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Spontaneous pneumomediastinum in the pediatric patient

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Abstract

BACKGROUND: Spontaneous pneumomediastinum (SPM) data in children are limited. We investigated the management of SPM at our institution.

METHODS: We reviewed children with pneumomediastinum treated from January 2011 to October 2014. Primary (no precipitating factors) and secondary (underlying respiratory disease) SPM patients were included. Admission data and clinical outcomes were recorded.

RESULTS: A total of 129 patients were included. Average age was 11.6 ± 4.6 years; 90 males (70%). Frequent presenting symptoms were chest pain (n = 76) and dyspnea (n = 51). Of the total, 89 patients (69%) were admitted. No patient required additional interventions. Of those, 85 patients (65.9%) had follow-up.

Patients with secondary SPM (n = 58) were more likely than primary (n = 71) to be admitted (84% vs 56%, $P = .001$), receive oxygen (69% vs 35%, $P = .04$), and have longer stays (2 days [interquartile range, 1 to 3] vs 1 day [interquartile range, 0 to 1], $P < .001$). Readmission rates were equivalent.

CONCLUSIONS: Differentiating types of SPM is important as clinical course differs. Secondary SPM patients are more frequently admitted than primary SPM patients.

Pneumomediastinum (PM) in children is rare and often leads to evaluation for potential tracheobronchial tree injury. The pathogenesis of spontaneous pneumomediastinum (SPM) is hypothesized to be secondary to a sudden increase in intrathoracic pressure that causes an increased intra-alveolar pressure. This sudden increase in pressure gradients in the pulmonary parenchyma theoretically results in alveolar rupture with leaking of air into the interstitium and bronchoalveolar tissue, with a predilection for the mediastinum.[1,2] This sudden drop in pressure can occur either primarily, in a spontaneous fashion with no underlying etiology, or secondarily because of trauma, positive pressure ventilation, intrathoracic infections, or instrumentation of the thoracic cavity.

Although PM secondary to trauma is more frequent[2] and is often concerning for potential airway disruption that warrants further evaluation,[3,4] the management of an incidental finding of primary or SPM is more poorly defined. When children present to the emergency department (ED) with vague chest complaints, no history of trauma or recent thoracic surgery, and an incidental finding of PM,

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practitioners are often conflicted over the appropriate management strategy. Owing to the infrequent nature of this problem and limited published information on this topic, management of such patients is often based on extrapolation from adult studies or personal experience with the condition.[5] Due to the concern for underlying tracheobronchial injury, surgeons are routinely consulted for management decisions in these patients. We sought to evaluate our institutional experience with spontaneous primary PM and characterize the presentation and management strategies in an effort to educate providers on the clinical and respiratory outcomes of these patients.

Methods

Patient population

After institutional review board approval (H-35648), pediatric patients (aged 18 years or less) managed at a single large volume pediatric tertiary care center with the diagnosis of PM based on *International Classification of Diseases*, *9th Revision* codes were evaluated. Charts were reviewed from January 1, 2011 to October 7, 2014. Patients with the diagnosis of SPM were included, whereas patients with iatrogenic PM secondary to chest trauma, mechanical ventilation, or history of recent cardiothoracic surgery were excluded.

Study design and clinical variables

The study was a retrospective chart review. Data were collected with regard to age, sex, vital signs on admission, presenting symptoms, radiographic evaluation, and management strategy. Patients with SPM included in the study were further stratified by primary or secondary etiology of PM. Primary SPM was defined as PM occurring secondary to coughing, choking, Valsalva-like maneuvers, or without any obvious cause. Secondary SPM was defined as patients with asthma exacerbation or underlying pulmonary infections. Outcomes evaluated included hospital admission, time to resolution of SPM, need for intervention after diagnosis, length of hospital stay, clinical outcomes, and return rates to the ED.

Statistical analyses

Statistical analyses were performed using SPSS, version 22.0 (SPSS Inc., Armonk, NY). Frequency distributions between categorical values were compared using chi-square analysis. Summary statistics were presented as frequency and proportions for categorical variables. As patients with secondary SPM were more likely to have underlying medical conditions that could potentially predispose them to different clinical course and outcomes, univariate analyses were performed comparing outcomes between primary and secondary SPM. Continuous data were presented as means with standard deviation or median with interquartile range (IQR) for parametric and nonparametric data, respectively. Data from admission (vital signs, presenting symptoms, and radiographic findings) that were significant on univariate analyses were placed into a multivariate regression. This was used to determine independent predictors of primary or secondary SPM. A P value of less than .05 was determined to be statistically significant.

Results

Patient characteristics

A total of 218 children were identified with PM during the study period. Of those, 89 patients met exclusion criteria leaving 129 patients to be included in the study at an average age of 11.6 ± 4.6 years. Additional patient characteristics can be seen in Table 1. Fifty patients (39%) had a history of asthma.

Hospital course and outcomes

Most patients (n = 68) were transferred to our hospital for radiographic findings of PM identified on chest x-ray (CXR; n = 58) and/or chest computed tomography (CT; n = 30) performed at outside institutions. The median length of symptoms before evaluation in the ED was 1 day

Table 1 Patient characteristics and clinical presentation of patients with SPM

Variables	SPM (n = 129)
Age (y), mean ± SD	11.6 ± 4.6
BMI, median (IQR)	17.4 (15.4–22)
Males, n (%)	90 (70)
Temperature (°F) on admission, median (IQR)	98.4 (98–98.8)
Heart rate on admission (bpm), mean ± SD	104 ± 31
Respiratory rate on admission (bpm), median (IQR)	22 (20–32)
Systolic blood pressure on admission (mm Hg), mean ± SD	118 ± 14
Diastolic blood pressure on admission (mm Hg), mean ± SD	68 ± 9.9
O_2 saturation on admission, median (IQR)	98 (96–100)
WBC on admission, mean ± SD	13.5 ± 6.1
Radiographic findings	
PM alone, n (%)	65 (50)
Subcutaneous air alone, n (%)	0 (0)
PM + subcutaneous air, n (%)	48 (37)
PM + pneumothorax, n (%)	11 (9)
PM + subcutaneous air + pneumothorax, n (%)	5 (4)

BMI = body mass index; IQR = interquartile range; PM = pneumomediastinum; SD = standard deviation; SPM = spontaneous pneumomediastinum; WBC = white blood cell.