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J Pulm Respir Med 2016, 6:4(Suppl)
http://dx.doi.org/10.4172/2161-105X.C1.014

4th International Conference and Exhibition on

Lung & Respiratory Care

August 01-02, 2016 Manchester, UK

Role of genetic testing in lung transplantation

Rolando Grave de Peralta Menendez
Electrical Neuroimaging Group & Eng-Tech, Switzerland

Multiple clinical conditions require the use of mechanical ventilation (MV). It is indeed considered that the probability of being under MV during your life span is 50%, largely surpassing the probability of significant motor paralysis. However, to insure that MV fulfills its role we need to guarantee a correct coordination between the Patient's respiratory effort and the ventilator, i.e., the correct synchrony between the patient's neural drive and the machine. Indeed, patient-ventilator asynchrony creates substantial imposed loads which can lead also to muscle fatigue and discomfort, increasing the dependence of the patient from the ventilator. Current partially successful solutions to this problem are PAV and NAVA, however, both require a mature or strong neural drive and the later also requires an invasive procedure. Given the transient nature of MV (i.e., used mainly over night or during acute clinical conditions), precluding the use of invasive methods, and inspired by current research on Brain Computer Interfaces, we take here a neurological approach to propose a novel mechanical ventilation mode (MVM) based on the two empirical facts: 1) the probability of asynchronies is proportional to the number of set parameters of the MVM and 2) scalp recorded EEG (electroencephalography) signals can provide information about the neural activity of automatic and voluntary respiratory centers. As such, the Patient Ventilator Interface appears to be simpler to operate, better suited for clinical conditions diminishing the neural drive, while minimizing patient-ventilator asynchronies and remaining fully non invasive.

Rolando.Grave@electrical-neuroimaging.ch

Role of genetic testing in lung transplantation

Mohamed S A Mohamed
University of Cologne, Germany

Due to the increased incidence of end-stage lung diseases that lead to pulmonary failure, lung transplant becomes a frequent life-saving intervention. Unfortunately, there is a high incidence rate of primary graft dysfunction and failure after transplant. Research is progressing strongly in many directions to improve the clinical outcome of lung transplant.Interleukin-6 (IL-6) are a pro-inflammatory cytokine and an anti-inflammatory myokine. In humans, it is encoded by the IL6 gene.1 IL-6 is produced mainly by the T cells and the macrophages of the lung, bone marrow, spleen, lymph nodes, brain and skin. Nuclear factor kappa-light-chain enhancer of activated B cells (NF-κB) is the main regulator of IL-6 gene expression, which increases in all cases of tissue injury and inflammation. IL-6 is also secreted by the vascular smooth muscles as a pro-inflammatory cytokine, however, IL-6 processes an indirect anti-inflammatory effects through the antagonization of TNF-alpha and IL-1, and the activation of IL-10.3 IL-10 is another cytokine, but with anti-inflammatory actions. It down regulates the expression of cytokines in the T helper-1 cells, and the major histocompatibility class II antigens and stimulatory molecules on the surface of macrophages. Moreover, IL-10 antagonizes the activity of NF-κB.4 accordingly; the balance between IL-6 and IL-10 can affect the prognosis of any inflammatory condition, including the ischemic reperfusion injury and the graft- host interaction. Hence, the ratio between both cytokines has the potential to predict the prognosis of lung transplant and the incidence of post-transplant graft failure.5 A high IL-6/IL-10 ratio post-transplant was found to be associated with severe primary graft dysfunction and 20 fold increased relative risk of death. The Torono team for lung transplant, which is one of the leading teams in this regard, has already developed a chip to assess the expression levels of mRNAs of certain genes in graft biopsy, as markers for the prognosis of lung transplant. This includes the expression levels of IL-6 and IL-10. This technology is reliable and takes between 20-30 minutes, which can be performed while the graft on ex vivo perfusion. Due to the increased incidence of end-stage lung diseases that lead to pulmonary failure, lung transplant becomes a frequent life-saving intervention.

Mohammed.shehatta1@gmail.com