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Contents

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OPINION REVIEW

- 9550** Psychiatric disorders and pain: The recurrence of a comorbidity
Vyshka G

REVIEW

- 9556** Cardiovascular disease and COVID-19, a deadly combination: A review about direct and indirect impact of a pandemic
Vidal-Perez R, Brandão M, Pazdernik M, Kresoja KP, Carpenito M, Maeda S, Casado-Arroyo R, Muscoli S, Pöss J, Fontes-Carvalho R, Vazquez-Rodriguez JM
- 9573** Molecular factors, diagnosis and management of gastrointestinal tract neuroendocrine tumors: An update
Pavlidis ET, Pavlidis TE

MINIREVIEWS

- 9588** Human-induced pluripotent stem cell-atrial-specific cardiomyocytes and atrial fibrillation
Leowattana W, Leowattana T, Leowattana P
- 9602** COVID-19 and the cardiovascular system-current knowledge and future perspectives
Chatzis DG, Magounaki K, Pantazopoulos I, Bhaskar SMM

ORIGINAL ARTICLE

Case Control Study

- 9611** PDCA nursing in improving quality management efficacy in endoscopic submucosal dissection
He YH, Wang F

Retrospective Study

- 9619** Impact of COVID-19 pandemic on the ocular surface
Marta A, Marques JH, Almeida D, José D, Sousa P, Barbosa I
- 9628** Anatomy and clinical application of suprascapular nerve to accessory nerve transfer
Wang JW, Zhang WB, Li F, Fang X, Yi ZQ, Xu XL, Peng X, Zhang WG
- 9641** Therapeutic effect of two methods on avulsion fracture of tibial insertion of anterior cruciate ligament
Niu HM, Wang QC, Sun RZ
- 9650** Efficacy of transcatheter arterial chemoembolization using pirarubicin-loaded microspheres combined with lobaplatin for primary liver cancer
Zhang C, Dai YH, Lian SF, Liu L, Zhao T, Wen JY

- 9657** Prognostic significance of sex determining region Y-box 2, E-cadherin, and vimentin in esophageal squamous cell carcinoma

Li C, Ma YQ

- 9670** Clinical characteristics and prognosis of orbital solitary fibrous tumor in patients from a Chinese tertiary eye hospital

Ren MY, Li J, Wu YX, Li RM, Zhang C, Liu LM, Wang JJ, Gao Y

Observational Study

- 9680** Altered heart rate variability and pulse-wave velocity after spinal cord injury

Tsou HK, Shih KC, Lin YC, Li YM, Chen HY

- 9693** Intra and extra pelvic multidisciplinary surgical approach of retroperitoneal sarcoma: Case series report

Song H, Ahn JH, Jung Y, Woo JY, Cha J, Chung YG, Lee KH

META-ANALYSIS

- 9703** Meta-analysis of gemcitabine plus nab-paclitaxel combined with targeted agents in the treatment of metastatic pancreatic cancer

Li ZH, Ma YJ, Jia ZH, Weng YY, Zhang P, Zhu SJ, Wang F

- 9714** Clinical efficacy analysis of mesenchymal stem cell therapy in patients with COVID-19: A systematic review

Cao JX, You J, Wu LH, Luo K, Wang ZX

CASE REPORT

- 9727** Treatment of gastric cancer with dermatomyositis as the initial symptom: Two case reports and review of literature

Sun XF, Gao XD, Shen KT

- 9734** Gallbladder hemorrhage—An uncommon surgical emergency: A case report

Valenti MR, Cavallaro A, Di Vita M, Zanghi A, Longo Trischitta G, Cappellani A

- 9743** Successful treatment of stage IIIB intrahepatic cholangiocarcinoma using neoadjuvant therapy with the PD-1 inhibitor camrelizumab: A case report

Zhu SG, Li HB, Dai TX, Li H, Wang GY

- 9750** Myocarditis as an extraintestinal manifestation of ulcerative colitis: A case report and review of the literature

