


Tuberculous Peritonitis in a Peritoneal Dialysis Paediatric Patient: A Case Report

Marwh Aldriwesh^{1,2} , Hessa Albass¹, Shog Alzaben¹, Reem Alangari¹, Lama Alajroush¹, Mohammed Almutairi^{2,3,4} and Khamisa Almokali^{2,5,6}

¹Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. ²King Abdullah International Medical Research Center, Riyadh, Saudi Arabia. ³Department of Pediatric Emergency, King Abdullah Specialist Children Hospital, Ministry of the National Guard-Health Affairs, Riyadh, Saudi Arabia. ⁴College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. ⁵Department of Pediatric Nephrology, Ministry of the National Guard – Health Affairs, Riyadh, Saudi Arabia. ⁶College of Medicine, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia.

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ABSTRACT: *Mycobacterium tuberculosis* is known to cause infection primarily in the lungs, which may spread to other parts of the body causing extrapulmonary tuberculosis. Few studies in the literature identify *M. tuberculosis* as a cause of peritoneal dialysis (PD)-associated peritonitis among paediatric patients who have no history of pulmonary tuberculosis. PD is the most used renal replacement therapy for paediatric patients with end-stage renal disease. However, despite continuous improvements in the PD connecting system, peritonitis remains the Achilles' heel of dialysis procedures and prophylaxis for PD. Here, we report a case of *M. tuberculosis* peritonitis in a paediatric patient receiving PD and the infection was managed successfully with appropriate anti-tuberculous treatment. This case emphasises the importance of considering tuberculous peritonitis in PD paediatric patients who have no history of pulmonary tuberculosis and whose PD routine cultures produce negative results.

KEYWORDS: *Mycobacterium tuberculosis*, paediatrics, tuberculosis, peritonitis

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CORRESPONDING AUTHOR: Marwh Aldriwesh, Department of Clinical Laboratory Sciences, College of Applied Medical Sciences, King Saud bin Abdulaziz University for Health Sciences, P.O. Box 3660, Riyadh 11481, Saudi Arabia. Email: Aldriwesh_marwh@hotmail.com

Introduction

Tuberculous peritonitis in peritoneal dialysis (PD) patients due to *Mycobacterium tuberculosis* (MTB) with no history of pulmonary tuberculosis is rarely reported in the literature – particularly in paediatrics. Tuberculosis is well-known as an infectious disease caused by a cluster of closely related (>99% nucleotide sequence identity), acid-fast, bacilli bacteria collectively known as the MTB complex that primarily infects the lungs. MTB usually gains access to the human body through the respiratory tract. After overcoming the local respiratory immune clearance mechanisms, the bacterium locates in the lower part of the lungs, leading to a primary tuberculosis infection that is referred to as pulmonary tuberculosis (more commonly TB). Moreover, the MTB may disseminate through the lymphohematogenous route to other body organs, leading to extrapulmonary tuberculosis.^{1,2} We performed a literature search of the PubMed search engine using the terms *Mycobacterium tuberculosis*, *tuberculosis*, *peritonitis*, *paediatrics* and *peritoneal dialysis* to investigate reported cases of tuberculous peritonitis among PD paediatric patients, resulting in a very few reported cases. This report provides insights into the presentation, diagnosis and management

of a single case of tuberculous peritonitis in a PD paediatric patient, one of the first cases reported in Saudi Arabia.

Case scenario

The present case study included a 10-year-old female patient with end-stage renal disease (ESRD). The disease was secondary to familial nephrotic syndrome due to a genetic mutation in the *ADCK4* gene. She was hypertensive, sickle cell anaemic and started automated PD in December 2015 using 1.5% glucose PD solution. The patient had experienced multiple episodes of PD-related peritonitis caused by coagulase-negative Staphylococci. She had a history of vague, intermittent abdominal pain with negative results for routine bacterial cultures of PD fluid. Due to recurring episodes of coagulase-negative Staphylococci peritonitis, the decision was made to change the peritoneal catheter, which was removed and replaced with a new one on 28 November 2017. PD fluid was collected prior to the insertion of the new catheter and was then sent to the diagnostic microbiology laboratory for gram stain, cell count, routine bacterial culture, acid-fast bacilli stain and tuberculosis



Table 1. Review of microbiology laboratory results after suspicion of tuberculous peritonitis.

