Respiratory Medicine Case Reports 37 (2022) 101638

Contents lists available at ScienceDirect

Respiratory Medicine Case Reports

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

Case report

Loeffler's syndrome mimicking lung tumor and pneumonia in a child: A case report

Bui-Binh-Bao Son [a,b,*], Nguyen-Thi Kim-Hoa [b], Nguyen-Van Tuy [a], Nguyen-Manh Phu [b], Nguyen-Duy Nam-Anh [a]

[a] Department of Pediatrics, Hue University of Medicine and Pharmacy, Hue University, Viet Nam
[b] Pediatric Center, Hue Central Hospital, Viet Nam

ARTICLE INFO

Keywords:
Loeffler's syndrome
Eosinophilic pneumonia
Lung tumor
Pneumonia
Child

ABSTRACT

Loeffler's syndrome is a rare and benign eosinophilic pneumonia which is commonly transient and self-limiting. Herein we report a 12-year-old boy who presented with dry cough, hemoptysis, chest pain, no fever and diminished breath sounds on the right lung. Chest imaging showed a consolidation lesion with bronchograms in the right upper and middle lobes, accompanied by a right free-flowing pleural effusion. Laboratory studies showed elevated C-reactive protein levels, and an eosinophil count of 13.7%. A lung biopsy was performed to diagnose the Loeffler's syndrome. The patient's condition was improving significantly with antibiotic therapy and is now followed up closely.

1. Introduction

Loeffler's syndrome, a transient respiratory illness associated with blood eosinophilia and radiographic shadowing, was defined by Wilhelm Loeffler in 1932 [1–3]. In 1952, Crofton et al. suggested the classification of the pulmonary eosinophilias into five major groups according to the basis of clinical criteria: (1) simple pulmonary eosinophilia or Loeffler's syndrome, transient infiltrations; (2) prolonged pulmonary eosinophilia, prolonged or recurrent infiltrations without asthma; (3) pulmonary eosinophilia with asthma, infiltrations with asthma; (4) tropical pulmonary eosinophilia, usually with asthmatic symptoms; (5) polyarteritis nodosa [4]. These diseases were characterized by pulmonary opacities associated with tissue or peripheral eosinophilia [5]. The early description of Loeffler's syndrome listed *Ascaris lumbricoides* as the most common etiology; but other acute hypersensitivity reactions to medications and parasitic infections were included as causes for simple pulmonary eosinophilia. Loeffler's syndrome is considered a benign, self-limiting disease without significant morbidity [6,7]. Symptoms usually subside within 3–4 weeks or shortly after the offending medication is withdrawn in drug-induced pulmonary eosinophilia [8].

2. Case report

A previously healthy 12-year-old boy, from Quang Binh province, Viet Nam was admitted to Hue Central Hospital after having experienced dry cough, small-volume hemoptysis twice at home, chest pain and without fever for 1 week. These only two episodes of hemoptysis were resolved without any treatment. His family and he didn't have any special illness, and medication intake history. On admission, he still looked well, had dry cough, no fever, no respiratory distress, no enlarged peripheral lymph nodes, and diminished

* Corresponding author. Department of Pediatrics, Hue University of Medicine and Pharmacy, Hue University; 6 Ngo Quyen street, Hue city, Viet Nam; ;
E-mail addresses: bbbson@hueuni.edu.vn, bbbson@huemed-univ.edu.vn (B.-B.-B. Son).

https://doi.org/10.1016/j.rmcr.2022.101638
Received 11 November 2021; Received in revised form 23 January 2022; Accepted 17 March 2022
Available online 21 March 2022

breath sounds on the right lung. A chest X-ray was done and showed opacity in the right middle lung zone (Fig. 1), thus the initial diagnosis was pneumonia. With a large opacity in the right middle lung region and feverless throughout the disease's course, a chest CT scan was performed to differentiate pneumonia from a lung tumor. The chest CT scan showed a consolidation measuring 22 × 31 × 28mm with surrounding ground-glass opacity in the upper edge of the right lung hilum (Fig. 2). Laboratory studies showed elevated white blood cell count (14.500/mm^3), with an eosinophil percentage of 13.7%, slight elevated CRP level, negative parasite serology tests; and normal serum IgE, LDH, uric acid levels. In order to confirm the diagnosis, a needle biopsy of the lung lesion was done, then the patient was treated with antibiotics (ceftazidime and vancomycin) pending the results of histopathology based on our hospital guidelines for cases where the diagnosis is not clear between pneumonia and lung tumor.