Wang YY, Shi W, Wang J, Li Y, Tian Z, Jiao Y

- 9760** Endovascular treatment of traumatic renal artery pseudoaneurysm with a Stanford type A intramural haematoma: A case report

Kim Y, Lee JY, Lee JS, Ye JB, Kim SH, Sul YH, Yoon SY, Choi JH, Choi H

- 9768** Histiocytoid giant cellulitis-like Sweet syndrome at the site of sternal aspiration: A case report and review of literature

Zhao DW, Ni J, Sun XL

- 9776** Rare giant corneal keloid presenting 26 years after trauma: A case report
Li S, Lei J, Wang YH, Xu XL, Yang K, Jie Y
- 9783** Efficacy evaluation of True Lift®, a nonsurgical facial ligament retightening injection technique: Two case reports
Huang P, Li CW, Yan YQ
- 9790** Synchronous primary duodenal papillary adenocarcinoma and gallbladder carcinoma: A case report and review of literature
Chen J, Zhu MY, Huang YH, Zhou ZC, Shen YY, Zhou Q, Fei MJ, Kong FC
- 9798** Solitary fibrous tumor of the renal pelvis: A case report
Liu M, Zheng C, Wang J, Wang JX, He L
- 9805** Gastric metastasis presenting as submucosa tumors from renal cell carcinoma: A case report
Chen WG, Shan GD, Zhu HT, Chen LH, Xu GQ
- 9814** Laparoscopic correction of hydronephrosis caused by left paraduodenal hernia in a child with cryptorchism: A case report
Wang X, Wu Y, Guan Y
- 9821** Diagnosed corrected transposition of great arteries after cesarean section: A case report
Ichii N, Kakinuma T, Fujikawa A, Takeda M, Ohta T, Kagimoto M, Kaneko A, Izumi R, Kakinuma K, Saito K, Maeyama A, Yanagida K, Takeshima N, Ohwada M
- 9828** Misdiagnosis of an elevated lesion in the esophagus: A case report
Ma XB, Ma HY, Jia XF, Wen FF, Liu CX
- 9834** Diagnostic features and therapeutic strategies for malignant paraganglioma in a patient: A case report
Gan L, Shen XD, Ren Y, Cui HX, Zhuang ZX
- 9845** Infant with reverse-transcription polymerase chain reaction confirmed COVID-19 and normal chest computed tomography: A case report
Ji GH, Li B, Wu ZC, Wang W, Xiong H
- 9851** Pulmonary hypertension secondary to seronegative rheumatoid arthritis overlapping antisynthetase syndrome: A case report
Huang CY, Lu MJ, Tian JH, Liu DS, Wu CY
- 9859** Monitored anesthesia care for craniotomy in a patient with Eisenmenger syndrome: A case report
Ri HS, Jeon Y
- 9865** Emergency treatment and anesthesia management of internal carotid artery injury during neurosurgery: Four case reports
Wang J, Peng YM

- 9873** Resolution of herpes zoster-induced small bowel pseudo-obstruction by epidural nerve block: A case report
Lin YC, Cui XG, Wu LZ, Zhou DQ, Zhou Q
- 9879** Accidental venous port placement *via* the persistent left superior vena cava: Two case reports
Zhou RN, Ma XB, Wang L, Kang HF
- 9886** Application of digital positioning guide plates for the surgical extraction of multiple impacted supernumerary teeth: A case report and review of literature
Wang Z, Zhao SY, He WS, Yu F, Shi SJ, Xia XL, Luo XX, Xiao YH
- 9897** Iatrogenic aortic dissection during right transradial intervention in a patient with aberrant right subclavian artery: A case report
Ha K, Jang AY, Shin YH, Lee J, Seo J, Lee SI, Kang WC, Suh SY
- 9904** Pneumomediastinum and subcutaneous emphysema secondary to dental extraction: Two case reports
Ye LY, Wang LF, Gao JX
- 9911** Hemorrhagic shock due to submucosal esophageal hematoma along with mallory-weiss syndrome: A case report
Oba J, Usuda D, Tsuge S, Sakurai R, Kawai K, Matsubara S, Tanaka R, Suzuki M, Takano H, Shimoizawa S, Hotchi Y, Usami K, Tokunaga S, Osugi I, Katou R, Ito S, Mishima K, Kondo A, Mizuno K, Takami H, Komatsu T, Nomura T, Sugita M
- 9921** Concurrent severe hepatotoxicity and agranulocytosis induced by *Polygonum multiflorum*: A case report
Shao YL, Ma CM, Wu JM, Guo FC, Zhang SC
- 9929** Transient ischemic attack after mRNA-based COVID-19 vaccination during pregnancy: A case report
Chang CH, Kao SP, Ding DC
- 9936** Drug-induced lung injury caused by acetaminophen in a Japanese woman: A case report
Fujii M, Kenzaka T
- 9945** Familial mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episode syndrome: Three case reports
Yang X, Fu LJ
- 9954** Renal pseudoaneurysm after rigid ureteroscopic lithotripsy: A case report
Li YH, Lin YS, Hsu CY, Ou YC, Tung MC

