Fiberoptic Bronchoscopy in the Presence of Space-occupying Intracranial Lesions*

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The performance of flexible fiberoptic bronchoscopy (FFB) has anecdotally been considered to carry a high risk of neurologic complications in patients with raised intracranial pressure (ICP). There is no evidence in the literature to support this concern. We evaluated this risk by reviewing hospital records of 132 patients who underwent FFB and computer tomography of the central nervous system (CNS-CT) during the same hospitalization. Twenty-nine patients had CT evidence of increased ICP. For the purpose of analysis, patients were divided into two groups: 17 patients had evidence of raised ICP prior to the performance of FFB and had received treatment with an intent to lower the ICP, and 12 patients in whom increased ICP was not suspected at the time of FFB and therefore did not receive any form of pretreatment. There was no evidence of neurologic complications in either group during the first postbronchoscopy week. We conclude that FFB carries a low risk in patients with elevated ICP.

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The flexible fiberoptic bronchoscope has revolutionized the diagnostic approach to airway and parenchymal pulmonary disease. Many lesions that were previously inaccessible for biopsy without thoracotomy are now routinely sampled with this instrument. Flexible fiberoptic bronchoscopy (FFB) is a relatively low-risk, high-yield procedure. While overall morbidity and mortality from the procedure remain low, complications that do occur can be severe and life threatening. Major complications, ie, hemorrhage, pneumothorax, life-threatening hypoxemia, arrhythmias, and myocardial infarction, occur in only 0.8% to 1.7% of the procedures and 0.01 to 0.1% of the patients undergoing FFB are estimated to have a fatal outcome. In one study, the incidence of complications was found to be as high as 11 percent. In a great majority of the fatalities, preexisting conditions and illnesses predispose patients to a grim outcome and bronchoscopy is only the final precipitating event. Hence, a careful prebronchoscopy evaluation and screening is very important to identify any contraindications to the performance of FFB. Contraindications are few and include inability of the patients to cooperate, bleeding diathesis, recent myocardial infarction, serious cardiac arrhythmias, and unstable obstructive airway disease. In some studies, reviews, and texts, the presence of raised intracranial pressure is identified as a relative contraindication. The performance of FFB is anecdotally considered to carry a high risk of neurologic complications in patients with raised intracranial pressure (ICP). Most pulmonary physicians have been hesitant to perform bronchoscopy in patients with space-occupying intracranial lesions, fearing that potential increases in intrathoracic pressures (especially during cough) could lead to increases in ICP with subsequent transtentorial herniation. After extensive review of the literature, only one report of documented occurrence of increased ICP during FFB was found. To assess the actual risk of bronchoscopy in patients with increased ICP or at risk of developing increased ICP, we performed an extensive retrospective review at our institution.

METHODS

All patients who underwent FFB between January 1, 1990 and March 31, 1990 at Kings County Hospital Center, Brooklyn, NY, were identified. Medical records of those patients who also had computed tomography of the central nervous system (CNS-CT) were reviewed. Cases were identified by hospital discharge coding according to the International Classification of Diseases (ICD-9-CM). During the study period, 3,156 fiberoptic bronchoscopies were performed. Of these patients, 132 had CNS-CT during the same hospitalization. Twenty-nine of 132 were found to have intracerebral mass lesions with surrounding edema and/or shift of midline structures and hence evidence of increased ICP. All 29 patients had proven bronchogenic carcinoma (Table 1). The mean age was 57 ± 3 years. The majority of the patients had presented with neurologic signs and symptoms and therefore had CNS-CT prior to FFB. The remaining patients had presented primarily with respiratory complaints and did not have any signs and symptoms.

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamous cell carcinoma</td>
<td>12 (41)</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>9 (31)</td>
</tr>
<tr>
<td>Undifferentiated malignancy</td>
<td>4 (14)</td>
</tr>
<tr>
<td>Large-cell carcinoma</td>
<td>3 (10)</td>
</tr>
<tr>
<td>Small-cell carcinoma</td>
<td>1 (3)</td>
</tr>
</tbody>
</table>

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pertaining to the CNS. These patients did not have CNS-CT until after the bronchoscopy. Prebronchoscopy medications in all patients consisted of meperidine (Demerol), 50 to 75 mg as a single dose, and atropine, 0.4 to 0.6 mg as a single dose, both administered intramuscularly. In addition, intravenous diazepam was used in three patients during the procedure for excessive cough or agitation, the maximum dose being 10 mg.

RESULTS

For the purpose of analysis, patients were divided into two groups (Table 2). Group 1 consisted of 17 patients in whom FFB was performed in the setting of known intracranial abnormalities. These patients had presented with neurologic signs and/or symptoms (Table 3) and therefore had CNS-CT antecedent to FFB. Subsequent chest radiographs revealed pulmonary lesions that warranted diagnostic FFB. The mean interval between CNS-CT and FFB was six days. Prior to FFB, these patients had been treated in an attempt to reduce cerebral edema. All these patients had received steroid therapy (dexamethasone, average dose 16 mg/d). In addition, four patients had also received CNS radiation therapy. None of the patients was intubated or hyperventilated prior to or during the procedure. Nine of the 17 patients in group 1 had preexisting seizures at the time of FFB. No seizures were observed during the procedure and there was no change in character or frequency of seizures after the FFB.

Group 2 consisted of 12 patients who had primarily presented with respiratory complaints and did not have any signs and symptoms pertaining to the CNS. These patients did not have CNS-CT until after the bronchoscopy. In this group, intracranial abnormalities were detected subsequent to FFB and therefore these patients did not receive any kind of treatment prior to the FFB. The mean interval between FFB and CNS-CT was six days. During the first postbronchoscopy week, there was no evidence of cerebral herniation, new neurologic sequelae, or worsening of existing neurologic deficits in group 1 patients. Patients in group 2 developed no neurologic signs and/or symptoms during the same postbronchoscopy period.

Arterial blood gas samples from a representative number of patients from both groups (group 1 = 6, group 2 = 3) did not indicate any significant differences.

DISCUSSION

Our observations suggest that fiberoptic bronchoscopy may be performed safely in patients with symptomatic intracranial mass lesions (increased ICP), after 4 to 8 days of steroid therapy. Patients with unsuspected intracranial lesions (also producing mass effect) who underwent bronchoscopy (in the absence of steroid therapy) were also at relatively low risk of neurologic complications. We cannot conclude, however, that glucocorticoid therapy can be omitted in the symptomatic patients.

Neurologic complications arising from bronchoscopy have been reported in several studies and review articles.16 Seizures are the most frequently reported neurologic complication but in all instances they have been attributed to topical anesthetics used, although the exact timing of the occurrence of these seizures is not discussed. If these events occurred after starting the bronchoscopy, it would be difficult to ascertain whether they were due to the effects of the anesthetic or the actual procedure since a significant rise in ICP can clearly lead to convulsions and a host of other consequences. The fact that seizures were observed in patients without underlying neurologic illness is a strong argument that these resulted from altered seizure threshold related to serum anesthetic levels. Syncope as a result of bronchoscopy has also been reported and has been attributed to vasovagal phenomena. Acute behavioral changes during or after bronchoscopy have been described and are thought to result from hysterical reactions. Under all these circumstances, the neuropsychiatric events were easily reversible on removal of the bronchoscope and did not have any permanent sequelae. To our knowledge, ICP was being monitored with an intracranial device only in one instance.4 When a rise in ICP was noted, as measured by the subarachnoid pressure transducer, the bronchoscope was removed and the patient was hyperventilated; pressure returned to normal when these measures were employed. The report does not provide information regarding the presence or absence of structural CNS lesions.
The data presented in this study provide an experiential framework for a rational diagnostic approach for patients requiring FFB in the presence of increased ICP. Prospective observation of patients treated in this fashion will provide additional support for our conclusions regarding safety.

REFERENCES
1 Pereira W Jr, Kovnat DM, Snider GL. A prospective cooperative study of complications following flexible fiberoptic bronchoscopy.

Third Congress, Asian Pacific Society of Respirology
The Mandarin Singapore Hotel will be the site of the 3rd Congress of the Asian Pacific Society of Respirology, October 7-10. The congress is organized by the Singapore Thoracic Society under the auspices of the Asian Pacific Society of Respirology. Sponsors are the Ministry of Health, Singapore; Academy of Medicine, Singapore; and the National University of Singapore. For information, contact the congress secretariat: Communication Consultants, 336 Smith Street, New Bridge Centre, Singapore 0105.