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Ahmed Al-Jumail

Auckland University of Technology, New Zealand

Airway passages narrowness and pressure oscillation

Obstructive sleep apnea (OSA), asthma and respiratory distress syndrome (RDS) are three lung diseases associated with narrowing of the airway passages which is attributed to either collapse of the upper airways, airway constriction and/or lack of surfactant generation, respectively. These ailments are the major cause of morbidity and mortality worldwide and have serious negative contributions to the quality of life. Each one of these ailments has different mechanisms and is stimulated by various physiological activities; some are biochemical while others are biophysical. Various pharmaceutical treatments are available, but very seldom without side effects. Pressurizing the lung, such as using continuous positive airway pressure (CPAP) method to reduce the airway narrowness has been an effective treatment method for some cases. This presentation elaborates on how this treatment method can be enhanced and improved using pressure oscillation (PO). Some successful cases including clinical trials, tissue testing and an animal model will be discussed to show the successful results of using PO in the treatment of OSA, asthma and RDS. While lab experiments have demonstrated that length oscillations can reduce forces in contracted airway smooth muscles, which are the main driving mechanism for asthma attack, it has been proven that PO improves lung compliance, inflammatory stresses on patients and preserves surfactant function.

Biography

Ahmed Al-Jumail did PhD and MSc from the Ohio State University and BSc from the University of Baghdad. He is a Fellow member of the ASME, and a member of 11 other international professional societies. He is the Editor of the ASME monograph series-Biomedical and Nanomedical Technologies and the Editor in Chief of the *Journal of Biomedical Engineering and Technology*, and has been on the editorial and refereeing boards for several international journals. He has published more than 270 papers in international journals and conference proceedings including two ASME books on Vibration and Acoustics in Biomedical Applications and a third one on CPAP devices. He has supervised more than 90 Postgraduate students in biomedical applications, vibrations, biomechanics, and electroactive polymers. During his academic career, he forged strong alliances between academia and industries; in particular in the medical devices area. His current research focuses on biomedical applications with particular interest in the application of vibration and acoustics to airways constriction therapies and artery non-invasive diagnostics.

Ahmed.al-jumaily@aut.ac.nz

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