TYPE OF SAMPLE COLLECTED	SAMPLE COLLECTION DATE	DIAGNOSTIC PROCEDURE	RESULT
Peritoneal dialysate	21-11-2017	Cell count GeneXpert MTB-RIF assay	Clear appearance and colourless PD fluid; WBCs: $173 \times 10^6/L$; Monocytes: 71%; Lymphocytes: 17%; Eosinophiles: 10%; Basophiles: 1%; Segmented Neutrophiles: 1% Positive for MTB on 17/12/2017 Resistance to rifampicin was not detected
Peritoneal dialysate	21-11-2017	Acid fast bacilli stain and culture	No acid-fast bacilli were seen in the smear MTB was isolated on 09/01/2018 MTB was susceptible to ethambutol, isoniazid, pyrazinamide, rifampicin and streptomycin (TB)
Peritoneal dialysate	22-11-2017	Gram stain and routine culture	Rare white blood cells (WBCs) and no organisms were seen in the smear No growth of aerobic bacteria in 2 days No anaerobic organisms were isolated
Peritoneal dialysate	23-11-2017	Gram stain and routine culture	Rare WBCs and no organisms were seen in the smear No growth of aerobic bacteria in 3 days
Peritoneal dialysate	24-11-2017	Gram stain and routine culture	Few WBCs and no organisms were seen in the smear No growth of aerobic bacteria in 3 days No growth after enrichment culture
Peritoneal dialysate	25-11-2017	Gram stain and routine culture	Moderate WBCs and no organisms were seen in the smear No growth of aerobic bacteria in 3 days
Peritoneal dialysate	26-11-2017	Gram stain and routine culture	Rare WBCs and no organisms were seen in the smear No growth of aerobic bacteria in 2 days No anaerobic organisms were isolated
Catheter tip	26-11-2017	Routine culture	No growth of aerobic bacteria in 2 days
Wound swab	28-11-2017	Gram stain and wound culture	Rare WBCs and rare gram-negative bacilli were seen in the smear No growth of aerobic bacteria in 2 days
Wound swab	04-12-2017	Gram stain and wound culture	Rare WBCs and no organisms were seen in the smear No growth at 2 days
Peripheral blood	10-12-2017	Blood culture	No growth of aerobic bacteria in 5 days
Peritoneal dialysate	10-12-2017	Gram stain and routine culture	Rare WBCs and no organisms were seen in the smear No growth at 3 days No growth after enrichment culture

culture (Table 1). A polymerase chain reaction (PCR) test of PD fluid was performed on 17 December 2017 using GeneXpert MTB assay, yielding a positive result for MTB. The PD fluid culture was also sensitive to all first-line anti-tuberculous medications. On 17 December 2017, a

QuantIFERON tuberculosis blood test, purified protein derivative (PPD) skin test, chest x-ray (Figure 1) and 3 gastric aspirates were performed to detect pulmonary tuberculosis. Each of these pulmonary tuberculosis diagnostic tests was negative, indicating no history of pulmonary tuberculosis (Table 1).

