American Journal of Emergency Medicine 37 (2019) 1215.e1–1215.e4

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

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

Case Report

Tetratrichomonas in pyopneumothorax

Nian Dong [a], Xuewen Jin [c], Juhong Huang [c], Kunlun Chen [c], Yuping Li [a], Chengshui Chen [a], Dongwei Hu [b,*], Yupeng Xie [a,*]

[a] Department of Respiratory and Critical Care Medicine, The First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China
[b] Department of Laboratory Medicine, The First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China
[c] Department of Respiratory and Critical Care Medicine, the People's Hospital of Yuhuan Country, Taizhou, China

ARTICLE INFO

Article history:
Received 27 February 2019
Accepted 20 March 2019

Keywords:
Pleural trichomonosis
Trichomonad
Tetratrichomonas

ABSTRACT

Pleural trichomonosis is clinically rare, and very few cases of trichomonal empyema have been reported so far. A rare case of an 81-year-old woman with pyopeumothorax presenting with recurrent fever and macroscopic pyuria was present. Microscopic examination of the pleural effusion showed mobile flagellated protozoa which molecular methods identified as *Tetratrichomonas*. In addition, *Streptococcus anginosus* was discovered in pleural fluid cultures. Treatment with imipenem/cilastatin and metronidazole successfully eliminated the pathogens and led to relief of clinical symptoms. In the context of a review of the relevant literature, the clinical application of molecular methods in the diagnosis of pleural trichomonosis is underlined.

1. Introduction

Pleural trichomonosis is a clinically rare event, and very few cases of trichomonal empyema have been reported. In recent years pleural trichomonosis has emerged as a subject of interest as detection methods shift to molecular identification rather than microscopic examination [1]. The present molecular and phylogenetic identification of trichomonad species in trichomonal empyema primarily includes *Trichomonastenax* (*T. tenax*), *Trichomonasvaginalis* (*T. vaginalis*) and *Pentatrichomonashominis* (*P. hominis*) [2]. In contrast to the commensal organisms *Trichomonastenax*, *Trichomonasvaginalis* and *Pentatrichomonashominis*, *Tetratrichomonas* is a newly recognized human-host-adapted trichomonal species [3]. In addition to isolation from the oral cavity and bronchi, the discovery of tetratrichomonas in empyema raised the question of the zoonotic potential of trichomonads. To our knowledge, only 4 cases of tetratrichomonas infestation of pleural empyema have been reported in the English-language medical literature to date [4-6]. Herein the case report covers a case of pyopneumothorax co-infected with *Tetratrichomonas* species and *Streptococcus anginosus* manifesting as recurrent fever. This review of disease characteristics within this rare case as well as relevant reported literature may contribute to recognition of the disease.

2. Case report

The patient, an 81 year old female, lives locally in Yuhuan Country. She was admitted to the People's Hospital of Yuhuan Countryon June 5, 2018 due to repeated fever and macroscopic pyurialasting4 days. Before admission, she was asked to be treated with 2 g qd of ceftriaxone for anti-infection supplemented with alcohol perineal local disinfection for 3 days in the local hospital. This achieved relief of macroscopic pyuria but fever was still present. CT examination of chest and abdomen in the Outpatient Department in our hospital on June 5, 2018 showed two lung infections, left purulent pneumothorax, left pleural effusion of encapsulation, and a slightly narrow left bronchus (Fig. 1a, b, c, d). The patient had past history of type 2 diabetes for more than 20 years treated with acarbose and repaglinide, history of hypertension for more than 20 years treated with nitrendipine, and history of cerebral infarction15 years prior leading to persistent right limb weakness. She suffered a second cerebral infarction 3 months ago and was left with unclear speech. She denied a history of hepatitis B, tuberculosis or other infectious diseases. Hospital physical examination showed that her temperature was 37.8 °C, heart rate was 102 times/min, blood pressure was 136/76 mm Hg (1 mm Hg = 0.133 kPa), breathing rate was 22 times/min, lip had no cyanosis, left lung respiratory movement decreased, left chest percussion gave dull sounds, heard wet rale in bottom left lung, right lung sound was normal no dry or wet rale. Moreover, WBC was 24.7×10^9/L, neutrophil percentage was 94%, lymphocyte percentage was 2.1%, eosinophil percentage was 0.0%, c-reactive protein was 200.85 mg/L, procalcitonin was 4.950 ng/ml, blood glucose was 6.2 mmol/L, albumin was 26.8 g/L, creatinine was 43 μmol/L. The pleural effusion was yellow and turbid with nuclear cell count of 46,000/μl,

* Corresponding authors.
E-mail addresses: chenkl1978@dingtalk.com (K. Chen), kexianboy@163.com (D. Hu), xieyp2002@126.com (Y. Xie).