LETTER TO THE EDITOR

- 9961** Role of traditional Chinese medicine in the initiative practice for health
Li Y, Li SY, Zhong Y
- 9964** Impact of the COVID-19 pandemic on healthcare workers' families
Helou M, El Osta N, Husni R

- 9967 Transition beyond the acute phase of the COVID-19 pandemic: Need to address the long-term health impacts of COVID-19

Tsioutis C, Tofarides A, Spernovasilis N

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Infant with reverse-transcription polymerase chain reaction confirmed COVID-19 and normal chest computed tomography: A case report

Guang-Hai Ji, Bo Li, Zu-Chuang Wu, Wei Wang, Hao Xiong

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Abstract

BACKGROUND

Coronavirus disease-2019 (COVID-19) is a highly pathogenic respiratory disease that mainly affects adults and elderly patients. Yet, over the past three years, there were an increasing number of infected children; however, only a few cases of infants with reverse-transcription polymerase chain reaction (RT-PCR)-confirmed COVID-19 and chest computed tomography (CT) normal have been reported. Herein, we reported a single case of a patient (a 3-mo-old girl) with COVID-19, including her clinical and imaging findings.

CASE SUMMARY

The patient with fever, diarrhea came to fever clinic. Her chest CT was normal. The patient was treated accordingly, the fever disappeared while diarrhea persisted, what's more, RT-PCR testing of nasopharyngeal swab showed positive results; thus, the patient was admitted to the pediatric department on the 5th day of onset. The child was given systematic treatment, and all her symptoms significantly improved. Consecutive RT-PCR tests were negative after examining the pharyngeal swabs but positive after analyzing anal swabs. She was discharged on the 31st day of hospitalization.

CONCLUSION

This report provides useful references for treating infantile COVID-19 cases with diarrhea or other non-respiratory symptoms and normal chest CT scan. Given the

persistent positive RT-PCR results of anal swabs, the possibility of fecal-oral transmission of COVID-19 should be considered.

Key Words: Infant; COVID-19; SARS-CoV-2; Tomography; Case report

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Core Tip: This study reports an atypical infantile case of coronavirus disease-2019 accompanied by diarrhea or other non-respiratory symptoms. We presented the medical history and the whole process of diagnosis and management of the case and did a literature review. In this paper, we share our experience, which might provide a useful reference for pediatricians and radiologists.

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INTRODUCTION

Coronavirus disease-2019 (COVID-19) is an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that originated in China in 2019 and rapidly spread worldwide [1]. Although the disease is mainly affecting adults and the elderly, children of all ages can also get infected and experience serious complications. Moreover, while CT features and clinical characteristics of adult COVID-19 patients have been well investigated [2-3], data regarding pediatric patients are still lacking. Clinical reports have suggested that children with COVID-19 usually have mild clinical manifestations, most of which are transient fever or mild respiratory symptoms. Some children may present with diarrhea. Also, non-respiratory symptoms with negative or mild lung imaging findings have also been found in some cases [4]. The coincidence of the outbreak of COVID-19 and the winter-spring flu season was also challenging for establishment of early accurate diagnosis and intervention of pediatric pneumonia. Consequently, a better understanding of clinical and imaging features related to COVID-19 in infants, especially the atypical cases, is urgently needed.

