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Effect of sleep position and sleep stage on the collapsibility of the upper airways in patients with sleep apnea.

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Collapsibility of the upper airways has been identified as an important pathogenic factor in obstructive sleep apnea (OSA). Objective measures of collapsibility are pharyngeal critical pressure (Pcrit) and resistance of the upstream segment (Rus). To systematically determine the effects of sleep stage and body position we investigated 16 male subjects suffering from OSA. We compared the measures in light sleep, slow-wave sleep, REM sleep and supine vs. lateral positions. The pressure-flow relationship of the upper airways has been evaluated by simultaneous readings of maximal inspiratory airflow (Vimax) and nasal pressure (p-nCPAP). With two-factor repeated measures ANOVA on those 7 patients which had all 6 situations we found a significant influence of body position on Pcrit ($p < 0.05$) whereas there was no significant influence of sleep stage and no significant interaction between body position and sleep stage. When comparing the body positions Pcrit was higher in the supine than in the lateral positions. During light sleep Pcrit decreased from 0.6 ± 0.8 cm H₂O (supine) to -2.2 ± 3.6 cm H₂O (lateral) ($p < 0.01$), during slow-wave sleep Pcrit decreased from 0.3 ± 1.4 cm H₂O (supine) to -1.7 ± 2.6 (lateral) ($p < 0.05$) and during REM sleep it decreased from 1.2 ± 1.5 cm H₂O to -2.0 ± 2.2 cm H₂O ($p < 0.05$). Changes in Rus revealed no body position nor sleep-stage dependence. Comparing the different body positions Rus was only significantly higher in the lateral position during REM sleep ($p < 0.05$). The results indicate that collapsibility of the upper airways is not mediated by sleep stages but is strongly influenced by body position. As a consequence lower nCPAP pressure is needed during lateral positions compared to supine positions.

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