https://doi.org/10.1016/j.ajem.2019.03.029
0735-6757/

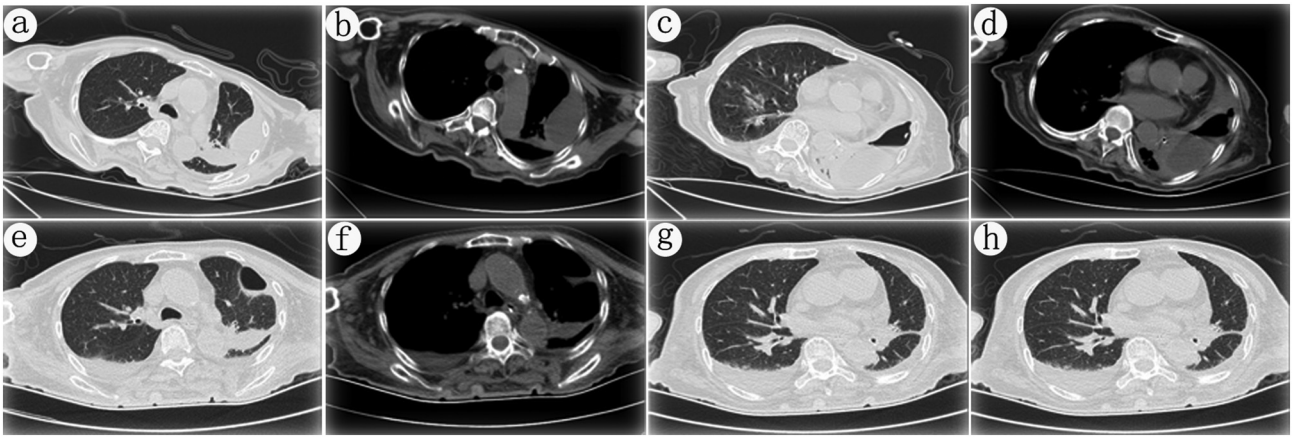

Fig. 1. Chest CT (2018.6.5) demonstrated a left-side pleural effusion with compressive atelectasis of the left lower lobe (a, b, c, d). Chest CT (2018.6.15) revealed the left pleural effusion was partially resolved (e, f, g, h).

neutrophil percentage was 85%, lymphocyte percentage was 10%, and eosinophil percentage was 0.0%. Rivalta test was positive, and microscopy showed that active protozoa was similar to trichomonas (Fig. 2a). *Tetratrichomonas* was identified by PCR in pleural effusion (Fig. 2b), and *Sterptococcus anginosus* was cultured from pleural effusion. Microscopic examination for *Trichomonas both in oral cavity* and pharynx was negative. Urine WBC was 692/μl, *Escherichia coli* cultured the urine were positive for ESBL drug sensitivity and trichomonas microscopic examination was negative. After admission, the patient was given tienam and metronidazole injections for anti-infection. Re-examination of the chest by CT on June 15, 2018 showed absorption of bilateral lung infection and left empyema; a new case of pneumothorax of the left upper lobe, absorption of left pleural effusion with encapsulation, a slight narrowing of left bronchus, and a new case of right pleural effusion (Fig. 1e, f, g, h). Re-examination showed that blood WBC, CRP, pleural fluid examination and urine examination were gradually improved, and no trichomonas was found by hydrothorax microscopic examination. The patient was in stable condition, and she was discharged with medicine with follow-up so far.

3. Discussion

Pleural trichomonosis was once thought to be a rare clinical event; however, current advances in molecular biology imply that the exact occurrence rate has been substantially underestimated over the past decades. In comparison with the well-known pathogenic and causative role of *T. vaginalis* in vaginitis, pleural trichomonosis involves multiple distinct trichomonad species. *T. tenax*, which is a harmless and forms a commensal relationship within the human oral cavity, is suspected to be responsible for pleural trichomonosis by means of aspiration from the oropharynax [7]. Secondary to *T. tenax*, *T. vaginalis* by means of maternal transmission in the process of delivery and *P. hominis* by means of orofaecal contamination may be involved in pleural trichomonosis [8,9]. *T. tenax*, *T. vaginalis* and *P. hominis* are three distinct trichomonad species which parasitize the human oral cavity, vagina and intestine respectively, and the discovery of these trichomonal organisms in the thorax outside of their natural habitats suggests they may cause Pleural trichomonosis.

In addition to the three previously mentioned common trichomonad species, a rare trichomonad species, *Tetratrichomonas*, was identified in the pyopneumothorax in the present case report. The human-host-adapted species *Tetratrichomonas* was thought to be of animal origin and parasitize the oral cavity and bronchi of predisposed patients with chronic pulmonary diseases. As for the entry of *Tetratrichomonas* into the thorax, the patient's history of cerebral infarction suggests the possibility of aspiration from oropharyngeal secretions. However, similar to reported pulmonary trichomonosis, microscopic examination for *Tetratrichomonas* in sputum, oral wash and urine came back negative [10]. Previous studies suggest that the number of *Tetratrichimonas* in oral–wash is relatively limited and the conventional detection method is not sensitive enough to detect them [11]. However, molecular analysis was only adopted for pleural effusion rather than oral-wash and urine in the present case.