Herein, we reported a single case of a 3-mo old female patient with COVID-19, including her clinical and imaging findings.

CASE PRESENTATION

Chief complaints

A 3 mo and 14 d old female infant visited our department on January 26, 2020 due to a fever that lasted one day and diarrhea that persisted for four days.

History of present illness

Her parents were Wuhan city residents who returned to Jingzhou city on January 18, 2020. Her father had fever and cough on January 25, 2020; the same symptoms were found in the infant one day later.

History of past illness

Patients did not report a history of any underlying disease. The laboratory testing of the infant was: Elevated peripheral white blood cells and lymphocytes, reduced neutrophils, normal C-reactive protein (CRP), elevated lactic dehydrogenase (LDH), alanine aminotransferase (ALT), and aspartate aminotransferase (AST), elevated creatine kinase-MB, and negative influenza virus A and B tests (Table 1). At the same time, the chest CT scan was normal.

Personal and family history

The infant's father and mother were diagnosed with COVID-19 on January 26 and January 29, 2020, respectively.

Table 1 Some blood test of the patient

Time	Jan 26, 2020	Jan 31, 2020	Feb 6, 2020	Feb 23, 2020	Feb 28, 2020
WBC	$10.39 \times 10^9/L$ (5-12)	$13.21 \times 10^9/L$ (5-12)	$12.90 \times 10^9/L$ (5-12)	$15.4 \times 10^9/L$ (5-12)	$8.5 \times 10^9/L$ (5-12)
RBC	$4.03 \times 10^{12}/L$ (4.3-5.8)	$4.38 \times 10^{12}/L$ (4.3-5.8)	$4.09 \times 10^{12}/L$ (4.3-5.8)	$3.99 \times 10^{12}/L$ (4.3-5.8)	$3.63 \times 10^{12}/L$ (4.3-5.8)
Hemoglobin	114 g/L (130-175)	128 g/L (130-175)	116.1 g/L (130-175)	109.9 g/L (130-175)	109.8 g/L (130-175)
Thrombocyte	$196 \times 10^9/L$ (100-300)	$527 \times 10^9/L$ (100-300)	$534 \times 10^9/L$ (100-300)	$418 \times 10^9/L$ (100-300)	$359 \times 10^9/L$ (100-300)
Neutrophils	$6.62 \times 10^9/L$ (1.8-6.3)	$0.93 \times 10^9/L$ (1.8-6.3)	$3.61 \times 10^9/L$ (1.8-6.3)	$2.33 \times 10^9/L$ (1.8-6.3)	$1.86 \times 10^9/L$ (1.8-6.3)
Lymphocytes	$2.84 \times 10^9/L$ (1.1-3.2)	$11.39 \times 10^9/L$ (1.1-3.2)	$64.6 \times 10^9/L$ (1.1-3.2)	$11.6 \times 10^9/L$ (1.1-3.2)	$5.97 \times 10^9/L$ (1.1-3.2)
Influenza A virus	-				
Influenza B virus	-				
CRP		0.47 mg/L (0-8)	0.11 mg/L (0-8)	0.49 mg/L (0-8)	0.35 mg/L (0-8)
Albumin		44.6 g/L (35-55)	44.5 g/L (35-55)	43.9 g/L (35-55)	43.7 g/L (35-55)
Globulin		17.0 g/L (20-35)	16.3 g/L (20-35)	16.3 g/L (20-35)	13.8 g/L (20-35)
Albumin/Globulin		2.62 (1.2-2.5)	2.73 (1.2-2.5)	2.69 (1.2-2.5)	3.17 (1.2-2.5)
ALT		143 U/L (1-40)	78 U/L (1-40)	66 U/L (1-40)	59 U/L (1-40)
AST		185 U/L (2-42)	72 U/L (2-42)	66 U/L (2-42)	71 U/L (2-42)
ALP		212 U/L (35-128)	217 U/L (35-128)		
LDH		348 U/L (100-240)	289 U/L (100-240)	298 U/L (100-240)	228 U/L (100-240)
TBA		12.99 μ mol/L (0-10)	5.16 μ mol/L (0-10)	7.9 μ mol/L (0-10)	4.8 μ mol/L (0-10)
CK-MB		51 U/L (0-20)	48 U/L (0-20)	63 U/L (0-20)	34 U/L (0-20)