High fever then appeared. The laboratory tests showed elevated white blood cell count (20.000/mm^3) and a very high CRP level (201 mg/l). The second chest CT scan revealed a consolidation with pretty clear boundaries measuring 40 × 46 × 38mm, and bronchograms within the lesion in the right upper and middle lobes; accompanied by a right free-flowing pleural effusion measuring 46mm (Fig. 3). Thoracentesis under ultrasound guidance was performed and the pleural fluid studies showed: total protein 64 g/L, lactate 13.5 mmol/L, glucose 0.3 mmol/L, LDH 3563 UI/L; red cells 145.200/mm^3; white cells 950/mm^3 (80% neutrophils, 15% lymphocyte); no malignant cells; and negative gram's stain. Lung biopsy showed large numbers of inflammatory cells; of these, 60% were eosinophils and 40% were neutrophils (Fig. 4).

After a multidisciplinary team discussion, the patient was diagnosed with Loeffler's syndrome with complication of secondary bacterial pneumonia; and antibiotic therapy was switched to meropenem and linezolid.

The patient responded well to treatment. His temperature normalized after 3 days treated with meropenem plus linezolid. Breath sounds on the right lung improved, and complete blood count and CRP returned to normal range. Chest CT scan on day 44 of admission (Fig. 5) showed significant shrinking of the right consolidation, and almost completely reducing the right pleural effusion.

3. Discussion

As first described in 1932 by Wilhelm Loeffler, Loeffler's syndrome typically presents as a triad of respiratory symptoms, an abnormal chest radiograph (with the constellation of ephemeral and migratory pulmonary infiltrates), and peripheral blood eosinophilia [9]. True Loeffler's syndrome is a disease on the spectrum of eosinophilic lung diseases including acute eosinophilic pneumonia, chronic eosinophilic pneumonia, Churg-Strauss syndrome, and hypereosinophilic syndromes [9,10].

The cause of Loeffler's syndrome was not known by Loeffler in his early description, but circumstantial evidence suggested it might be caused by parasites, fungi, bacterial infections, and agents in drugs or unknown etiology [11]. Among all the possible causes, *Ascaris lumbricoides* is the most common cause [3,8,10,12,13]. The life-cycle of Ascaris in the human host is complicated, starting with ingestion of infective, larvated Ascaris eggs. After ingestion of Ascaris eggs, larvae hatch in the intestine, cecum, or upper colon, then they go into the bloodstream via the portal system, and migrate to the liver. After that, they are carried to the capillary-alveolar interface of the lung, subsequently migrating through parenchyma and airways where they both cause mechanical tissue damage and stimulate a marked immune response [3,10,14]. Thus, the accumulation of eosinophil-mediated inflammatory reactions within the airways and lung parenchyma occur. The eosinophilic count may be elevated in sputum, peripheral blood, bronchoalveolar, or lung lesions.

