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Cpap Pressure by Cpap Titration or Prediction Formula

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Case Report

Obstructive sleep apnea (OSA) is a common disease in clinical practice and can lead to several cardiovascular complications such as death, heart failure, stroke, or atrial fibrillation [1]. The estimated prevalence is about 5-10% of general population [2]. Successful treatment with continuous positive airway pressure machine (CPAP) significantly reduces cardiovascular events [2,3]. Appropriate CPAP pressure can be determined by two methods: in hospital and home CPAP titration [4].

There are advantages and disadvantages of both methods. In hospital CPAP titration needs sleep technicians and hospitalization. Expenses and time consuming are two main disadvantages. In contrast, home automatic CPAP titration is more available, more convenient, less expensive, and less time consuming. Some issues on home CPAP titration are existed including high leakage of CPAP therapy or other troubleshooting problems on CPAP therapy while using CPAP [4,5]. Split night polysomnography or half night polysomnography with half night CPAP titration is an alternative way to save costs and times for in hospital CPAP titration. However, this modality may be appropriated only in severe OSA. To know the appropriate CPAP pressure is the goal of CPAP titration. In resource limited or busy sleep facilities, CPAP treatment while waiting for a titration test may be justified. Prediction of CPAP pressure by using a predictive formula is beneficial and equivalent to the in hospital standard method [6,7].

A CPAP prediction formula for American patients by Loredo et al. was published in 2007 [8]. Factors in the formula included respiratory disturbance, nadir saturation, and mean saturation. CPAP (pressure in cmH2O) = 30.8 + RDI × 0.03 - nadir saturation × 0.05 - mean saturation x 0.2) [8]. In 2012, a report from Turkey showed that CPAP pressure prediction can be calculated by using neck circumference and oxygen desaturation index [9]. Later on, Lee et al. reported a CPAP prediction model for Asian OSA patients [10]. The predictive equation was: predicted pressure (cm H_2O) = 6.656 + 0.156 × (body mass index [kg/m^2]) - 0.071 × (minimal SpO_2 [%]) + 0.041 × (respiratory disturbance index) + 0.094 × (score of Epworth Sleepiness Scale). Note that ESS was not in the US model.

The CPAP prediction model may be worthwhile but may need to be validated in different study population (Table 1). Ethnicity may be an important factor that affects the CPAP prediction model.

There are two types of CPAP machines for OSA treatment; auto CPAP and fixed pressure CPAP machine. Both types have pros and cons. The auto CPAP is more comfortable and provides therapy with variable range of CPAP pressure. Using auto CPAP machine therefore may not need the in hospital CPAP titration. The 90th or 95th percentile of CPAP pressure is given. A meta-analysis showed that the auto CPAP may have better outcomes on patient preference, compliance, and sleep architecture [11]. Some disadvantages of the auto CPAP include higher cost and limited clinical data [12,13]. The effect of auto CPAP on long-term cardiovascular outcomes needs further studies. One report showed that the auto CPAP may have residual apnea events compared with in hospital CPAP titration [14]. In resource limited setting, treatment of OSA with fixed CPAP machine using predictive model to identify the CPAP pressure may be a justified option. This strategy may reduce cost and facilitate faster treatment of OSA.

Conclusion

In conclusion, CPAP pressure prediction is beneficial particularly in resource-limited facilities. The formula may need to be validated in one's own setting.

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Model	Population/Year	Formula
Loredo et al. [8]	US/2007	30.8 + RDI × 0.03 - nadir saturation x 0.05 - mean saturation x 0.2)
Basoglu and Tasbakan [9]	Turkey/2012	(0.148 × NC) + (0.038 x ODI)
Lee et al. [10]	Korea/2013	6.656 + 0.156 × (body mass index [kg/m(2)]) - 0.071 × (minimal SpO_2 [%]) + 0.041 × (respiratory disturbance index) + 0.094 × (score of Epworth Sleepiness Scale)

Note: RDI: Respiratory Disturbance Index; NC: Neck Circumference; ODI: Oxygen Desaturation Index

Table 1: Summary of CPAP pressure prediction model in three studies.

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