WBC: White blood cell; RBC: Red blood cell; ALT: Alanine aminotransferase; CRP: C-reactive protein; ALT: Alanine aminotransferase; AST: Aspartate aminotransferase; ALP: Alkaline phosphatase; LDH: Lactic dehydrogenase; TBA: Total bile acid; CK-MB: Creatine kinase-MB; -: Negative.

Physical examination

Physical examination suggested: Body temperature, 36.5°C; blood pressure, 85/46 mmHg; heart rate, 119 beats per min; respiratory rate, 34 breaths per min. Her breathing was stable, without a nasal fan and three concave signs. The breath sounded thick, no obvious dry-wet rale was heard, heart rate was rhythmic, and no pathological murmur was detected.

Laboratory examinations

The relevant blood tests in the outpatient department and after admission are shown in [Table 1](#).

Imaging examinations

The patient presented with fever and diarrhea. We performed a routine chest CT scan ([Figure 1A](#)). After experiential and systematic treatment, fever and diarrhea disappeared on the 6th hospitalization day. However, the RT-PCR result in the nasopharyngeal swab was still positive. For safety, we routinely performed the second chest CT scan ([Figure 1B](#)).

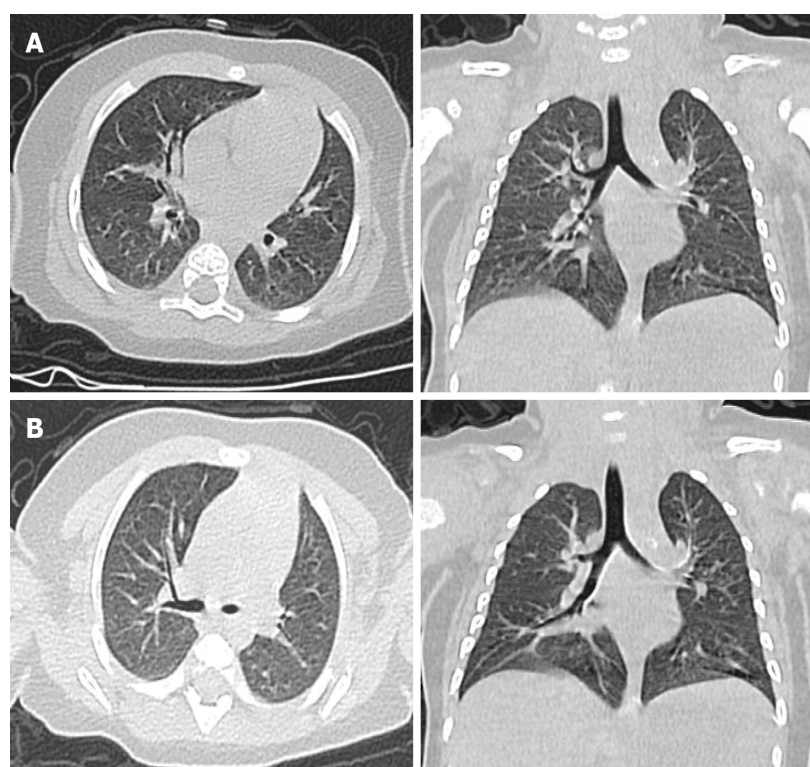
FINAL DIAGNOSIS

Combined with the patient's medical history and RT-PCR results, the final diagnosis was COVID-19.

TREATMENT

After giving cefixime (25 mg/bid, po) and oseltamivir (0.75 mg/bid, po), the infant's body temperature returned to normal; yet, the diarrhea was not still improved on January 28.

