Contents lists available at ScienceDirect

Respiratory Investigation

journal homepage: www.elsevier.com/locate/resinv

Original article

Clinical features of secondary spontaneous pneumothorax complicated with silicosis

Norichika Iga[a,*], Hideyuki Nishi[a], Nobukazu Fujimoto[b], Takumi Kishimoto[c]

[a]Department of Surgery, Okayama Rosai Hospital, 1-10-25 Chikkomidorimachi, Minamiku, Okayama 702-8055, Japan
[b]Department of Medical Oncology, Okayama Rosai Hospital, 1-10-25 Chikkomidorimachi, Minamiku, Okayama 702-8055, Japan
[c]Asbestos Research Center, Okayama Rosai Hospital, 1-10-25 Chikkomidorimachi, Minamiku, Okayama 702-8055, Japan

ARTICLE INFO

Article history:
Received 12 August 2017
Received in revised form
3 November 2017
Accepted 10 November 2017

Keywords:
Secondary spontaneous pneumothorax
Occupational lung disease
Pneumoconiosis
Silicosis

ABSTRACT

Background: Few studies have focused on the management of secondary spontaneous pneumothorax (SSP) as a complication of pneumoconiosis. The aim of this study was to investigate the clinical features and therapeutic course of SSP associated with silicosis.
Methods: Between April 2005 and March 2015, 17 patients with silicosis underwent chest tube drainage for SSP in our institution. We retrospectively analyzed patient characteristics, type of treatment, clinical course, rate of recurrence, and survival time, and compared them with those of 30 patients diagnosed with chronic obstructive pulmonary disease (COPD) during the same period.
Results: Fourteen patients with silicosis had performance status score $\geq$ 2 and modified Medical Research Council Grade $\geq$ 2; these were significantly different from those in patients with COPD ($P = 0.047$, $P = 0.026$). Patients with silicosis had a significantly longer duration of chest tube placement and hospital stay. Recurrent pneumothorax occurred in 47.1% of patients with silicosis, which was not significantly different from the proportion of patients with COPD (40.9%, $P = 0.843$). However, in the silicosis group, patients treated with chest tube drainage alone tended to have a higher rate of ipsilateral recurrence than those who had pleurodesis, although this was not statistically significant. The median overall survival time of patients with silicosis was 82.6 months, while that of patients with COPD was 104.1 months.
Conclusions: Patients with silicosis had worse physical status and respiratory functions at the time of occurrence of pneumothorax than those with COPD. Pleurodesis could be an effective treatment for SSP complicating silicosis.

List of abbreviations: SSP, Secondary spontaneous pneumothorax; COPD, Chronic obstructive pulmonary disease; ILO, International Labour Organization; IQR, Interquartile range; PS, Performance status; mMRC, modified Medical Research Council, Hugh-Jones classification; CVD, Cardiovascular disease; HOT, Home oxygen therapy

*Corresponding author. Fax: +81 86 262 3391.
E-mail address: igatoku0613@yahoo.co.jp (N. Iga).

https://doi.org/10.1016/j.resinv.2017.11.007

1. Introduction

Secondary spontaneous pneumothorax (SSP) usually occurs in elderly patients who are in poor general condition or have underlying lung disease. The presence of an underlying disease complicates the optimal management of pneumothorax. Conservative management, including chest tube drainage, alone or in combination with chemical pleurodesis, is widely used in patients with poor physical status to stop air leakage and to prevent recurrent pneumothorax.

Pneumoconiosis is an occupational lung disease caused by the inhalation of dust particles, such as silica or asbestos, leading to inflammation of the lung tissue [1]. Many types of secondary pulmonary complications can occur in patients with pneumoconiosis, including chronic obstructive pulmonary disease (COPD), hemoptysis, pneumothorax, pleural disease, infection, interstitial pneumonia, and malignancy [2]. Emphysema and bullae are commonly observed in progressive forms of silicosis, followed by SSP [3]. Patients with pneumoconiosis often have impaired pulmonary function and poor physical status at the time of onset of pneumothorax [2,4]; hence, surgical procedures are typically avoided [5].

