[Poster Board # H70] Non-Invasive Identification Of Inspiratory Flow Limitation In Patients Sleeping With An Oral Appliance In Place, [Publication Number: A3599]

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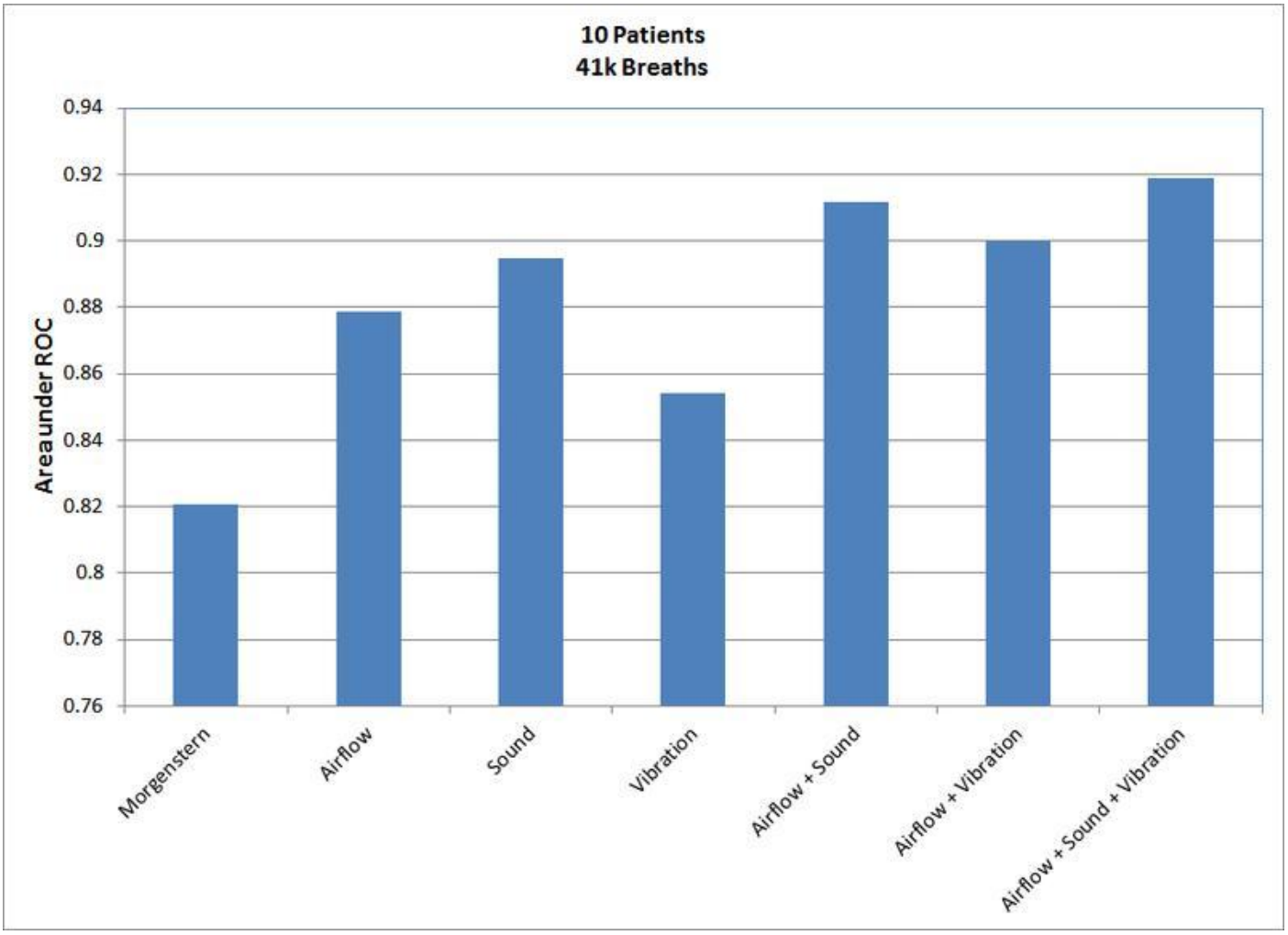
Introduction: Inspiratory flow limitation (IFL) is a common component of sleep-disordered breathing, but current methods of identification require catheterization of the pharynx. The objective of this study was to develop accurate, non-invasive methods of identifying IFL when an oral appliance (OA) is in the mouth.

Methods: Each participant (n=10) underwent a full-night polysomnogram that included measurement of supra-glottic pressure, nasal airflow, snoring sound, and dental vibration. The participant slept with temporary dental trays in the mouth attached to a motorized mandibular positioner (MATRx). Supra-glottic pressure was measured by a pressure transducer connected to a saline-filled naso-pharyngeal catheter. Airflow was measured from the air pressure in each nostril. Snoring sound and vibration were recorded by a microphone and accelerometer in the mandibular positioner, respectively. An auto-labeller (AL) used supra-glottic pressure and airflow signals to designate each breath as IFL or non-IFL. A neural network (NN) was trained to identify IFL breaths using features of the three non-invasive signals as inputs. Shape, frequency, and time features were extracted from the inspiration portion of each breath and used as NN inputs. The NN was trained on a random selection of 80% of the breaths and evaluated on the other 20%. The area under the receiver operating characteristic (ROC) curve was taken as a measure of agreement between the NN and AL.

Results: After excluding breaths associated with swallows and sighs, 41363 individual breaths were detected from the 10 subjects, and the AL identified 18656 (45%) as IFL and 22707 (55%) as non-IFL. The figure shows the AL/NN agreement for each of six input selections as well as the airflow-related parameters described by Morgenstern et al. (C., Morgenstern, M., Schwaibold, W.J., Randerath, A., Bolz, R. Jané, IEEE Trans. Biomed. Engineering 56(8), pp. 2006-2015, 2009). The Morgenstern parameters yielded an ROC area of 0.82, substantially less than the value of 0.91 reported in their study. Airflow, sound, and vibration each individually yielded ROC areas of 0.85-0.89, and the combination of airflow with sound and/or vibration increased the values to 0.90-0.92, with the highest resulting from the combination of all three.



Conclusions: The ROC area using Morgenstern parameters was less than previously reported, potentially as a result of the OA. The combined use of airflow, sound, and vibration may identify IFL with sufficient accuracy for clinical purposes.

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