After being hospitalized in the pediatric department, the infant was given systematic treatment, including budesonide (1 mg/bid, inh), interferon alfa-2b (140 units/bid, inh), vitamin C (1g/qd, ivdrip), inosine tablets (0.1g/qd, ivdrip), reduced glutathione (0.6g/qd, ivdrip) and probiotics (1g/qd, po). To



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Figure 1 Imaging examinations. A: The chest computed tomography (CT) of the infant while in the outpatient department: The result was normal; B: The chest CT on the 8th hospitalization day: The result was normal.

exclude the possibility of virus transmission by breastfeeding, the breast milk was analyzed by RT-PCR on the 4th hospitalization day, and the results were negative. After systematic treatment, diarrhea disappeared (on the 6th hospitalization day). On the 10th hospitalization day, liver function testing was still abnormal; thus, the attending doctor decided to prescribe hepatoprotective drugs Gantaile tablets (0.1 g/bid, po) and inosine tablets (0.1 g/bid, po). The main symptom, treatment plan, RT-PCR results, and chest CT results of the infant were presented (Figure 2).

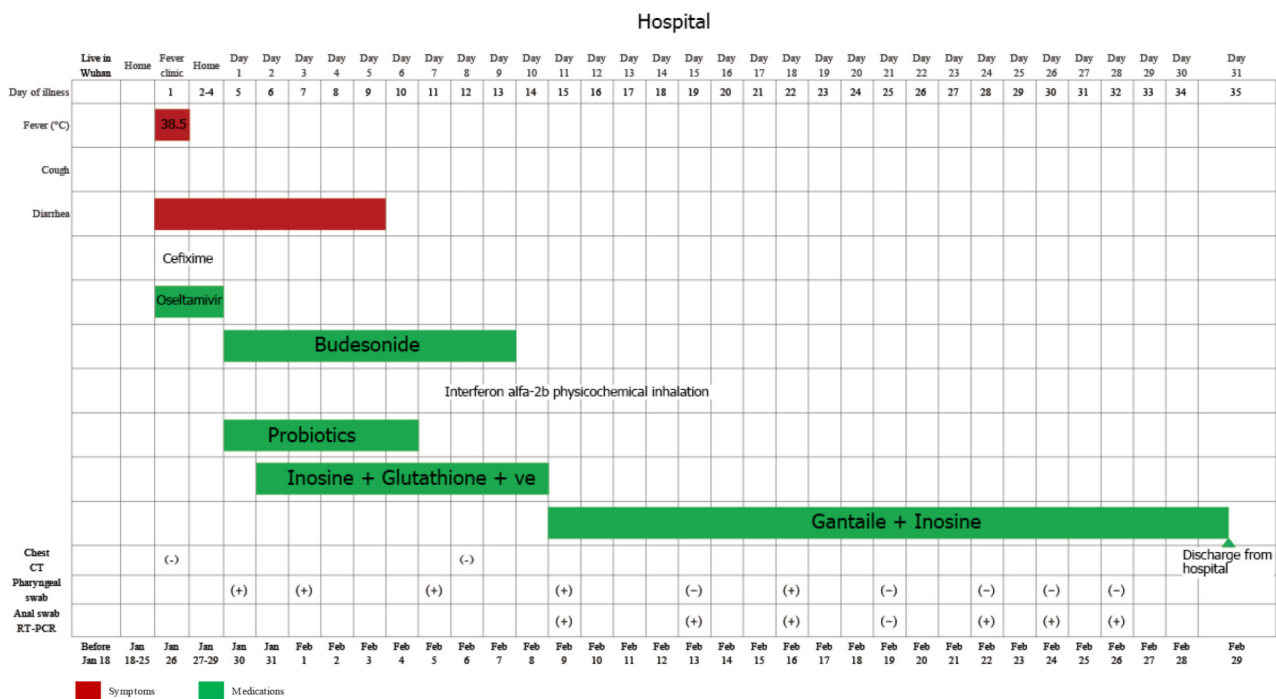
On the 31st hospitalization day, all symptoms of the infant were improved significantly (follow-up performed according to the guidelines for the diagnosis and treatment of COVID-19^[1]), and the infant was discharged from the hospital.

