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7. DISPELLING MYTHS: SPINAL CORD INJURY LEVEL AND PHRENIC NERVE CONDUCTION STUDIES DO NOT PREDICT DIAPHRAGM PACING SUCCESS- ALL PATIENTS SHOULD UNDERGO EARLY DIAGNOSTIC LAPAROSCOPY

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Background: Diaphragm Pacing (DP) demonstrates benefits over mechanical ventilation for spinal cord injured (SCI) patients. Phrenic nerve conduction studies (PNCS) have long been a mainstay in the preoperative evaluation when considering placement of DP yet they are difficult to perform with high reported false positive/negative results. Intact phrenic nerves are necessary for diaphragm stimulation but there is significant variability on the cervical nerve roots that provide innervation to the diaphragm so cervical injury level may not predict success or failure of diaphragm stimulation.

Methods: Retrospective review of a prospective database of all DP patients at single institution including initial FDA IDE trial. PNCS results, level of cervical injury and surgical evaluations and outcomes were analyzed.

Results: In the initial FDA study, PNCS results showed that EMG latencies for the populations that could be stimulated (n=44) and those that could not be stimulated (n=6) overlapped (7.8+/- 2.5ms vs 9.4 +/- ms) and the null hypothesis (that the means are equal) cannot be rejected (p-value>0.05). The range of amplitudes also overlapped as well (0.4 +/- 0.2mV vs 0.2+/- 0.2mV) and the null hypotheses cannot be rejected (P-value >0.05). In our database of 167 implanted patients who had diaphragm paralysis from other etiologies, 125 had PNCS. There were 78 (62.4%) false negative studies. These patient did not have an amplitude or a latency yet at laparoscopic surgery the diaphragm could be stimulated and DP led to recovery of function. In analyzing level of injury in 92 consecutively traumatically injured patients, 29 had success with DP even though they had a C3 or lower level injury. This demonstrated that level of injury had no bearing on DP success.

Conclusion: Given the lack of sensitivity of PNCS and cervical level of injury in predicting DP success, continued use of these as criterion is insupportable and eliminates patients who would benefit from DP placement. DP in SCI decreases early mortality, decreases ventilator days, shortens length of stay and decreases cost; a move toward direct visualization of diaphragm muscle response with laparoscopy in the operating room would preclude the exclusion of patients based on pre-operative testing with poor predictive value.