Obstructive sleep apnea and its effects on o cardiovascular diseases systemic review and meta-Analysis Study

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Eman Tawfik Abdelfatah

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List of Abbreviations

AASM	: American Academy of Sleep Medicine
AF	: Atrial fibrillation
AHI	: Apnea-hypopnea index
AI	: Apnea index
CI	: Confidence limits
CPAP	: Continuous positive airway pressure
CT	: Computerized tomography
CVS	: Cardio vascular disease
DF	: Degree of freedom
ECG	: Electrocardiography
EDS	: Excessive daytime sleepiness
EEG	: Electroencephalogram
EMG	: Electromyogram
ERS	: European respiratory society
ESS	: Epworth Sleepiness Scale
FTP	: Friedman tongue position
LCL	: Lower confidence limit
MRI	: Magnetic resonance imaging
MSLT	: Multiple sleep latency test
OR	: Odds ratio
OSA	: Obstructive sleep apnea
OSAHS	: Obstructive sleep apnea hypopnea syndrome
PSG	: Polysomnography
RD	: Risk difference
RDI	: Respiratory disturbance index
REM	: Random-effects method
RERAs	: Respiratory event related arousal
RR	: Risk ratio
SDB	: Sleep disordered breathing
SE	: Standard error
SMR	: Submucus resection
S-STE	: Skin-soft tissue envelope
UCL	: Upper confidence limit

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Introduction

Obstructive sleep apnea is defined as Episodes of partial or complete airway obstruction lasting for ≥10 s during sleep. Each episode of apnea or is commonly accompanied by reductions in blood oxygen saturation of at least 3% to 4%, and is usually terminated by brief, unconscious arousals from sleep Symptoms of excessive daytime sleepiness (excessive daytime somnolence; waking with gasping, choking, or breath holding; or witnessed reports of apneas, loud snoring, or both) and an apnea–hypopnea index (AHI) of ≥5 events/h during polysomnography confirm the presence of OSA. Snoring between apneas is a frequent complaint of bed partners and is often the symptom that prompts these patients to seek medical attention, although excessive daytime somnolence is a common initial complaint. OSA classified to mild OSA as 5 to 15 events per hour, moderate as 15 to 30 events, and severe as 30 events or more **(Somers et al., 2008).** The prevalence of OSA in the adult population is between 5% and 14%; however, this condition is often undiagnosed because of a lack of awareness and limited access to sleep centers **(Peppard et al., 2013) (Young et al., 1997).**

OSA is associated with cardiovascular diseases. For example, 20% of hypertensive patients have OSA, and a large study of 450 consecutive patients with heart failure estimated that the prevalence of OSA was between 31% and 38% ***(Lavie et al., 1984) (Sin et al., 1999).***

Ventricular arrhythmias and cardiac conduction disorders are frequent in patients with sleep disordered breathing (SDB), and the frequency of arrhythmic events decreases after the treatment of OSA ***(Guilleminault et al., 2005).***

Previous studies have also documented a strong association between OSA and atrial fibrillation (AF) ***(gami et al., 2004).***

In addition, several studies suggest that there is increased risk of stroke in patients with OSA when they also have AF ***(Velasco et al., 2013).***

Aim of work

The aim of this study to determine the effect of Obstructive sleep apnea on cardiovascular diseases.

Chapter (1)
Upper air way Anatomy and function

The nose

Nasal airway is the primary pathway for normal breathing. During quiet breathing the resistance through the nasal passage accounts for more than 50% of the total respiratory resistance. This is more than twice the resistance during mouth breathing. For air warming, humidification, and particle filtration, it is important that one preferentially breathes through the nose despite its higher resistance. Human newborn infants are obligatory nose breathers. The cephalic positions of the epiglottis and close apposition of the soft palate to the tongue and epiglottis in neonates may make mouth breathing more difficult than nose breathing ***(Motoyama EK, 1996).***

The nasal cavity is divided into two halves by the nasal septum. The entrance of each nostril is covered by skin with hair and is called the vestibule. Nasal valves are the narrowest portion of the nostril and demarcate the vestibule from the nasal cavity proper. The columella is the strut at the caudal end of the septum between the two nostrils. The floor of the

cavity is parallel to the hard palate and runs in a horizontal direction. Roof of the nose is tent shaped. The middle third of the roof is formed by the cribriform plate of the ethmoid and houses the olfactory epithelium. The septum, which supports the dorsum of the nose, consists of the quadrilateral cartilage joined to the vomer and the ethmoid bone. The lateral wall of the nose has three projecting shelves of bone known as turbinates or conchae **fig (1)** These serve to increase the surface area of the nasal cavity. The turbinates are labeled superior, middle, inferior and the space under each is called as the meatus. The middle meatus lies under the middle turbinate and is the most important functional area ***(Stuffear JL, 1994).***

