34. **Niederman MS.** Making sense of scoring systems in community acquired pneumonia. *Respirology* 2009;**14**:327–35.
35. **Agency for Healthcare Research and Quality.** *Pneumonia severity index calculator*. Rockville, Maryland, 2003. <http://pda.ahrq.gov/psicalc.asp> (accessed 16 Nov 2009).
36. **Altman DG,** Bland M. Diagnostic tests 2: Predictive values. *BMJ* 1994;**309**:102.
37. **Dinnes J,** Deeks J, Kirby J, *et al.* A methodological review of how heterogeneity has been examined in systematic reviews of diagnostic test accuracy. *Health Technol Assess* 2005;**9**:1–113.

Pulmonary puzzle

Dyspnoea, fever, patchy ground-glass opacities and intermittent severe epigastralgia

CLINICAL PRESENTATION

A 33-year-old Japanese man experienced intermittent severe epigastralgia 5 days before admission followed by dyspnoea and fever, and he was hospitalised in acute respiratory failure. He had taken no medications before admission. Bilateral ground-glass opacities were seen on the chest radiograph on admission. The patient received BCG in childhood and had no history of atopy, asthma or any allergies, and did not smoke. On examination, his body temperature was 38.3°C, and oxygen saturation on air was 88%. Mild fine inspiratory crackles were detected by chest auscultation. There were no signs of urticarial rash or angioedema. He had epigastric tenderness without signs of peritoneal irritation.

Laboratory tests revealed the following: white blood cell count, $1.26 \times 10^9/l$; proportion of peripheral eosinophils, 2.3% (normal <7.0%); C-reactive protein, 13.6 mg/dl (normal <0.3 mg/dl); amylase, 120 IU/l; immunoglobulin E, 456 IU/ml (normal <170 IU/ml); and *Aspergillus* precipitins and antinuclear cytoplasmic antibody (ANCA) were negative. Arterial blood gas analysis on air showed a pH of 7.40, P_{aCO_2} of 4.68 kPa (35 mm Hg) and P_{aO_2} of 7.51 kPa (56 mm Hg). High-resolution CT revealed bilateral non-segmental ground-glass opacities that were distributed dominantly in peripheral lesions. Interlobular septal thickening was also noted (figure 1A,B).

Figure 1 Chest high-resolution CT on admission revealed bilateral non-segmental ground-glass opacities and interlobular septal thickenings. (A) Right upper lobe view; (B) left lower lobe view.

Figure 2 Image from oesophagogastroduodenoscopy at the gastric corpus.

We performed immediate bronchoalveolar lavage and trans-bronchial lung biopsy. Severe epigastralgia occurred immediately following the bronchoscopy, so abdominal CT and oesophagogastroduodenoscopy were performed (figure 2). No abnormalities were observed on abdominal CT.

QUESTION

What is the cause of the pulmonary infiltrates and respiratory failure? What are the underlying cause and significance of the intermittent severe epigastralgia? What diagnostic test can confirm the diagnosis?

See page 920 for the answer

Naoya Hijikata,^{1,2} Noboru Takayanagi,² Yutaka Sugita,² Yoshinori Kawabata³

¹Department of Internal Medicine, Saitama Kyoudou Hospital, Saitama, Japan;

²Department of Respiratory Medicine, Saitama Cardiovascular and Respiratory Center, Saitama, Japan; ³Division of Pathology, Saitama Cardiovascular and Respiratory Center, Saitama, Japan

Correspondence to Dr Naoya Hijikata, Department of Internal Medicine, Saitama Kyoudou Hospital, 1317 Kizoro, Kawaguchi, Saitama 333-0831, Japan; n.hijikata-rocaltrain.1016@r7.dion.ne.jp

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Thorax 2010;**65**:890. doi:10.1136/thx.2010.136655