OUTCOME AND FOLLOW-UP

In view of the fact that the infant was diagnosed with COVID-19 and discharged from the hospital, it is recommended to isolate at home for 14 d and pay attention to personal hygiene and avoid getting cold. The child was required to re-examine the RT-PCR of SARS-CoV-2 in nasopharyngeal and anal swabs after one week, and the liver function after two weeks.

DISCUSSION

SARS-CoV-2 is primarily transmitted between people *via* respiratory droplets and contact routes[5]. Lymphopenia occurs in 35%-82.1% of adult patients[3,6]. In this case, lymphocyte count was increased, which was different from the laboratory findings in adult patients. Moreover, ALT, AST, and LDH can be elevated in adult patients, and the proportion of LDH elevation is larger (76%)[6]. The proportion of LDH elevation, in this case, was 45%. Also, according to reports, 86% of adult patients with COVID-19 have elevated CRP, which is a marker of inflammation[6]. Yet, our patient showed normal CRP. The above results show that the clinical manifestations of COVID-19 in infants and young children are different from those seen in adults, which may be related to the fact that children are mostly infected by the second or third-generation virus (the virus virulence is weakened) and due to their lower immune function[7].



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Figure 2 The Gantt chart showing the main symptom, treatment plan, reverse-transcription polymerase chain reaction results, and chest computed tomography results of the infant.

The clinical manifestations of children patients are similar to those of adults and mainly include fever and cough. Diarrhea and runny nose have been observed in a few infected children[8]. A recent study[7] suggested that the relatively low reaction of angiotensin-converting enzyme 2 (ACE2), which induces intracellular response in pediatric patients, might be the reason why children present less severe symptoms compared to adults. In this case, the child had a fever and occasional cough lasting for one day. The chest CT examinations were negative in the outpatient department and after admission. Her parents were confirmed with COVID-19; the father had fever and cough; the mother had no respiratory symptoms such as cough, nasal discharge, or shortness of breath. It is important to note that respiratory symptoms may not be a prerequisite for diagnosing COVID-19[9].

SARS-CoV-2 may also cause damage to the heart, liver, kidney, and other organs[2,3]. Mechanistically, SARS-CoV-2 invades human host cells expressing the ACE2 receptor. Although this case tested negative after examining pharyngeal swab on RT-PCR four times (February 19, 22, 24, and 26), the results of anal swab RT-PCR analysis on February 22, 24, and 26 were still positive, which suggested that the virus may invade the digestive system through the ACE2 receptor of the gastrointestinal tract and be transmitted *via feces*. The current clinical diagnosis and treatment plan suggest that the criteria for discharge from isolation should be a normal temperature for more than 3 days, improved respiratory symptoms, and two consecutively pharyngeal swabs of RT-PCR test negative separated by at least 1 d[1]. Yet, given the persistent positive RT-PCR results of anal swabs (as seen in this case), the possibility of fecal-oral transmission of COVID-19 should also be considered.

CONCLUSION

Based on the diagnosis and treatment of this case, people of all ages are susceptible to COVID-19, and the degree of susceptibility may be different. In addition, COVID-19 patients may have few or no clinical symptoms, normal chest CT, and even false-negative PR-PCT results. Thus, early chest CT screening, timely follow-up, corresponding pathogen detection, and epidemiological and clinical features analysis should be included in the screening protocol for children with COVID-19. Early diagnosis, isolation, and treatment of COVID-19 are critical for controlling this pandemic.

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FOOTNOTES

Author contributions: Ji GH and Li B contributed equally to this work. Ji GH, Li B and Wang W collected the patient's data and images and wrote the original manuscript; Wu ZC took part in the diagnosis and treatment of the patient; Xiong H was responsible for revising the draft; all authors read and approved the final manuscript.

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