Spinal Cord Stimulation with Wire Leads to Restore Cough

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Statistical Analysis Plan:

1. Assessment of Expiratory Muscle Activation Parameters. At each hospital out-patient visit, expiratory muscle assessments will be performed to measure airway pressure and peak expiratory airflow rates over a wide range of stimulus amplitudes. Curves will be constructed relating stimulus amplitude and stimulus frequency to airway pressure and peak expiratory airflow generation. These curves will be used to determine supramaximal stimulus paradigms (i.e. the lowest effective stimulus amplitude which results in maximal airway pressure and peak expiratory airflow generation). During each subject visit, the maximum airway pressure and peak expiratory airflow rate during spontaneous efforts and spinal cord stimulation (SCS) will also be recorded. Mean changes for the entire group will be determined. Since the magnitude of these parameters is affected by lung volume, it is important that airway pressure and peak expiratory airflow rate measurements be compared at the same lung volume. Measurements will be made at functional residual capacity (FRC) and total lung capacity (TLC), in the sitting posture. Each subject will be served as their own control.

2. Assessment of Clinical Outcome Parameters. The incidence of acute respiratory tract infections over a 2-year period will be collected prior to implantation of the study device. Following implantation, this will be tracked continually. Responses to questionnaires (life quality, caregiver burden, secretion management index) will be compared prior to implantation and also at defined endpoints during the study. Mean changes of each parameter for the entire group will be determined.

3. Statistical Analysis. Statistical analyses will be performed using a repeated measures analysis of variance. Each of the subjects will be served as their own control. Upon overall significance, appropriate pairwise comparisons will be performed. Since these contrasts are equivalent to multiple t-tests between levels, protection against type I error will be accomplished with a Bonferroni correction. A p value of < 0.05 will be taken as indicating statistical significance. Statistical significance, however, does not necessarily translate into clinical significance. Based upon numerous previous clinical studies, positive airway pressures of 40cmH_2O and peak airflow rates of 180L/min (3L/s) are considered effective in clearing secretions. This study will be considered successful, if SCS using wire lead electrodes will results in a) airway pressures and peak expiratory airflow rates that match or exceed these values and b) significant improvement in one or more of the clinical outcome parameters will be achieved.