Date :

Title : RESPIRATORY FAILURE FOLLOWING THYMECTOMY

Authors : R.A. Hirsh, M.D., F.K. Orkin, M.D., and S.R. Leventhal, M.D.

Affiliation: Department of Anesthesia and Research Medicine, University of Pennsylvania, Philadelphia, Pennsylvania 19104

Introduction. Patients with myasthenia gravis are at increased risk of respiratory failure following surgery. Using discriminant analysis on data obtained from all (24) myasthenic patients undergoing thymectomy at the Hospital of the University of Pennsylvania (HUP) from September 1975 to August 1978, the authors have established criteria and a risk score to predict preoperatively which myasthenic patients are likely to have respiratory failure following thymectomy performed through a median sternotomy incision.[1] The purpose of the present study is to validate that risk score using a different population and to identify patients likely to have prolonged severe respiratory failure.

Methods. We assigned a preoperative risk score to all (18) myasthenic patients who had thymectomies at HUP from September 1978 to March 1980. The risk score was the total point value of weighted risk factors identified earlier[1]: duration of myasthenia for more than 6 years (10 points), pyridostigmine dosage in excess of 750 mg/day (8 points) and vital capacity (VC) < 2.9 l (4 points). We assigned no points if the risk factor was absent. The risk score could range from 0 to 34 points. For example, a patient with myasthenia for 1 year (0 points), no respiratory disease (0 points), a VC of 2.7 l (4 points), taking 900 mg of mestinon (8 points) daily has a risk score of 12 points.

We predicted that patients with risk scores less than 10 would have benign postoperative respiratory courses and that those with risk scores of 10 or more would have respiratory failure. We defined respiratory failure as the need for mechanical ventilation for more than six hours following operation or the need for reintubation and mechanical ventilation in the postoperative period.[1,2]

Results. Of the 18 patients in this study, 12 had scores of 9 or less. Nine of these were extubated in the OR and 3 in the ICU within 2 hours of arrival. None of these patients was reintubated during the postoperative stay nor readmitted to the ICU.

Six patients had scores of 12-16. Four were extubated in the OR. The other two both had respiratory failure following surgery. One of them required mechanical ventilation for 30 hours postoperatively. The other was extubated 2 hours after arrival in the ICU, but developed respiratory failure on the 10th postoperative day. She required mechanical ventilatory support on that occasion and five subsequent occasions and was still hospitalized on the 180th postoperative day.

Discussion. The risk score accurately predicted those myasthenia patients who had a benign respiratory course post-thymectomy. No patient with a score of 9 points or less had postoperative respiratory failure. The risk score also identified all patients who had postoperative respiratory failure. However, 4 of 6 patients with high risk scores had a benign postoperative course ("false positives").

To reduce the number of "false positives" (i.e., to make the risk score more specific), reclassification of some variables and addition of other variables may be helpful. Among all myasthenics undergoing thymectomy from September 1975 to March 1980, three had diagnoses of chronic obstructive lung disease (COPD) and all three had postoperative respiratory failure. A patient with asthma, who was also classified as having concurrent respiratory disease, had no postoperative problems. These observations suggest that it may be possible to improve the specificity of the risk score by categorizing respiratory diagnosis rather than using the general term "respiratory disease." Patients whose daily mestinon dosage increased at least 300 mg per day in the month prior to surgery were more likely ($p = .02$) to develop respiratory failure (5/9) compared to those patients who had no such change in medication (5/33). Thus, including a variable to indicate recent exacerbation of myasthenia should also improve the specificity of the risk score.

Two patients, one of whom died in the hospital, had very severe respiratory morbidity, requiring months of mechanical ventilation and a hospital stay of 6 months. Both were in their 60's, had a rapidly progressive clinical course with less than one year between diagnosis of myasthenia and surgery, moderate COPD and a VC < 2.9 l. They were the only patients with COPD and reduced VC and the only patients requiring prolonged ventilatory support and hospitalization. Of the remaining 40 patients, one died (from septic shock 2° to a bowel perforation), none was ventilated more than 9 days and the longest postoperative hospital stay was 73 days. The probability that the subset of patients defined by moderate COPD and VC < 2.9 l differs from patients without both risk factors in having a prolonged complicated postoperative course is highly significant, despite the fact that there were only two such patients ($p = .003$), (Fisher's Exact Test).

Conclusions. We conclude that

1. The risk score[1] accurately predicts that patients with low risk scores (9 or less) will not have respiratory failure following thymectomy with a median sternotomy incision.
2. One third of patients with a risk score of 10 or more have postoperative respiratory failure.
3. Patients with moderately severe COPD and a VC < 2.9 l, have severe postoperative respiratory morbidity.
4. Categorizing respiratory disease by diagnosis and introducing a variable to indicate recent exacerbation of myasthenia may help to reduce the prevalence of "false positive" risk scores.

Reference.

1. Leventhal SR, Orkin FK, Hirsh PA: Prediction of the need for postoperative mechanical ventilation in myasthenia gravis. Anesthesiology, in press.
2. Hirsh RA, Geer RT, Klineberg P: Respiratory management of myasthenics following thymectomy. American Society of Anesthesiologists Abstracts of Scientific Papers, 127-128, 1977.