Few studies have focused on the management of pneumothorax occurring as a complication of pneumoconiosis, although there are several guidelines on the management of spontaneous pneumothorax [6–9]. Most patients with pneumoconiosis are admitted to hospitals specializing in the care of patients with occupational diseases. Therefore, many chest physicians have little opportunity to treat pneumothorax complicating pneumoconiosis, although they have more clinical experience with COPD, most often the disease underlying pneumothorax. The purpose of this study was to investigate the clinical manifestations and therapy of SSP occurring as a complication of silicosis, compared to those that arise from underlying COPD, and to provide additional guidance for clinical practice.

2. Patients and methods

2.1. Patients and data collection

Clinical records and radiological images of patients admitted with SSP at a single institution over a 10-year period from April 1, 2005, to March 31, 2015, were retrospectively reviewed. A total of 17 patients with silicosis and 30 patients with COPD were treated with chest tube drainage. We initially analyzed the patients undergoing chest tube drainage regarding age and clinical parameters including heart rate, (HR), oxygen saturation (SpO_2), oxygen requirement at admission, performance status (PS), respiratory status based on the modified Medical Research Council (mMRC) Grade at the onset of pneumothorax, history of cardiovascular disease (CVD), history of home oxygen therapy (HOT), and previous history of pneumothorax. Radiological images were retrospectively reviewed as follows: (1) the extent of lung collapse was assessed on chest radiographs using Kircher's method; (2) computed tomography (CT) images were evaluated for the presence of pleural adhesions; and (3) chest radiographs were classified based on the International Labour Organization (ILO) guidelines [10].

The patient groups were divided according to the cause of pneumothorax, and were compared based on the type of treatment received. We recorded the duration of chest tube placement, duration of the hospital stay, incidence of recurrent pneumothorax, time interval from the removal of the chest tube to recurrence, and overall survival after pneumothorax. We defined the duration of chest tube placement as: (1) the time from insertion of the chest tube to removal in the case of drainage alone; (2) from the administration of the sclerosing agent to chest tube removal in the case of pleurodesis; and (3) from the time from insertion of the chest tube to the day of surgery in the case of surgical treatment. The requirement for informed consent was waived because of the anonymous nature of the data. The study was approved by our institutional review board (Approval No. 90; April 11, 2017).

2.2. Statistical analysis

Continuous variables are expressed as median and interquartile range (IQR, 25th–75th percentile). Categorical data are expressed as counts and proportions. Continuous variables were analyzed using the Mann-Whitney U test, and categorical variables using Fisher's exact test. Univariate analysis was carried out with the log-rank test, to identify significant variables affecting survival time, for inclusion in a multivariate Cox regression model. Multivariate analyses of independent prognostic factors were performed using a Cox proportional hazards model. The results are presented as estimated relative risks with 95% confidence intervals (CI). Kaplan-Meier curves were plotted, and compared using the log-rank test for univariate analysis.

The data were censored on March 31, 2015. Patients who were lost to follow-up were censored at the date of the last contact/follow-up. Patients who were alive on March 31, 2015, were censored for overall survival analysis. A P value less than 0.05 was considered statistically significant. Statistical analysis was performed using StatMate version 5 (ATMS Publishing, Japan).

3. Results

3.1. Patient characteristics

The patient characteristics are summarized in Table 1. There were no significant differences in mean age, HR, SpO_2, or oxygen requirement at admission between the groups ($P = 0.268$, $P = 0.266$, $P = 0.414$, $P = 0.487$, respectively). Four patients in the silicosis group and five patients in the COPD group were on home oxygen therapy. There were significantly more patients with PS $\geq$ 2 in the silicosis group (14/17; 82.4%) than in the COPD group (16/30; 53.3%, $P = 0.047$). Furthermore, 14 patients with silicosis (14/17; 82.4%) had an mMRC Grade $\geq$ 2 compared to 11 patients with COPD (11/30; 36.7%, $P = 0.026$).