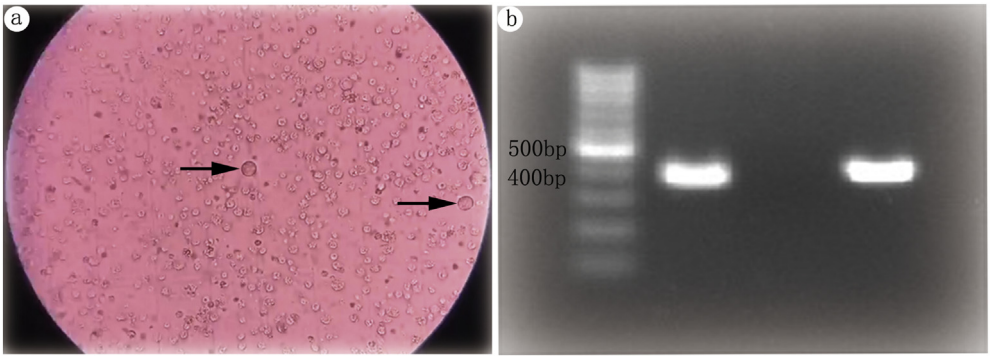

Fig. 2. Microscopic examination of wet preparation of empyema fluid mobile flagellated protozoans (a). The eleltropherogram of 18s rRNA gene PCR product, the sequence as follows pleural fluid, negative control (Human DNA) and positive control (*T. vaginalis*) (b).

Table 1
Characteristics of the 4 reported cases of Tetratrichomonas-associated pleural empyema.

Character of pleural effusion	Microscopic examination	Molecular analysis	Bacterial co-infection	Therapy	Prognosis	Ref
Foul-smelling and purulent	Flagellate	Tetratrichomonas species	Yes	AMX,MTZ	Better	[4]
Purulent, brownish, and fetid	Flagellate	Tetratrichomonas species	Yes	TAZ/PIPC, MTZ		[5]
Purulent, brownish, and fetid	Flagellate	Tetratrichomonas species	Yes	TAZ/PIPC, MTZ		[5]
Brown, fetid pus	Flagellate	Tetratrichomonas species	Yes	MEPM,MTZ	Death	[6]

AMX: amoxicillin, MTZ: metronidazole, TAZ/PIPC: tazobactam/piperacillin, MEPM: meropenem.

The presence of bacteria as well as microaerophilic conditions is necessary for the proliferation of trichomonad in the thorax [12,13]. In agreement with published literature, routine pathogen culture of the purulent pleural effusion showed the existence of *Streptococcus anginosus*, which *Tetratrichomonas* was thought to feed on. Pyopneumothorax/empyema is a serious complication of pulmonary infection and the pathogenic microorganism is supposed to be identical. However, given the impaired tolerance to bronchoscope in aged woman, bronchoalveolar lavage fluid (BALF) was not collected for further bacterial culture or trichomonad detection. We hypothesized that the *Streptococcus anginosus* and *Tetratrichomonas* entered the respiratory tract by aspiration at disease onset such as in the condition of pneumocystis pneumonia (PCP) [14]. Still, the pathogenic role of *Streptococcus anginosus* and *Tetratrichomonas* in the pathogenesis of pyopneumothorax remains to be elucidated. On admission the broad-spectrum antibiotic imipenem/cilastatin was administered with regard to the clinical manifestations of pyopneumothorax and macroscopic pyuria, and the ineffectiveness of ceftriaxone used outside the hospital. Upon the discovery of trichomoad through wet preparation evaluation of empyema fluid, metronidazole was added to the antibiotic regimen. A rapid improvement of the clinical symptoms was observed 2 weeks later.

To better understand the diverse clinical manifestations and therapeutic outcomes of tetratrichomonas-associated pleural empyema, a systemic review of the relevant reports published in the PUBMED database with key words “pleural” and “tetratrichomonas” was carried out. A total of 4 case reports of tetratrichomonas-associated pleural empyema were found (reviewed in Table 1).

Over past decades trichomonal species have not been characterized owning to the effectiveness of metronidazole in eradicating trichomonal species; however, it is important to accurately identify trichomonal species in the era of precision medicine. Microscopic examination is usually limited to the trichomonas genus. Moreover, the diagnosis of trichomonosis is often neglected even by expert parasitologists [8]. The present clinical application of molecular methods such as polymerase chain reaction (PCR) and next-generation sequencing (NGS) would significantly contribute to identification at the species level and the discovery of new species [15]. Despite the rarity of pleural trichomonosis in the clinic, the potential occurrence of trichomonad should be taken into consideration and pleural trichomonosis should be included in the differential diagnosis of pleural effusion. With the systematic usage of molecular biology, the prevalence of the pleural trichomonosis as well as incriminated trichomonal species may become better characterized in the future.

