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Maxillomandibular advancement for obstructive sleep apnea syndrome treatment: Long-term results

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ABSTRACT

Purpose: We evaluated the long term effectiveness of maxillomandibular advancement (MMA) for OSAS treatment patients. This retrospective study reviewed the patients treated by MMA for OSAS between 1995 and 2009. They were evaluated by complete polysomnography, cephalometry and quality of life questionnaire. The minimum follow up was 3 years. Success rate was defined by an IAH <10 with at least a 50% reduction.

Material and methods: 88 patients had MMA during this period. 34 accepted the evaluation (28 men, 6 women). Mean age was 52.4 ± 14 . Mean follow-up was 12.5 years.

Results: Long term success rate was 28% for the entire group, postoperative IAH was reduced between 50 and 80% for all the patients except one. Success rate was 100% for young patients (age < 45), with BMI <25 and IAH <45 and SNB <75° and narrow retrobasinlingual space (<8 mm) and with preoperative orthodontics. Esthetic and sleep results were better with a moderate maxillary advancement and anterior impaction. There was no skeletal relapse. The major postoperative complication was inferior alveolar nerve hypoesthesia.

Conclusions: MMA is an effective and stable treatment of OSAS in selected patients. Preoperative orthodontics is recommended.

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1. Introduction

Obstructive sleep apnea syndrome (OSAS) is a common condition (300 million persons worldwide), which involves the collapse of the upper airway during sleep. It is associated with significant cardiovascular morbidity and mortality (Lévy et al., 2011).

Standard treatment is continuous positive airway pressure (CPAP) ventilation. Compliance with and tolerance of CPAP are not always very good (Lévy et al., 2007). This treatment can be difficult to accept in the long term by young patients in particular. The acceptance rate is 70%–80% (Rauscher et al., 1991).

Surgical alternative treatments have been numerous. They aimed to expand one or more stages of the upper airways,

increasing the pharyngeal space by removing obstacles and reducing the compliance by stretching the walls of the upper airway (Lévy et al., 2007). The Stanford group (Riley et al., 1993) proposed a stepwise procedure adapted to the specific anatomical abnormalities of each patient. Phase 1 surgery involved mandibular geniotubercle advancement, an uvulopalatopharyngoplasty (UPPP), and a hyothyroidopexy. If unsuccessful, phase 2 surgery completed treatment via maxillomandibular advancement (MMA). Results of phase 1 treatment were not corroborated by other teams (Bettega et al., 2000).

MMA has become the first-line therapeutic alternative to CPAP (Marrone and Vincini, 2010), especially for moderate to severe OSAS in young patients without associated pathology but with retrusive dysmorphia (Hochban et al., 1994).

This surgical technique has proved effective, with a success rate of around 80% in the short term (Riley et al., 1993; Bettega et al., 2000; Hochban et al., 1994; Holty and Guilleminault, 2010; Waite

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et al., 1989; Prinsell, 1999; Riley et al., 1990; Guilleminault et al., 1989; Li et al., 2000; Dekeister et al., 2006). However, no study has indicated the effectiveness and stability of long-term treatment, although some cases appear to corroborate this. To the best of our knowledge, no publication has dealt with morbidity and long-term sequels of MMA for OSAS.

The aim of this study was to evaluate, more than 3 years after surgery, patients treated with MMA for OSAS. The main criterion was the apnea-hypopnea index (AHI) evolution. The secondary objective was to correlate AHI modification with anatomical parameters and body mass index (BMI).

2. Material and methods

2.1. Study design

This study was a retrospective monocentric study. The included patients underwent operation between March 1995 and November 2009.

Surgery was proposed to symptomatic patients with moderate to severe OSA, after failure of noninvasive treatments. The inclusion criterion was a period of postoperative follow-up of at least 3 years. All patients underwent a complete polysomnography preoperatively and postoperatively (6 months, 1 year and after 3 years).

Radiological evaluation included frontal and lateral cephalograms, and dental panoramic, which were repeated preoperatively and 1 week, 1 year, and almost 3 years after surgery. All patients were reviewed for a first surgical visit and a medical visit between November 2012 and April 2013.

This study was approved by Medical Ethics Committee on 7 March 2012.

The primary endpoint was the AHI. Success was defined by an AHI of <10 associated with almost a 50% reduction. Secondary objectives were to assess co-morbidities, sequelae, and quality of life by comparing successes and failures, and also to study the success/failure correlations with regard to jaw advancement and stability, upper airway dimension, maxillary transversal dimension, body mass index (BMI), age, and date of intervention.

2.2. Study population and assessment

A total of 88 patients (69 men [78.4%] and 19 women [21.6%]) underwent operation. Of the patients, 30 were lost to follow-up, 17 refused to participate to the study, and 4 were excluded. Three patients died (1 stroke, 1 cardiac stent thrombosis, and 1 metastatic adenocarcinoma of the sigmoid).

Among the 17 patients who refused to participate, 3 patients clearly expressed their dissatisfaction with surgery (lower lip hypoesthesia, esthetic changes in the face), and 3 patients reported being generally satisfied and asymptomatic. The main reason for the other patients refusing was the necessity of extra consultation and examination while those patients were asymptomatic. They did not understand the utility of a new investigation.

Four patients were excluded because they minor child, protected adult or with a follow up <3 years.

In all, 34 patients were evaluated (28 men [82.3%] and 6 women [17.7%]), with a mean age of 52.4 ± 14 years (range 23–74 years). A total of 29 patients had late postoperative polysomnography during the study. Seven patients had failed phase 1 and 5 patients had resumed CPAP treatment (Fig. 1).

The mean preoperative BMI was 24.6 ± 4 kg/m² and the mean preoperative AHI was 56.6 ± 24 . The average follow-up time was 12.5 years ± 3.5 years.

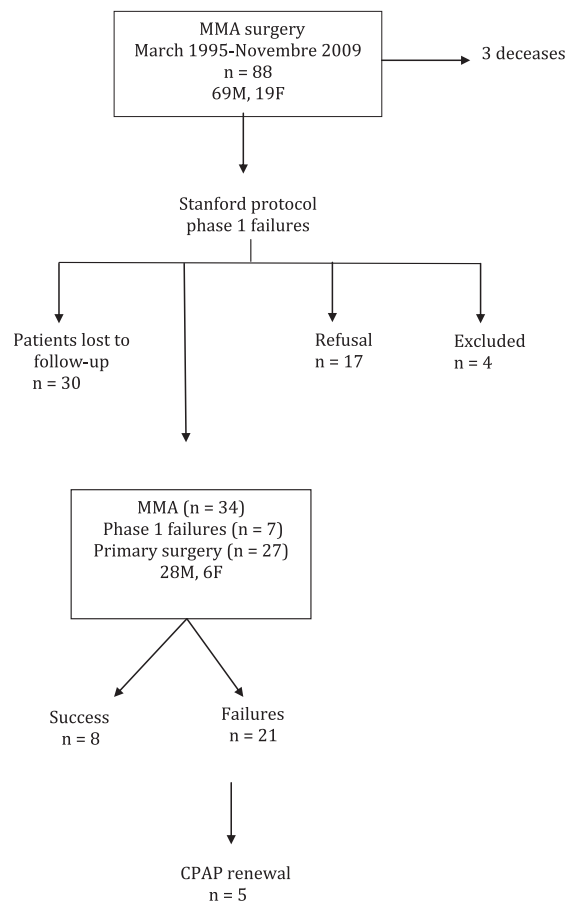


Fig. 1. Demographic features. M = male, F = female, MMA = maxillomandibular advancement, CPAP = continuous positive airway pressure ventilation.

2.3. Polysomnography

Sleep recordings were made in our University Hospital Centre or in an ambulatory sleep health center. The European Sleep Apnoea Database (ESADA) questionnaire (Hedner et al., 2011) was completed. It included personal medical and surgical history, current treatments, clinical signs of sleep disorder, the Epworth Sleepiness Scale, and a scale of fatigue and depression.

Polysomnographic data were analyzed manually according to ASDA standard criteria (Polysomnography Task Force, 1997). Electroencephalography (EEG; electrodes C4-A1, C3-A2), eye movements, chin electromyography (EMG), and electrocardiology (ECG) studies were performed. The air flow was measured by a thermistor oral and/or nasal cannula. The respiratory effort was assessed by monitoring thoracic and abdominal movements, and oxygen saturation was measured. Sleep fragmentation was assessed by the number of micro-arousals, which corresponded to arousal from 3 to 15 s that were not perceived by patients and were ended by a respiratory event or periodic leg movements. Episodes of apnea were defined as a complete cessation of airflow for at least 10 s. Hypopnea was defined as a decrease of the upper air flow of 50% of the inspiratory flow or less than 50% associated with a desaturation of at least 3% and/or an arousal of more than 10 s. The AHI was calculated from these measurements. Apneas or hypopneas were differentiated: obstructive (persistent respiratory effort), central (no respiratory effort) or mixed (central type early, late obstructive type) (Lévy et al., 2007).

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