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CASE REPORT

Pneumatosis cystoides intestinalis in a patient with aseptic meningitis: a case report

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Abstract

Background Although pneumatosis cystoides intestinalis (PCI) is observed in patients who are on corticosteroid treatment, most patients have underlying diseases requiring long-term corticosteroid treatment. Herein, we present a rare case of a patient with aseptic meningitis who had PCI of the ascending colon while receiving betamethasone treatment.

Case presentation A 46-year-old man was sent to our institution due to disturbance in consciousness and general weakness. Brain computed tomography (CT) scan showed multiple hyperdense lesions over the bilateral hemisphere at the white-gray matter junction. Empiric antibiotic treatment with vancomycin and ceftriaxone was prescribed. Due to acute generalized exanthematous pustulosis (AGEP), we ordered betamethasone and diphenhydramine. Two days later, the patient had bloating and abdominal tenderness. Moreover, contrast-enhanced abdominal CT scan revealed PCI of the ascending colon. Since ischemic bowel disease was suspected, laparoscopy and colonoscopy were carried out. However, no abnormal mucosa or mass lesion was noted. Then, tachycardia, hypotension, and change in consciousness along with loss of brainstem reflex and increased intracranial pressure were noted. After further treatment, the patient's condition worsened, and he eventually died.

Conclusion As the outcomes of PCI range from benign to life-threatening, an accurate diagnosis must be made to prevent unnecessary abdominal surgeries. Benign PCI in a patient without PCI correlated to underlying diseases, but received short-term corticosteroid treatment should be considered.

Keywords Pneumatosis cystoides intestinalis · Aseptic meningitis · Corticosteroid

Introduction

Pneumatosis cystoides intestinalis (PCI) is a condition characterized by the presence of submucosal or subserosal gas cysts in the bowel wall. PCI is not a diagnosis but a physical or radiographic finding, which has various outcomes ranging from benign to life-threatening [1, 2]. The common symptoms of PCI include diarrhea, bloody stools, abdominal pain, constipation, weight loss, and tenesmus [2]. PCI of being causes is often asymptomatic, and such condition must be distinguished from PCI of life-threatening causes. The most common and emergent life-threatening cause of PCI is consequent bowel necrosis, which results from bowel ischemia, infarction, necrotizing enterocolitis, neutropenic colitis, volvulus, and sepsis [3]. Therefore, a differential diagnosis of PCI is important.

Corticosteroid is a drug significantly correlated to the development of PCI [4]. Herein, we describe the occurrence of benign PCI in a patient with aseptic meningitis who received betamethasone treatment at a dose of 12 mg daily. However, it is rare in patients without any history of PCI correlated to underlying diseases or long-term use of corticosteroids showing benign PCI while receiving short-term corticosteroids. Our patient is the first case.

Case report

A 46-year-old man was sent to our emergency department due to disturbance in consciousness and general weakness. His body temperature was 36.6 °C. Physical examination showed

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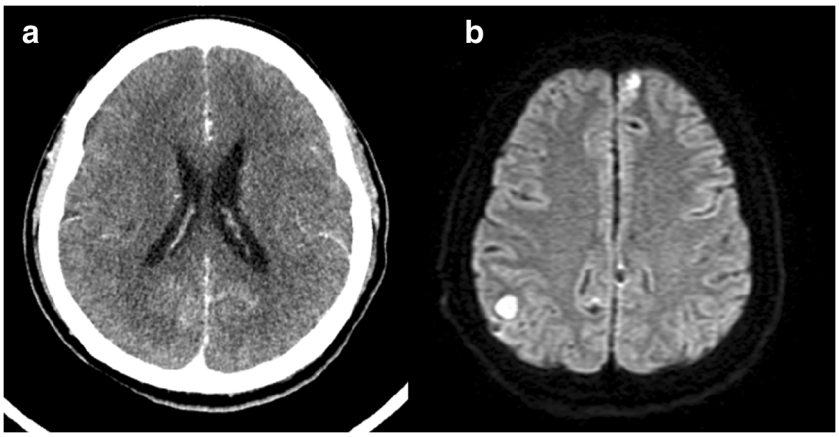

Fig. 1 Brain CT and brain magnetic resonance imaging (MRI). **a** CT of the brain showed several small hyperdense nodules at the subcortical region of the bilateral cerebral hemisphere on day 1. **b** MRI of the brain showed high-signal lesions involving the bilateral cerebrum and increased enhancement of the cerebral and cerebellar sulci on day 4

no abnormal findings on the chest, abdomen, and extremities. The patient was lethargic based on the neurological examination, and visual defect in the left side of the eye was suspected based on an assessment using the Glasgow Coma Scale (E3M6V4). Brain computed tomography (CT) scan showed several small hyperdense nodules at the subcortical region of the bilateral cerebral hemisphere (Fig. 1). The differential diagnoses included metastases, septic emboli, small hemorrhage, cavernoma, or parasite infection.

On day 2, the result of the cerebrospinal fluid (CSF) analysis indicated elevated intracranial pressure (ICP) with an opening pressure > 30 (normal 9–18) mmHg, pleocytosis (WBC of 36/μL with lymphocyte and monocyte predominance, normal 0–5/μL), increased total protein level at 79 (normal 10–40) mg/dL, and significant hypoglycorrhachia with glucose in the CSF and plasma (22 [normal 50–75] mg/dL and 127 mg/dL, respectively). According to the abovementioned findings, a differential diagnosis of bacterial, tuberculous, or fungal meningitis was made. Therefore, empiric antibiotic treatment with intravenous vancomycin at a dose of 2000 mg daily and intravenous ceftriaxone at a dose of 4000 mg daily was prescribed.