Acknowledgement

We would like to thank CJS and LJL from Department of Respiratory and Critical Care Medicine, The First Affiliated Hospital of Wenzhou Medical University, for the careful revision of the manuscript.

Funding

Not applicable.

Availability of data and materials

Not applicable.

Author's contributions

ND and XWJ drafted the manuscript and interpretation of data, YPX, WDH, YPL and CCS collected the primary data, generated the figures, JHH and KLC contributed to the literature review. All authors read and approved the manuscript.

Ethics approval and consent to participate

Not applicable.

Patient consent for publication

Written informed consent for publication of the clinical details was obtained from the patient.

Competing interests

The authors declare that they have no competing interests.

Author's information

ND is the resident of Department of Respiratory and Critical Care Medicine, The First Affiliated Hospital of Wenzhou Medical University, Wenzhou, China.

References

[1] Duboucher C, Pierce RJ, Capron M, Dei-Cas E, Viscogliosi E. Recent advances in pulmonary trichomonosis. Trends Parasitol 2008;24:201–2.
[2] Leterrier M, Morio F, Renard BT, Poirier AS, Miegeville M, Chambreuil G. Trichomonads in pleural effusion: case report, literature review and utility of PCR for species identification. New Microbiol 2012;35:83–7.
[3] Kutisova K, Kulda J, Cepicka I, Flegr J, Koudela B, Teras J, et al. Tetratrichomonads from the oral cavity and respiratory tract of humans. Parasitology 2005;131:309–19.
[4] Mantini C, Souppart L, Noel C, Duong TH, Mornet M, Carroger G, et al. Molecular characterization of a new Tetratrichomonas species in a patient with empyema. J Clin Microbiol 2009;47:2336–9.
[5] Lopez-Escamilla E, Sanchez-Aguillon F, Alatorre-Fernandez CP, Aguilarzapata D, Arroyoescalante S, Arellano T, et al. New tetratrichomonas species in two patients with pleural empyema. J Clin Microbiol 2013;51:3143–6.
[6] Arase M, Yamashita M, Mimasu M, Mizuno S, Yamada K, Ohkusu K. A first case report of empyema caused by Tetratrichomonas species in Japan. Rinsho Byori 2014;62:1197–202.
[7] Porcheret H, Maisonneuve L, Esteve V, Jagot JL, Le Pennec MP. Pleural trichomoniasis due to trichomonas tenax. Rev Mal Respir 2002;19:97–9.
[8] Jongwutiwes S, Silachamroon U, Putaporntip C. Pentatrichomonas hominis in empyema thoracis. Trans R Soc Trop Med Hyg 2000;94:185–6.
[9] Hoffman DJ, Brown GD, Wirth FH, Gebert BS, Bailey CL, Anday EK. Urinary tract infection with Trichomonas vaginalis in a premature newborn infant and the development of chronic lung disease. J Perinatol 2003;23:59–61.
[10] Shiota T, Arizono N, Morimoto T, Shimatsu A, Nakao K. Trichomonas tenax empyema in an immunocompromised patient with advanced cancer. Parasite (Paris, France) 1998;5:375–7.
[11] Mallat H, Podglajen I, Lavarde V, Mainardi JL, Frappier J, Cornet M. Molecular characterization of Trichomonas tenax causing pulmonary infection. J Clin Microbiol 2004;42:3886–7.

[12] Bellanger AP, Cabaret O, Costa JM, Foulet F, Bretagne S, Botterel F. Two unusual occurrences of trichomoniasis: rapid species identification by PCR. J Clin Microbiol 2008;46:3159–61.
[13] Duboucher C, Gerbod D, Noel C, Durand-Joly I, Delgado-Viscogliosi P, Leclerc C, et al. Frequency of trichomonads as coinfecting agents in Pneumocystis pneumonia. Acta Cytol 2005;49:273–7.
[14] Duboucher C, Caby S, Pierce RJ, Capron M, Dei-Cas E, Viscogliosi E. Trichomonads as superinfecting agents in Pneumocystis pneumonia and acute respiratory distress syndrome. J Eukaryot Microbiol 2006;53(Suppl. 1):S95–7.
[15] Hong KH, Hong SK, Cho SI, Eunkyung R, Hee HK, Beom KS, et al. Analysis of the vaginal microbiome by next-generation sequencing and evaluation of its performance as a clinical diagnostic tool in vaginitis. Ann Lab Med 2016;36:441–9.