All the sinuses open into this meatus with the exception of the sphenoidal and the posterior ethmoidal cells. The openings of the sinus ostia into the middle meatus are close together and form the ostio-meatal complex. This is a key area because pathology in this region can interfere with ventilation and mucociliary clearance of the sinuses. Prolonged obstruction of these ostia during prolonged nasotracheal intubation can lead on to chronic sinusitis The superior meatus receives the opening of the sphenoidal air cells. Only one structure opens into the inferior meatus, the nasaolacrimal duct ***(Norton ML, 1995).***

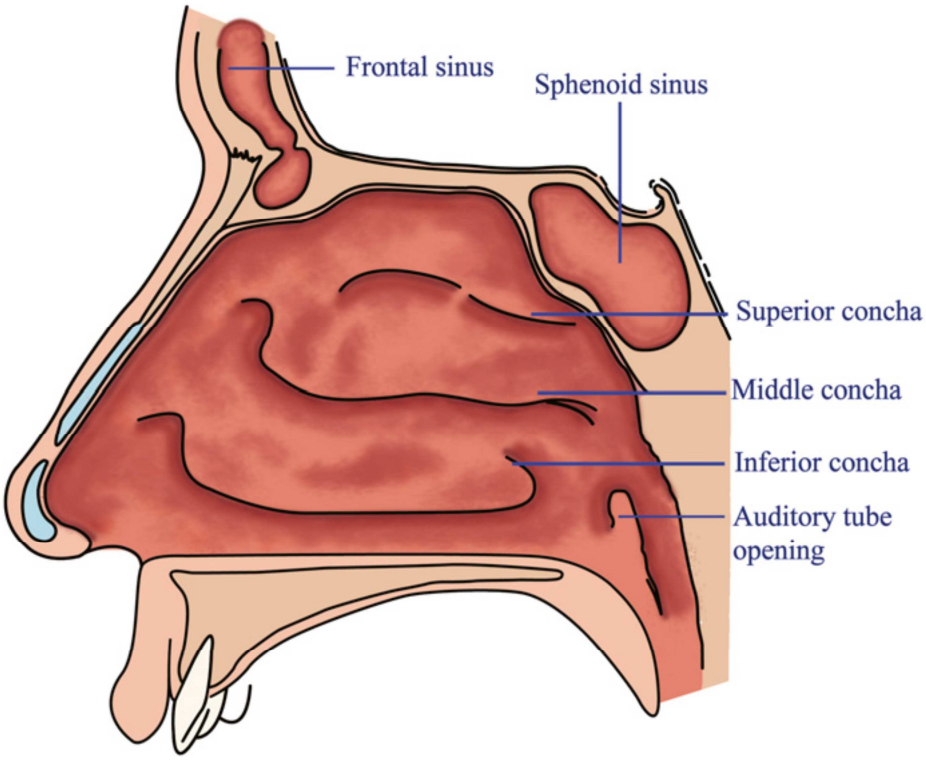

Figure (1): View of the lateral wall of the nasal cavity **(Graney DO, 1986)**

The Pharynx

The pharynx is comparable to a collapsible tube. The pharyngeal airway, unlike the nasal or laryngeal airway, is not supported by a rigid bony or cartilaginous structure. Its walls consist of soft tissue and muscles for swallowing. The pharyngeal airway is easily collapsed by the posterior displacement of the mandible during sleep in the supine position, flexion of the neck or external compression over the hyoid bone. More important, it is also easily collapsed by

negative pressure within the pharyngeal lumen created by inspiration effort, especially when airway maintaining muscles are depressed or paralyzed. In neonate, the orpharynx and the entrance to the larynx at the level of the aryepiglottic fold are the areas most easily collapsed. Mechanical support to sustain the patency of the pharynx against the collapsing force of luminal negative pressure during inspiration is given by the tension or contraction of various muscles surrounding the pharynx. These include the genioglossus, geniohyoid, sternohyoid, sternothyroid, and thyrohyoid muscles. In addition to maintenance of pharyngeal wall tension, these muscles have phasic inspiratory activity synchronous with diaphragmatic contraction. Suction force by the inspiratory activity of the diaphragm and intercostal muscles must be well balanced by the tone of the muscles supporting the upper airway and dilating it. Increased nasal and pharyngeal airway resistance exaggerates the suction force. In addition once pharyngeal closure occurs, mucosal adhesion of the collapsed pharyngeal wall becomes an added force against the opening of Pharyngeal air passage ***(Cistulli PA, et al., 1994)***

The following reflex mechanisms help to maintain the balance between the dilatory and collapsing force in the pharynx: