Abstract
Purpose. We investigated the postoperative complications that developed in patients who underwent surgery after induction chemotherapy (IC) for primary lung cancer.

Methods. Twenty-seven patients underwent surgery after receiving IC; for advanced non-small cell lung cancer in 16, and for small cell lung cancer in 11. All patients were given the platinum-based chemotherapy regimen.

Results. Lobectomies were performed for 18 patients, bilobectomies for 4, pneumonectomies for 2, and partial resections or segmentectomies for 3. There were two postoperative deaths; one caused by adult respiratory distress syndrome (ARDS) and one caused by respiratory failure, resulting in a mortality rate of 7.4%. The postoperative complications included sputum retention in six patients, ARDS in two, anastomotic dehiscence after bronchoplasty in one, and pneumonia in one, resulting in 44.4% morbidity. The morbidity of patients who had received IC (IC group) was higher than that of a comparative group of 560 who underwent lung resection without IC during the same period (non-IC group), but the difference was not significant (44.4% vs 22.6%; $P = 0.16$). Both ARDS and bronchial insufficiency occurred more frequently in the IC group than in the non-IC group, but the differences were not significant ($P = 0.25$).

Conclusions. These findings indicate the feasibility of treating primary lung cancer with IC followed by surgery as long as a cautious operative procedure is used and careful postoperative management is given, paying particular attention to the risk of ARDS and bronchial complications.

Key words Complications · Primary lung cancer · Platinum-based drugs · Induction chemotherapy

Introduction
The incidence of lung cancer is increasing, and patients with locally advanced lesions or mediastinal lymph node involvement generally have a poor prognosis. Postoperative adjuvant chemotherapy has been evaluated in several randomized trials, but the results were inconclusive and few reported survival benefit.1–3 Recent trials have suggested that induction chemotherapy (IC) followed by surgery may be beneficial;4,5 however, it remains controversial whether the surgical risks after IC would be increased. The number of patients for whom IC is indicated is thought to be increasing. Therefore, it is important to evaluate the mortality and morbidity of surgery after IC. The purpose of this retrospective study was to assess the complications of pulmonary resection after IC to treat primary lung cancer.

Patients and Methods
Between January 1990 and March 2000, we operated on 27 patients who had received IC for primary lung cancer with locally advanced lesions or mediastinal lymph node involvement. The characteristics of the patients are shown in Table 1. We used the staging system of lung cancer defined by The Japan Lung Cancer Society.6

Indications and Patient Selection for IC
Before IC, a histological diagnosis was made by transbronchial biopsy or cytologic examination of bronchial brushings or washing. All of the patients were
younger than 75 years of age and the performance status ranged from 0 to 1. None of the patients had serious cardiac, respiratory, or renal problems before IC. Sixteen patients who had advanced non-small cell lung cancer (NSCLC) agreed to undergo two or three courses of IC followed by surgery, 11 of whom had locally advanced lesions (2 classified as C-T3 and 9 as C-T4), and 5 of whom had mediastinal lymph node involvement (2 classified as C-N2 and 3 as C-N3). Another 11 patients were given chemotherapy as treatment for small cell lung cancer (SCLC) followed by surgery for complete resection of the remnant disease. One of these patients had SCLC diagnosed by transbronchial lung biopsy, but NSCLC (adenocarcinoma) was confirmed after surgery by the histological study of the permanent specimen of lung.

**IC Regimen**

All regimens of the chemotherapy were platinum-based. Of the 16 patients with NSCLC, 10 were given cisplatin (CDDP), vindesine (VDS), and mitomycin C (MMC), another 5, including the patients in whom SCLC was diagnosed preoperatively, were given CDDP and etoposide (VP-16), and 2 were given carboplatin (CBDCA) and irinotecan (CPT-11). Of the 11 patients with SCLC, 4 were given CDDP and VP-16, and 6 were given CBDCA and CPT-11. Each regimen was performed for two or three cycles and the clinical response was evaluated.

**Assessment of Clinical Response**

Clinical restaging was done with the aid of computed tomography and clinical response assessment about 4 weeks after IC. A complete response (CR) was defined as the total disappearance of all radiological evidence of disease. A partial response (PR) was defined as any response less than complete, but with greater than 50% reduction in the sum of the products of the crossed diameters of all measurable lesions. Patients with less tumor shrinkage were considered to have undergone no change (NC). Progressive disease (PD) was defined as an increase of greater than 25% in the sum of the products of the crossed diameters of all measurable lesions or the appearance of new lesions. The overall response rate was calculated as the sum of the CR and PR divided by the number of total assessable patients.

**Radiation Therapy**

Before surgery with IC, radiation therapy was given to three patients with locally advanced disease in the chest wall and vertebrae. Another patient was given radiation therapy after surgery for remnant disease in the thoracic vertebrae. The dose of radiation ranged from 40 to 56Gy.

**Surgical Procedure**

Operations were performed about 4 weeks after the last cycle of IC. Pulmonary resection and dissection of mediastinal lymph nodes were performed for complete resection of the disease. Lobectomy was preferred, but