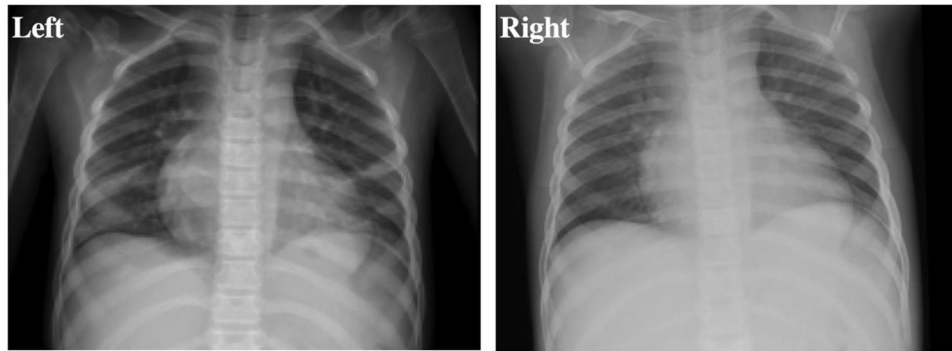


Figure 1. Chest x-ray findings in the 10-year-old female patient, which depicts no definite active lung lesions. The cardiac shadow is mildly enlarged with both congested hila and broadened superior mediastinum that is likely vascular.

The patient was treated for 1 year with oral anti-tubercular therapy that included induction regimen rifampicin, pyrazinamide, isoniazid and pyridoxine for 2 months followed by maintenance therapy of rifampicin, isoniazid and pyridoxine for 10 months. The patient did not complain of any abdominal pain throughout the course of her treatment and no modifications were made on her PD prescription plan. She demonstrated good compliance with her medication, and treatment was discontinued on 23 December 2018.

Discussion

Peritonitis is an inflammation of the peritoneal membrane, which is most often caused by a bacterial infection. The bacteria that cause peritonitis are usually derived from normal flora that reside on the skin (skin contaminants) or from within the peritoneum itself via the intestine.³ Tuberculous peritonitis is a rare category of extrapulmonary TB detected in only 0.1% to 0.7% of all TB cases.⁴ As stated in a previous report, while tuberculous peritonitis arises in adults, it is seldom detected among paediatric patients.⁴ For instance, in Germany, tuberculous peritonitis has been recognised in 5% of paediatric patients aged <14 years.⁵ In other reported cases, tuberculous peritonitis was indicated in an 11-month-old patient, 1-year-old patients and a 15-month-old patient.⁶⁻⁹ However, these reported cases were related to paediatrics who were not on PD. Here, the current report examined a unique case of tuberculous peritonitis in a PD paediatric patient.

Generally, ESRD patients are more susceptible to developing mycobacterial infection than patients with normal renal function due to their impaired cellular immunity.¹⁰ Furthermore, peritoneal dialysate has an elevated level of glucose, non-physiologic pH and osmolality that resulted in a bioincompatible environment compromising phagocytes and lymphocytes activity against invading microbes.^{10,11} In the current case, in addition to ESRD, the child suffered from hypertension and sickle cell anaemia, which further weakened her immune system. This could explain the multiple episodes of peritonitis that she had experienced as a result of coagulase negative Staphylococci and eventually MTB. Of interest is the fact that she developed

tuberculous peritonitis without a history of pulmonary tuberculosis. Because PD is a home-based therapy, and because she was a child, the MTB could access the patient's abdomen accidentally through an infected parent or a care giver. Accordingly, it is recommended that family members of paediatric patients who utilise PD are screened for pulmonary tuberculosis.

Early detection and diagnosis are critical to initiate tuberculosis therapy and ensure effective management of TB. Diagnosis of TB is usually started by screening of acid-fast bacilli smear (using Fluorochrome stain or Fuchsin Acid-Fast stain). Then cultures are performed utilising different media specifically designed to enhance mycobacterial growth.¹² However, TB cultures can take up to 8 weeks for the growth result to be visualised. Molecular methods are promising diagnostic tools that provide reliable results in a timely manner. The majority of these methods are based on PCR amplification of the MTB gene; subsequently, the resultant amplicon is analysed to detect resistance against a specific TB drug.¹²

The data presented here has several important clinical implications. Screening of pulmonary TB before commencing PD therapy is a worthy protective strategy, especially for high-risk populations such as ESRD patients. In this context, Abraham et al. have recommended performing pulmonary TB assessment tests (such as chest x-ray and Mantoux testing) before commencing PD therapy.¹³ This protective strategy would detect early any chest abnormalities related to TB and allow proper treatment before PD therapy commences. As a result, the risk of developing tuberculosis peritonitis would be reduced. Long treatment duration (approximately 12 months) was implemented for the case in this study as recommended by Ram et al. to minimise risk of TB recurrence.¹⁴ Another important aspect from this case is to consider tuberculous peritonitis when culture results yield negative and usual antimicrobial treatment turned out unsuccessful.