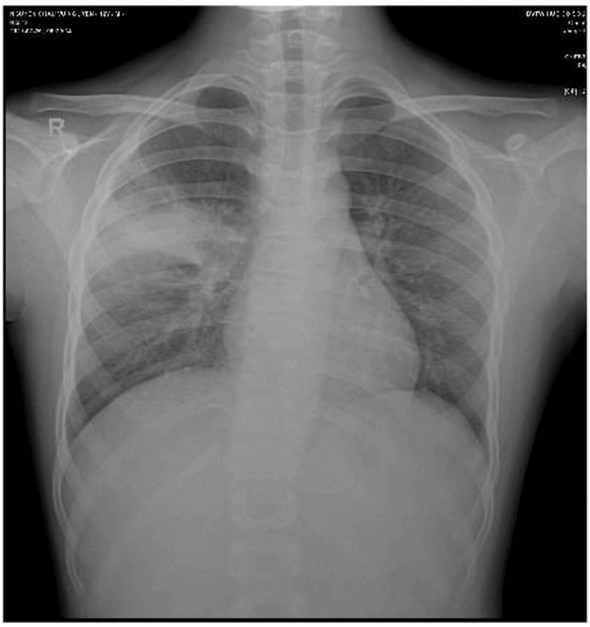

Fig. 1. Initial chest radiograph showing opacity in the right middle lung zone.

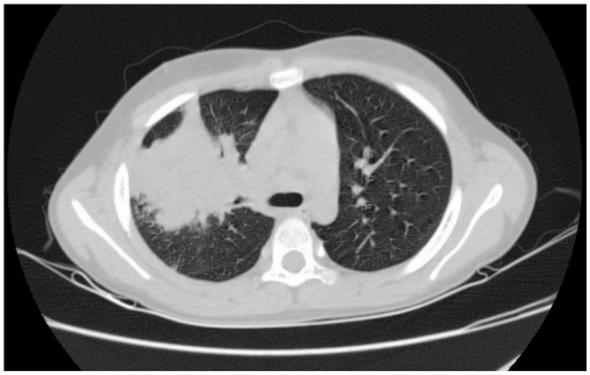

Fig. 2. Initial chest CT scan showing a consolidation measuring 22 × 31 × 28mm with surrounding ground-glass opacity in the upper edge of the right lung hilum.

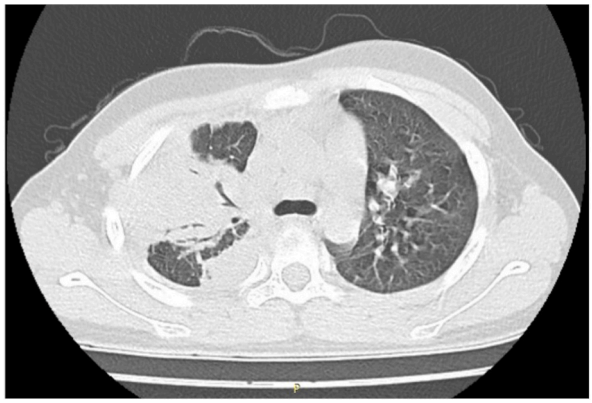

Fig. 3. Chest CT scan on day 17 of admission showing a consolidation measuring 40 × 46 × 38mm, with bronchograms within the lesion in the right upper and middle lobes; accompanied by a right free-flowing pleural effusion measuring 46mm.

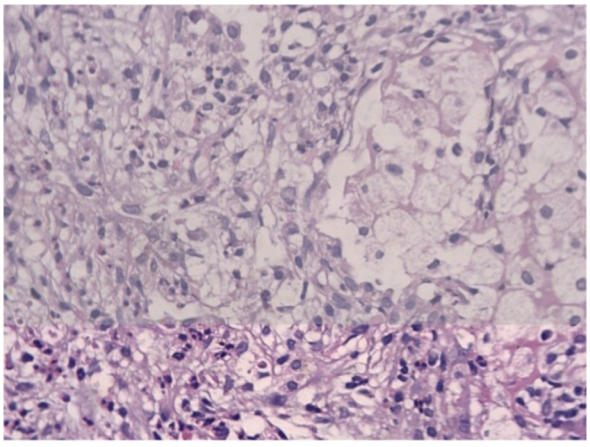

Fig. 4. Lung lesion tissue biopsy under 400× magnification demonstrating large numbers of inflammatory cells; of these, 60% were eosinophils and 40% were neutrophils.

