al., 2013; Gonçalves et al., 2014; Lee et al., 2012). Narrowing of the airway is expected after mandibular setback, and some authors have pointed to this as a factor triggering obstructive sleep apnoea (OSA) (Park et al., 2010). However, the potential role of this narrowing in OSA development remains a much-debated subject (Demetriades et al., 2010). It must not be forgotten that a physiological postural response to prevent airway collapse takes place after this surgery (Gokce et al., 2012; Panou et al., 2013; Kawamata et al., 2000; Jakobson et al., 2010). Other controversial questions are whether the changes in the airway brought about by the surgery are permanent (Kim et al., 2013a; Park et al., 2010) and whether they also affect skeletal stability (Gonçalves et al., 2014; Park et al., 2012).

The objectives of this review are to ascertain the consequences for UA size and shape of mandibular setback surgery in comparison with bimaxillary surgery (maxillary advancement with Le Fort I and mandibular setback), and to analyse the changes in oximetric indices and their relationship with OSA.

## 2. Materials and methods

The bibliography on UA alteration by mandibular setback and bimaxillary surgery (maxillary advancement with Le Fort I and mandibular setback) was subjected to a systematic review. It was carried out by two independent reviewers who followed the CONSORT criteria (Schulz et al., 2010). The 4 data bases searched were Medline, Scopus, Embase, and Cochrane. The search was made and updated on 15 April 2014. The following search limitations were set:

type of publication: articles, articles in press and reviews; studies of adults; type of study: systematic reviews and meta-analyses, clinical trials, cohort studies, and case–control studies; publication date in the past 15 years. The search strategy used a combination of 5 primary MESH terms related to orthognathic surgery and 9 secondary terms referring to the upper airway. The terms were as follows, and all of the possible combinations between them were explored: ‘orthognathic surgery’, ‘mandibular setback’, ‘bimaxillary surgery’, ‘malocclusion, Angle class III’, ‘prognathism’, ‘airway’, ‘posterior airway space’, ‘PAS’, ‘pharyngeal space’, ‘pharynx’, ‘nasopharynx’, ‘oropharynx’, ‘hypopharynx’ and ‘hyoid bone’.

The initial search yielded 668 articles, of which 498 were duplicate references. Of the remaining 170, an initial selection based on their titles and abstracts or summaries eliminated a further 123 articles. The remaining 47 papers were read in their entirety and 14 were selected for analysis: 12 retrospective and 2 prospective studies (Fig. 1). Of the 14 included, 8 were based on three-dimensional imaging techniques to record morphological and volume changes in the airway, and six analysed postoperative ventilation. Within the first of these two groups, six collected information on changes following bimaxillary surgery and five on changes following mandibular setback surgery. In the second group, four studied bimaxillary surgery and four addressed setback surgery.

To control the selection bias, two independent reviewers evaluated the titles and abstracts selected. Duplicate references were removed. The differences between both reviewers were solved by consensus.

The variables chosen for comparison between the studies were demographic (gender and age), sample size, type of surgery, follow-up time, technical parameters concerning the CBCT/CT apparatus

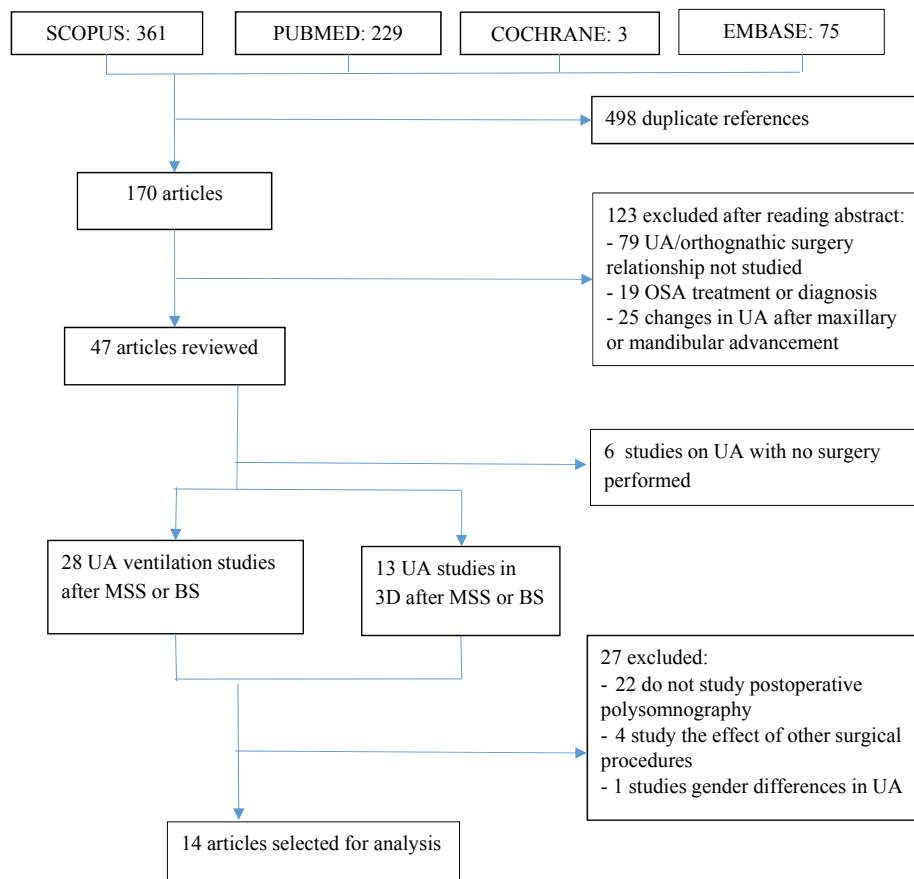


Fig. 1. Flow diagram.

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