Conclusion

Tuberculous peritonitis has to be considered among PD paediatric patients who have no history of pulmonary tuberculosis and whose PD routine cultures yield negative results. Moreover,

early diagnosis and appropriate anti-tuberculous treatment are essential to ensure effective management of the diseases.

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Author Contributions

All authors participated in the data collection, data interpretation, and manuscript writing. All authors revised the manuscript critically for intellectual content and approved the final version of the manuscript.


Ethical Approval

All procedures performed in the present study were in accordance with the ethical standards of the Institutional Review Board (IRB) at King Abdullah International Medical Research Centre (KAIMRC) in Riyadh, Saudi Arabia at which the study was conducted (IRB approval number RYD-19-419812-75281).

Informed Consent

Since the current study is a retrospective, the consent requirement was waived.

ORCID iD

Marwh Aldriwesh  <https://orcid.org/0000-0001-6319-2669>

REFERENCES

1. Gagneux S. Ecology and evolution of *Mycobacterium tuberculosis*. *Nat Rev Microbiol*. 2018;16:202-213.
2. Achtman M. Evolution, population structure, and phylogeography of genetically monomorphic bacterial pathogens. *Annu Rev Microbiol*. 2008;62:53-70.
3. Levy J, Brown E, Lawrence A. *Oxford Handbook of Dialysis*. Oxford University Press; 2016.
4. Dinler G, Sensoy G, Helek D, Kalayci AG. Tuberculous peritonitis in children: report of nine patients and review of the literature. *World J Gastroenterol*. 2008;14:7235-7239.
5. Forssbohm M, Zwahlen M, Loddenkemper R, Rieder HL. Demographic characteristics of patients with extrapulmonary tuberculosis in Germany. *Eur Respir J*. 2008;31:99-105.
6. Katigbak MW, Shlasko E, Klein SM, Calaman S. Peritoneal tuberculosis in a 15-month-old male: surgical diagnosis of an insidious disease. *Surg Infect*. 2005;6:255-258.
7. Azoumah KD, Douli KN, N'timon B, et al. Chylous ascites, a revealing sign of peritoneal tuberculosis in an 11-month-old infant. *Arch Pediatr organe*. 2013;20:274-277.
8. Gürkan F, Ozateş M, Boşnak M, et al. Tuberculous peritonitis in 11 children: clinical features and diagnostic approach. *Pediatr Int*. 1999;41:510-513.
9. Avcu G, Sensoy G, Karli A, et al. A case of tuberculous peritonitis in childhood. *J Infect Public Health*. 2015;8:369-372.
10. Vadivel N, Tucker JK, Trikudanathan S, Heher E, Singh AK. Tuberculous peritonitis: a race against time. *Kidney Int*. 2006;70:969-972.
11. Rohit A, Abraham G. Peritoneal dialysis related peritonitis due to *Mycobacterium* spp.: a case report and review of literature. *J Epidemiol Glob Health*. 2016;6:243-248.
12. Tille P. *Bailey & Scott's Diagnostic Microbiology-e-Book*. Elsevier Health Sciences; 2015.
13. Abraham G, Mathews M, Sekar L, Srikanth A, Sekar U, Soundarajan P. Tuberculous peritonitis in a cohort of continuous ambulatory peritoneal dialysis patients. *Perit Dial Int*. 2001;21:202-204.
14. Ram R, Swarnalatha G, Akpolat T, Dakshinamurthy KV. *Mycobacterium tuberculosis* peritonitis in CAPD patients: a report of 11 patients and review of literature. *Int Urol Nephrol*. 2013;45:1129-1135.