

The Rapid Development of Sleep Apnea Syndrome

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Sleep medicine has developed rapidly as a medical subspecialty in the past 30 years. A great variety of sleep disorders, including sleep deprivation, dyssomnia, hypersomnia, sleep cycle disturbance and parasomnia, are attracting numerous clinical and basic researchers to explore this new territory. Among the sleep disorders, sleep-disordered breathing, such as obstructive sleep apnea (OSA), central sleep apnea, complex sleep apnea, upper airway resistance syndrome, and sleep hypoventilation, has become the main focus of research in current sleep medicine.

In the March 2009 issue of the *Journal of the Chinese Medical Association*, Huang reported a bibliometric analysis of medical literature, from 1991 to 2006, in the database of the Science Citation Index (SCI), on OSA.¹ The results disclose a tremendous increase in OSA-related publications, not only in the number of articles and authors, but also in citation count during this 16-year period. The *Productivity Index* of OSA-related articles also increased 3.25-fold during this period, compared to a 1.81-fold increase for all publications obtained from MEDLINE in the same period. It is expected that this rapid increase in OSA-related publications will continue for decades.

The rationale for this speculation is based on the complexity of OSA with regard to its clinical manifestation, pathogenesis, health impact and treatment modalities. OSA is basically a disease process of upper airway obstruction during sleep. Nevertheless, sleep apnea is just the tip of the iceberg. The whole picture of sleep-disordered breathing is actually more complicated than what we can observe. Its clinical manifestation varies from simple snoring, respiratory effort-related arousals, hypopnea, obstructive apnea, central apnea, complex sleep apnea, hypoventilation, overlap syndrome and "OSA plus hypoventilation" to "overlap syndrome plus hypoventilation". The complexity in clinical manifestation generally reflects a similar complexity in the underlying etiology of this disorder. Obesity, retropalatal and/or retrolingual narrowing, backward displacement

of the mandible and/or maxilla, low position of the hyoid bone, obstruction in the nasal cavity, hypertrophy of tonsils or adenoids, and neuromuscular insufficiency of upper airway muscles are all involved in the pathogenesis of this disorder.² Hereditary, genetic and/or racial factors may also play roles in the development of this disorder.³ It has been shown in some preliminary studies that Asian ethnicity was more predisposed to OSA.⁴ Craniofacial structure is apparently the underlying cause of this discrepancy. Cephalometric studies disclosed that maxillar position (PVA) is a significant predictor of OSA among Caucasians,⁵ but the position of the hyoid bone (MPH) is the most significant factor in Taiwanese patients.^{6,7} The characteristics of craniofacial structure, therefore, constitute an important research issue in this particular area.

The impact of OSA on health is also very complicated. First, the disrupted sleep structure causes dyssomnia at night, excessive hypersomnolence in the daytime, cognitive disturbance, impaired learning and occupational efficiency, impaired social relationships and an increased rate of traffic accidents.⁸ Second, the physiological derangement from repeated apneas/hypopneas causes intermittent hypoxia, insulin resistance, exaggerated autonomic neural modulation, hypertension, cardiovascular morbidity, renal dysfunction, increased expression of inflammation mediators and coagulation abnormalities. Consequently, the life span is shortened, especially among those with moderate to severe OSA.

Complexity is also noted in the treatment of OSA. Patients are first instructed to control body weight, sleep in decubitus position, avoid alcohol intake and be cautious with oversedation or anesthesia. Thereafter, they are carefully evaluated in accordance with the characteristics of upper airway obstruction, the respiratory disturbance index, the severity of nocturnal desaturation, the degree of daytime hypersomnolence, and the presence of comorbidity to determine whether they should undergo surgery or nasal continuous positive



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airway pressure (CPAP) therapy or supportive care or use an oral appliance.

The social, legal and economic impacts of OSA are also important issues. First, the risk of traffic accident among severe OSA patients is much increased.⁹ Should traffic regulations be amended to keep severe OSA patients off the road?¹⁰ Second, nasal CPAP and oral appliance are not yet paid for by National Health Insurance in Taiwan. Should we add them to the reimbursement list? Third, as the practice of sleep medicine has become more specialized, should a formal training program for sleep physicians and technologists be established?

In conclusion, it is the complexity of the disease and its wide impacts on health, community, law, medical insurance and medical education that has led to the rapid development of sleep medicine. Huang's bibliometric analysis of OSA faithfully reflects the current status of sleep-disordered breathing, and is an important guide for the direction of our future investigations.

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