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Adherence to Continuous Positive Airway Pressure therapy in Singaporean patients with Obstructive Sleep Apnea

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ABSTRACT

Purpose: To investigate the rates of Continuous Positive Airway Pressure (CPAP) uptake and adherence amongst Singaporean patients diagnosed with Obstructive Sleep Apnea (OSA), and to evaluate factors correlated with CPAP uptake and adherence.

Study design: Retrospective review of medical records.

Methods: Medical records were reviewed for baseline demographics, daytime sleepiness, presence of nasal symptoms and OSA severity, initial treatment choice, the rate of CPAP treatment uptake and CPAP adherence at 1 and 12 months.

Results: 2160 patients were diagnosed with OSA within the 5-year period (2011–2015). 463 (21.4%) had mild OSA, 583 (27.0%) had moderate OSA and 1114 (51.6%) had severe OSA. For initial therapy, 751 (34.8%) patients opted for a 1-month CPAP trial, 288 (13.3%) patients chose surgery upfront, 291 (13.5%) patients chose adjunctive treatments (weight loss, positional therapy, dental appliance, intranasal steroid spray for allergic rhinitis) and 830 (38.4%) patients rejected all forms of treatment.

337 out of 751 patients (44.9%) were adherent to CPAP therapy during the 1 month trial. 381 out of 751 (50.7%) patients took up CPAP therapy following the trial period, of which 299 out of 381 (78.5%) patients were adherent to CPAP therapy at 1 year.

CPAP adherence during the 1-month trial was a predictor for eventual CPAP treatment uptake and CPAP adherence at 1 year ($p < 0.001$). Age ($p < 0.001$), BMI ($p < 0.001$) and normal ESS ($p = 0.01$) were predictors of treatment rejection.

24 patients underwent upper airway surgery during their first year of using CPAP. 21 out of the 24 patients (87.5%) were adherent to CPAP at 1 year after undergoing surgery. These patients had a higher rate of CPAP adherence compared to the overall cohort (87.5% versus 78.5%), but this was not statistically significant ($p > 0.05$).

Conclusion: Singaporean patients who accept CPAP therapy after an initial 1-month CPAP trial will generally be adherent to CPAP therapy. Initial patterns of CPAP usage are predictive of long term CPAP adherence. However, there is a high rate of CPAP treatment rejection both at the time of diagnosis and after the CPAP trial. Upper airway surgery in selected patients may improve CPAP adherence.

1. Introduction

Obstructive Sleep Apnea (OSA) is a disorder that is characterized by obstructive apneas and hypopneas/respiratory effort related arousals caused by repetitive complete or partial collapse of the upper airway during sleep. Left untreated, OSA is associated with impaired daytime performance, an increased risk of traffic accidents, hypertension, neuropsychological disturbances, cardiovascular events and all cause mortality. It is a chronic disease which requires long term multidisciplinary care [1].

Continuous Positive Airway Pressure (CPAP) is the first line treatment for OSA. The CPAP machine generates a positive pharyngeal

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Table 1
Studies on CPAP uptake and adherence in Asian populations.

Source/year	Country	Follow up period	Disease severity	Cohort size	CPAP acceptance	CPAP adherence (patients who accepted CPAP)
Author's own data	Singapore	1 year	Mild, moderate and severe OSA	751	50.7%	78.5%
Lee et al./2017 [3]	Singapore	1 year	Moderate OSA with ESS > 10 and severe OSA	135	57.8%	52.6%
Hussain et al./2014 [4]	Pakistan	1 year	Mild, moderate and severe OSA	75	80%	76.7%
Yang et al./2013 [5]	Taiwan	9 months	Mild, moderate and severe OSA	315	40%	64%
Tokunaga et al./2013 [6]	Japan	2 years	Moderate and severe OSA	204	–	89.8%
Tanahashi et al./2012 [7]	Japan	6 months	Mild, moderate and severe OSA	101	87%	38%
Wang et al./2012 [8]	China	30 months	Severe OSA	210	66.8%	64.3%
Hui et al./2001 [9]	Hong Kong	3 months	Moderate and severe OSA	112	–	72%

transmural pressure so that the intraluminal pressure exceeds the surrounding pressure. As a result, respiratory events due to upper airway collapse are prevented [1].

While CPAP is highly effective when used, non-adherence to therapy is a major issue. A patient with OSA needs to use CPAP for at least 4 h a night to experience reduction in daytime somnolence and neurocognitive function, and reduce risk of developing cardiovascular and metabolic comorbidities. Hence, > 4 h of CPAP use per night on most nights (> 70% of nights) is used as the definition of CPAP adherence/CPAP compliance by many authors [1].

CPAP adherence rates are variable, with previous studies (using data from Western countries) showing 17–54% of patients being adherent to CPAP [2]. CPAP adherence rates in Asian populations report a 38–90% adherence rate [3–9] (Table 1); recent Western data reports a comparable 37.3–87.5% adherence rate (Table 2) Only one study to date has evaluated the CPAP adherence in Singaporean patients [3].

Factors which are associated with CPAP adherence and non-adherence has been a topic of extensive research. Factors influencing CPAP adherence include: disease and patient characteristics, treatment titration procedures, device factors, psychological and social factors. Barriers to CPAP acceptance include: cost, inconvenience, discomfort, do not see the need for treatment and choice of alternative therapies [1–3].

2. Methods

The aim of the study was to investigate the rates of Continuous Positive Airway Pressure (CPAP) uptake and adherence amongst Singaporean patients diagnosed with Obstructive Sleep Apnea (OSA), and to evaluate factors correlated with CPAP uptake and adherence.

The study involved the retrospective review of medical records of patients of the Integrated Sleep Service of Changi General Hospital (a tertiary referral hospital). These patients underwent a diagnostic sleep study between January 2011 to December 2015 and were diagnosed with OSA. Their medical records were accessed the following information was obtained-age, gender, Body Mass Index (BMI), Epworth Sleepiness Score (ESS), presence of nasal symptoms, Apnea-Hypopnea Index (AHI), choice of initial treatment for OSA (CPAP, surgery, adjunctive therapies, reject treatment), CPAP uptake, CPAP adherence at 1 and 12mths.

At the Integrated Sleep Service of Changi General Hospital, patients with sleep disorders receive multidisciplinary care - comprising of medical professionals and allied health personnel from the medical specialties: Otolaryngology, Respiratory Medicine, Neurology, Psychiatry, Oromaxillofacial Surgery, Bariatric Surgery, Sports Medicine and Endocrinology. After their diagnostic sleep study is performed, patients are reviewed by a sleep specialist. Their diagnosis of OSA is explained and treatment recommendations are made. CPAP or adjunctive therapy (positional, oral appliance, treatment of allergic rhinitis and weight loss) is encouraged. Surgical treatment is not advocated as an initial treatment, and is only pursued if the patient declines nonsurgical therapies and has a clear anatomical site of airway obstruction that interferes with CPAP usage. The treatment plan is tailored to the individual, and relevant referrals are made within the Integrated Sleep Service based on the needs of the patient (e.g. - referral to a Sports physician, physiotherapist, dietician and Endocrinologist for the management of morbid obesity and enrolment in a structured weight loss programme, or referral to the oromaxillofacial surgeon for creation of mandibular advancement device).

For the purposes of data collection, patients are classified into 4 groups based on their choice of initial treatment - CPAP, surgery, adjunctive treatments and rejection of treatment. Patients were counted into the CPAP treatment group if they accepted a 1-month CPAP trial as their initial treatment, with the possibility of long term CPAP therapy thereafter. Most of these patients also received adjunctive treatment (such as enrolment in a weight loss programme and treatment of their allergic rhinitis) and several of them underwent surgery while on CPAP, but as CPAP was their primary treatment they were assigned to the CPAP group. Patients who opted for surgery as an initial treatment were classified into the surgery group. Many of these patients also received adjunctive treatments, but none were using CPAP. Patients who were grouped as receiving adjunctive treatments (positional therapy, oral appliance, treatment of allergic rhinitis and weight loss) did not use CPAP or undergo surgery. Lastly, patients were considered to have rejected therapy if they attended their initial consultation and declined all treatment for OSA (accepting the risks of untreated OSA), or if they did not attend the consultation after completing their sleep study.

The diagnosis of OSA is established when a patient undergoing a diagnostic sleep study has an AHI of 5 or more. Patients were classified by AHI into mild (AHI ≥5 and < 15), moderate (≥15 and < 30) and

Table 2
Studies on CPAP acceptance and adherence in Western populations.

Source/year	Country	Follow up period	Disease severity	Cohort size	CPAP acceptance	CPAP adherence
Jacobsen et al./2017 [10]	Denmark	3 years	All OSA	695	–	78%
Lanza et al./2017 [11]	Italy	1 year	Severe OSA	144	–	87.5%
Budhiraja et al./2017 [12]	USA	6 months	Severe OSA	394	–	67.3%
McMillan et al./2014 [13]	UK	1 year	Severe OSA	102	–	35.3%
Ching et al./2013 [14]	Australia/New Zealand	1 year	Moderate and severe OSA	50	–	46%
Nadal et al./2017 [15]	Spain	6 months	Moderate and severe OSA	191	–	75%