28. van Ewijk BE, Wolfs TF, Fleer A, *et al.* High *Pseudomonas aeruginosa* acquisition rate in CF. *Thorax* 2006;**61**:641–2.
29. van Ewijk BE, van der Zalm MM, Wolfs TF, *et al.* Prevalence and impact of respiratory viral infections in young children with cystic fibrosis: prospective cohort study. *Pediatrics* 2008;**122**:1171–6.
30. Ratjen F, Walter H, Haug M, *et al.* Diagnostic value of serum antibodies in early *Pseudomonas aeruginosa* infection in cystic fibrosis patients. *Pediatr Pulmonol* 2007;**42**:249–55.
31. West SE, Zeng L, Lee BL, *et al.* Respiratory infections with *Pseudomonas aeruginosa* in children with cystic fibrosis: early detection by serology and assessment of risk factors. *JAMA* 2002;**287**:2958–67.
32. Jaques A, Daviskas E, Turton JA, *et al.* Inhaled mannitol improves lung function in cystic fibrosis. *Chest* 2008;**133**:1388–96.
33. Waters V, Ratjen F. Multidrug-resistant organisms in cystic fibrosis: management and infection-control issues. *Expert Rev Anti Infect Ther* 2006;**4**:807–19.

Pulmonary puzzle

ANSWER

From the questions on page 890

Analysis of bronchoalveolar lavage from the right B₅ segment revealed a total cell count increase of $7.8 \times 10^5/\text{ml}$ with 50% eosinophils. No bacteria or tubercle bacilli were detected in the bronchoalveolar lavage fluid. Eosinophilic infiltration with degranulation and fibrin was seen in the transbronchial lung biopsy specimen (figure 1A,B). These histopathological findings are consistent with eosinophilic pneumonia (EP).

Oesophagogastroduodenoscopy revealed an *Anisakis simplex* on the gastric body mucosa. After removal of the parasite with endoscopic biopsy forceps (figure 2), the patient's severe epigastralgia, dyspnoea, cough, fever and respiratory failure improved almost immediately without steroid treatment. Radiographic abnormalities improved remarkably at 3 days after removal of the *Anisakis*. Because improvement of the patient's EP occurred only after removal of the *Anisakis*, our ultimate diagnosis was EP due to gastric anisakiasis.

Although various parasitic diseases can cause EP,¹ there have been no reports implicating *Anisakis*. Anisakiasis can be responsible for four clinical forms of illness in humans: gastric, intestinal and ectopic anisakidosis, and allergic forms.² Three cases have been reported in which the *Anisakis* was located in the intrathoracic area rather than the gastrointestinal tract.^{3–5} Allergic patients suffering from anaphylaxis can exhibit bronchospasm, urticaria, angioneurotic oedema and digestive symptoms.²

Figure 1 Histopathological findings of transbronchial lung biopsy. Eosinophilic infiltration (arrows) and fibrin depositions (arrowheads) are seen. (A) $\times 20$ magnification; (B) $\times 40$ magnification.

Figure 2 Oesophagogastroduodenoscopy revealed an *Anisakis* at the gastric corpus. The *Anisakis* was removed with endoscopic biopsy forceps.

Our patient frequently ate raw seafood such as squid and *saba* (mackerel) before admission and was positive for the *A simplex* antibody by radioallergosorbent test. Therefore, we thought this to be a case of fulminant-type gastric anisakiasis with sensitisation and Arthus-type hypersensitivity reaction. Such allergic reactions might possibly cause EP.

Thorax 2010;**65**:920. doi:10.1136/thx.2010.136655

REFERENCES

1. Chitkara RK, Krishna G. Parasitic pulmonary eosinophilia. *Semin Respir Crit Care Med* 2006;**27**:171–84.
2. Audicana MT, Kennedy MW. *Anisakis simplex*: from obscure infectious worm to inducer of immune hypersensitivity. *Clin Microbiol Rev* 2008;**21**:360–79.
3. Matsuoka H, Nakama T, Kisanuki H, *et al.* A case report of serologically diagnosed pulmonary anisakiasis with pleural effusion and multiple lesions. *Am J Trop Med Hyg* 1994;**51**:819–22.
4. Kobayashi A, Tsuji M, Wilbur DL. Probable pulmonary anisakiasis accompanying pleural effusion. *Am J Trop Med Hyg* 1985;**34**:310–13.
5. Saito W, Kawakami K, Kuroki R, *et al.* Pulmonary anisakiasis presenting as eosinophilic pleural effusion. *Respirology* 2005;**10**:261–2.