In the immunocompetent host, symptoms of Loeffler's syndrome are often mild or absent and may spontaneously improve. The classic symptoms are dry irritating cough, wheezing and/or rales, subjective dyspnea, and rare sign of hemoptysis. Although eosinophilic lung diseases are diverse, the diagnosis can be made if any of the following findings are present: (1) peripheral blood eosinophilia and chest X-ray infiltrates; (2) tissue eosinophilia confirmed at either open or transbronchial lung biopsy; (3) increased eosinophils in bronchoalveolar lavage fluid [15]. In our case, these classic signs and symptoms included dry cough, hemoptysis two times at home, chest pain and without fever for a week, diminished breath sounds on the right lung. Fever just appeared after doing a

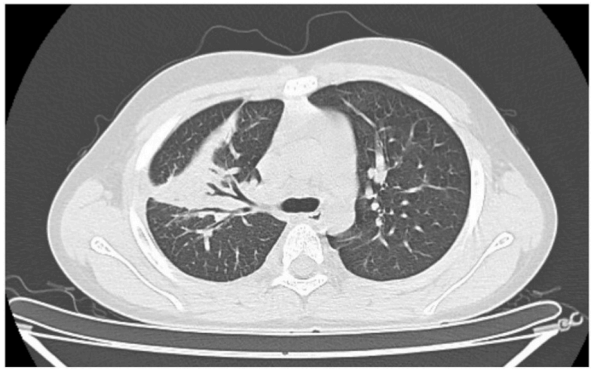

Fig. 5. Follow-up chest CT scan on day 44 of admission showing magnificent improvement of the right consolidation.

needle biopsy of lung lesion. Elevated white blood cell count (20.000/mm^3) and very high CRP level could demonstrate bacterial infection after invasive procedure. Moreover, the abnormal chest radiographs and chest CT scans were the most prominent signs. With the lung biopsy result showing large numbers of inflammatory cells, of these, eosinophils counted for 60%; and peripheral eosinophilia of 13.7%; and no malignant cells found in the pleural fluid studies, the patient was diagnosed with Loeffler's syndrome with complication of secondary bacterial pneumonia. However, with the negative parasite serology and blood culture tests, and the patient had no history of medication use, it is difficult to find the etiologic agents.

Classically, Loeffler's syndrome is considered a benign, self-limiting disease [10,16]. Notably, our patient responded well to antibiotic therapy. His temperature normalized after a 3-day treatment with meropenem plus linezolid. Breath sounds on the right lung improved, and complete blood count and CRP returned to normal range. A follow-up chest CT scan obtained 44 days after the previous image showed significant shrinking of the right consolidation, and almost completely reducing right pleural effusion.

4. Conclusion

Loeffler's syndrome is a rare and self-limited disease. Respiratory symptoms, pulmonary opacities on chest radiograph, and peripheral blood eosinophilia or tissue eosinophilia from lung biopsy, are the criteria to diagnose. It should be diagnosed after careful consideration to rule out the differential diagnosis. Monitoring response to treatment is also a criterion to strengthen the diagnosis.

Patient consent

Written informed consent was obtained from his mother after the mother was fully informed. This report does not contain any personal information that could lead to the identification of the patient.

Funding

No funding or grant support was received for this work.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Author contributions

BBBS: Contributed to conception and design; contributed to acquisition; draft manuscript; critically revised manuscript; gave final approval; agrees to be accountable for all aspects of work ensuring integrity and accuracy. **NTKH:** Contributed to conception; gave final approval. **NVT:** Contributed to conception; gave final approval, **NMP**: Contributed to conception; gave final approval. **NDNA**: Contributed to conception; gave final approval.

Declaration of competing interest

The following authors have no financial disclosures.

Acknowledgments

The authors are grateful to A/Prof. Dang Cong Thuan and Ph.D. Pham Nguyen Cuong and physicians, administrative staff at the Pediatric Center of Hue Central Hospital for allowing us to undertake this research.

References

[1] I. Meta-Jevtovic, M.S. Tomovic, S. Mojsilovic, et al., [Non allergic simple eosinophilic pneumonia–Loffler syndrome–a case report study], Med. Pregl. 61 (2008) 643–646, https://doi.org/10.2298/mpns0812643m, 2009/04/17.

