Optimal sampling methods for margin cytology examination following lung excision

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Abstract

Local recurrence of the tumor after lung excision often occurs in cases with positive cytology results at the surgical stump. Some reports have described the efficacy of margin cytology examinations with various sampling procedures, though an optimum method has not been established. In the period between 2005 and 2008, 58 patients underwent a lung excision followed by a margin cytology examination at our hospital, of whom 49 were finally diagnosed with malignancy. Cytology samples were obtained by scratching the staple lines of both resected and residual lungs, and collecting lavage from washed stapler cartridges used in the procedure, with the results compared. Of the 49 cases with malignancy, 44 underwent both sampling techniques, of which four had positive results, three detected in lavage samples and one by the scratching method. Since neither technique detected all positive cases, it is recommended that samples be obtained using both techniques to avoid missing malignancy.

Keywords: Lung cancer surgery; Lung tumor; Thoracoscopy; Video-assisted thoracic surgery

1. Introduction

A lobectomy and lymph node dissection procedure is considered to be standard treatment for resectable non-small cell lung cancer, while lung excision is generally employed for patients with small peripheral lesions. When performing lung excision for lung cancer, it is mandatory that malignant cells not be left in the residual pulmonary parenchyma. In an ongoing phase III trial (‘A phase III randomized trial of lobectomy vs. sublobar resection for small peripheral non-small cell lung cancer’ (CALGB 140503)), it is strongly recommended to confirm the absence of disease in the wedge margin using histological or cytological examinations of frozen sections. Since an optimal sampling method for margin cytology examinations after lung excision has not been established, we performed the present study using samples collected with two different methods to address this issue.

2. Patients and methods

In the period between April 2005 and June 2008, 58 patients underwent a lung excision, including 34 men and 24 women ranging in age from 18 to 81 years (mean, 60 years). The surgical procedures used were a wedge resection in 53 and segmentectomy in 5, both of which utilized automated surgical staplers for resecting the pulmonary parenchyma.

Margin cytology samples were obtained by scratching and from obtained lavage (Fig. 1). For the scratching method, the entire length of the resection line in the pulmonary parenchyma was scratched with a long stainless spoon, which was then washed in saline in tubing. The scratching was performed along both staple lines of the resected and residual lungs, which produced two samples per patient. In the lavage method, all staple cartridges used for resecting the pulmonary parenchyma were lavaged in saline in tubing. Collected samples in the tubes were centrifuged, fixed with ethanol on a slide glass, and colored with Papanicolaou stain for examination. Cytology results were compared between the two methods. Histological examinations of the stumps were performed using hematoxylin and eosiinform stained sections derived from paraffin-embedded blocks. The Institutional Review Board of Osaka University Hospital approved the design of the study and consented to waive the need to obtain informed consent from the patients.

3. Results

Of 58 patients who underwent a lung excision, 49 were finally diagnosed with malignancy. Both methods were performed in 44 of the malignant cases, which included 25 with primary lung cancer and 19 with metastatic tumors. The cytology examinations found positive tumor cells in 4 of the 44 cases (9.1%), of which three were detected by the lavage method and one by the scratching method.
Neither method detected all of the positive cases. As for the surgical procedures utilized in the positive cases, three underwent a wedge resection and one a segmentectomy. Histological examinations revealed no positive results.

4. Comment

In the present study, we compared scratching and staple cartridge lavage methods to determine which was more reliable for cytology examinations. We considered that if all positive cases were detected by a single method, then it could be proposed as a standard. However, both were required to detect all positive cases in the present study. Since the superiority of one of the methods could not be established, we recommend that both be performed to obtain samples for margin cytology examinations.

In previous observational studies of patients with small pulmonary nodules who underwent lung excision instead of a lobectomy, including anatomical segmentectomies and non-anatomical wedge resections, the postoperative courses were considered acceptable, based on better postoperative pulmonary function as compared to those who underwent a lobectomy, in addition to comparable long-term recurrence and survival rates [1–4]. Although it has not been determined whether lung excision should be established as standard treatment for a certain subgroup of primary lung cancer cases, it is considered essential to completely resect the lesion without residual tumor cells when performing the procedure with curative intent. Previously, we reported that tumor recurrence in the surgical stump occurred in more than half of the subjects with positive cytology results [5], which was later supported by another study [6]. In addition, a cytology examination was shown to be more sensitive than a histological examination for detecting tumor cells in the surgical stump using cells extracted from the margin [7]. Thus, it is considered that a margin cytology examination can provide important information regarding the presence or absence of tumor cells in the margin of the parenchyma. The present results indicate that it is advisable to examine both the resection line and staple cartridges.

The time required for performing cytological sampling and the examination may be a concern. In the present study, the procedures were not accurately timed. However, obtaining a sample with the scratching method is considered to require <1 min for both residual and resected lungs, while the lavage method is thought to require ~10 s per cartridge. Thus, excessive time and effort are not needed, even when both sampling procedures are performed. In addition, ~40 min is needed to receive results after sending the samples to the laboratory, which is a tolerable intraoperative period for determining whether additional resection is indicated.

In conclusion, margin cytology examinations were performed using samples obtained from both scratching and staple cartridge lavage methods. Based on our results, we propose that samples be obtained using both methods to avoid missing positive cases.

References


