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Title: Change of breathing pattern after breathing assist technique and pursed-lip breathing intervention

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Body: Background: The general pattern of breathing after breathing assist technique (BAT) and pursed-lip breathing (PLB) has never been reported. Aim: The aim of this study was to evaluate the pattern of breathing after BAT and PLB using a portable sleep recorder (PSR: SAS2100 by NIHON KOHDEN). Methods: Five patients with pulmonary disease (2 females and 3 males, mean ± SD age 81.8 ± 1.8) participated in this research. BAT assists during expiration. Participants performed BAT for 10 min and training PLB for 10 min, 5 times a week for 8 to 56 days. We evaluated the breathing pattern by PSR, respiratory rate(RR), 6-minute distance (6MD), and oxygen saturation (SpO_2) before and after these programs. Case A: Vital Capacity (VC) 0.94L (%VC 44.8%), Forced Expiratory Volume in one second ($FEV_{1.0}$) 0.52L (%$FEV_{1.0}$ 37.4%). Case B: VC 2.34L (%VC 80.1%), $FEV_{1.0}$ 0.65L (%$FEV_{1.0}$ 37.4%). Case C: VC 1.73L (%VC 60.1%), $FEV_{1.0}$ 0.57L (%$FEV_{1.0}$ 34.3%). Case D: VC 2.17L (%VC 75.9%), $FEV_{1.0}$ 0.58L (%$FEV_{1.0}$ 35.6%). Case E: VC 1.37L (%VC 61.6%), $FEV_{1.0}$ 0.96L (%$FEV_{1.0}$ 73.2%). Results: The average height of waveforms of the breathing pattern increased about 3 times. 6MD in 2cases and SpO_2 in 3cases increased in this study; however, the 3 other cases of 6MD and 2 other cases of SpO_2 remained unchanged. Additionally, RR decreased in 4 cases. Since the start of the program, changes in the breathing pattern from mouth to nose breathing were observed in a case. Conclusions: This study revealed that BAT and PLB resulted in a decrease of RR and a change in the breathing pattern; furthermore, after this program, changes from mouth to nose breathing were observed.