[2] M. Te Booij, E. de Jong, H.J. Bovenschen, Löffler syndrome caused by extensive cutaneous larva migrans: a case report and review of the literature, Dermatol. Online J. 16 (10) (2010 Oct 15) 2. PMID: 21062596.

[3] D.M. Savani, O.P. Sharma, Eosinophilic lung disease in the tropics, Clin. Chest Med. 23 (2) (2002 Jun) 377–396, https://doi.org/10.1016/s0272-5231(01)00012-0, ix.

[4] J.W. Crofton, J.L. Livingstone, N.C. Oswald, A.T. Roberts, Pulmonary eosinophilia, Thorax 7 (1) (1952 Mar) 1–35, https://doi.org/10.1136/thx.7.1.1.

[5] Y.J. Jeong, K.I. Kim, I.J. Seo, C.H. Lee, K.N. Lee, K.N. Kim, et al., Eosinophilic lung diseases: a clinical, radiologic, and pathologic overview, Radiographics 27 (3) (2007 May-Jun) 617–637, https://doi.org/10.1148/rg.273065051.

[6] J. Fine, Loeffler's syndrome? Arch. Dermatol. 115 (6) (1979 Jun) 677–678. PMID: 453867.

[7] A.M. Tocker, Transitory pulmonary infiltrations (Loeffler's syndrome) with case report, J. Allergy 20 (1949) 211–221, https://doi.org/10.1016/0021-8707(49)90098-2, 1949/05/01.

[8] A. Celandroni, L. Cinquanta, U.E. Lagrasta, et al., [Loeffler syndrome and Mycoplasma pneumonitis. A case report], Minerva Pediatr 54 (2002) 243–247, 2002/06/19.

[9] D.M. Rose, D.E. Hrncir, Primary eosinophilic lung diseases, Allergy Asthma Proc. 34 (1) (2013 Jan-Feb) 19–25, https://doi.org/10.2500/aap.2013.34.3628.

[10] K. Gipson, R. Avery, H. Shah, D. Pepiak, R.E. Bégué, J. Malone, et al., Löffler syndrome on a Louisiana pig farm, Respir. Med. Case. Rep. 19 (2016 Sep 16) 128–131, https://doi.org/10.1016/j.rmcr.2016.09.003.

[11] S. Ekin, B. Sertogullarindan, H. Gunbatar, A. Arisoy, H. Yildiz, Loeffler's syndrome: an interesting case report, Clin. Res. J 10 (1) (2016 Jan) 112–114, https://doi.org/10.1111/crj.12173.

[12] O. Ozdemir, Loeffler's syndrome: a type of eosinophilic pneumonia mimicking community-acquired pneumonia and asthma that arises from Ascaris lumbricoides in a child, North. Clin. Istanb. 7 (5) (2020 Aug 5) 506–507, https://doi.org/10.14744/nci.2020.40121.

[13] N. Narula, R. Mahajan, M. Rohit, Loeffler's syndrome, Pediatr. Cardiol. 31 (6) (2010 Aug) 931–932, https://doi.org/10.1007/s00246-010-9732-7.

[14] P. Akuthota, P.F. Weller, Eosinophilic pneumonias, Clin. Microbiol. Rev. 25 (4) (2012 Oct) 649–660, https://doi.org/10.1128/CMR.00025-12.

[15] J.N. Allen, W.B. Davis, Eosinophilic lung diseases, Am. J. Respir. Crit. Care Med. 150 (5 Pt 1) (1994 Nov) 1423–1438, https://doi.org/10.1164/ajrccm.150.5.7952571.

[16] R. Spener, I. Safe, D.C. Baia-da-Silva, M.V.G. de Lacerda, M. Cordeiro-Santos, Löeffler's syndrome, Int. J. Infect. Dis. 89 (2019 Dec) 79–80, https://doi.org/10.1016/j.ijid.2019.09.011.