On day 4, magnetic resonance imaging of the brain showed some T1 and T2 high-signal lesions involving the bilateral cerebrum with diffuse T2 low-signal lesions scattered in the bilateral cerebrum, thalamus, and cerebellum, and increased enhancements of the cerebral and cerebellar sulci were also noted. Meningoencephalitis with septic emboli was suspected (Fig. 1). The differential diagnosis still included hemorrhagic metastasis, hypertensive encephalopathy, and cavernomatosis.

However, skin rashes over the trunk and four limbs were observed a few days after the initiation of treatment, and AGEP due to drug allergic reaction was suspected. The drug was then immediately changed to meropenem. Intravenous betamethasone at a dose of 12 mg daily and diphenhydramine were also prescribed to suppress allergic reaction on day 15.

Repeat lumbar puncture was carried out on day 17, which revealed an elevated ICP with an opening pressure of 16 mmHg, pleocytosis (WBC of 46/μL with lymphocyte and monocyte predominance), increased total protein at 110 mg/dL, and significant hypoglycorrhachia with glucose in the CSF and plasma (< 10 mg/dL and 141 mg/dL, respectively). As previously mentioned, empiric antibiotic treatment with meropenem was continuously administered due to negative CSF culture findings.

On day 17, we observed that the patient had abdominal bloating. Physical examination showed abdominal tenderness

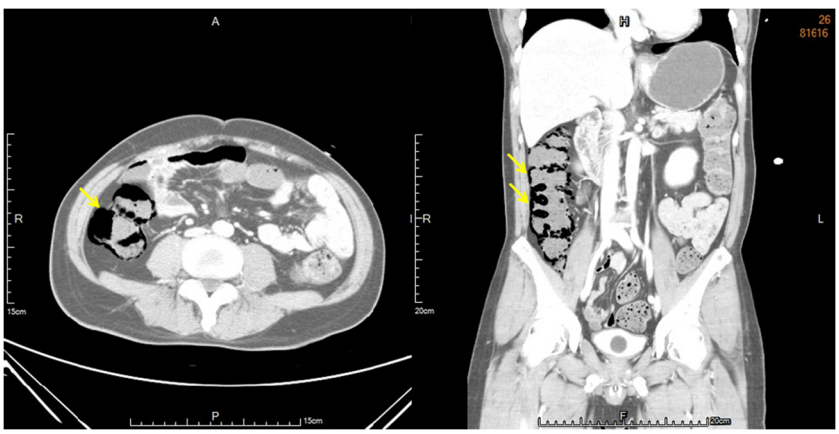

Fig. 2 Abdominal CT. Abdominal CT showed pneumatosis intestinalis of the ascending colon with surrounding free air (arrows) on day 17

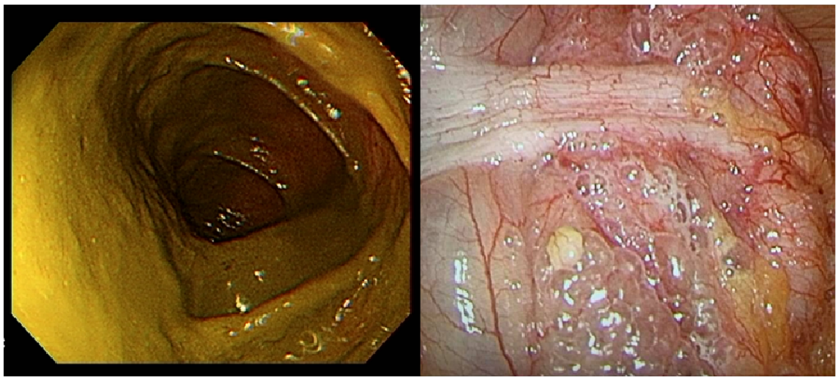

Fig. 3 Diagnostic laparoscopy on day 18 revealed multiple gas bubbles surrounded the ascending colon. No ischemic bowel wall or turbid ascites was found. Colonoscopy showed the normal ascending to transverse colon

but equivocal rebound pain. In addition, tumor marker analyses on day 10 showed elevated carcinoembryonic antigen (CEA) and carbohydrate antigen 19-9 (CA19-9) levels at 99.92 ng/mL and 43.76 U/mL, respectively. Thus, we conducted abdominal CT scan, which showed extensive intramural gas in the ascending colon (Fig. 2). Based on such finding, the patient was diagnosed with PCI. Since ischemic bowel disease was suspected, diagnostic laparoscopy was performed on day 18, and colonoscopy was subsequently carried out because an abnormal mucosa or mass lesion, except for numerous gas bubbles at the ascending colon, was not observed on laparoscopy (Fig. 3). Then, postoperative flatulence and defecation were noted, and the patient underwent panendoscopy on day 19, and no malignancy was observed.

According to the abovementioned investigation and laboratory tests performed to diagnose autoimmune disorders, which showed no apparent finding (anti-nuclear antibodies (ANA): negative, anti-double-stranded deoxyribonucleic acid (anti-dsDNA) level 0.5 IU/mL, anti-cardiolipin immunoglobulin G (IgG) level 0.90 GPL-U/m, and anti-cardiolipin immunoglobulin M (IgM) level 1.3 MPL-U/m), PCI associated with systemic lupus erythematosus (SLE) was ruled out, and the patient was diagnosed with aseptic meningitis.

However, tachycardia, hypotension, change in consciousness with loss of brainstem reflex, and increased intracranial pressure were noted on day 23. After further treatment, the patient's condition worsened, and the patient eventually died on day 42.

Discussion

Our patient who had aseptic meningitis but did not have any history of autoimmune disease or long-term use of corticosteroids presented with benign PCI of the ascending colon while receiving short-term corticosteroid treatment for AGEP. Considering that the radiological findings correlated to PCI had not been observed until upon admission to our hospital, the development of PCI might had occurred during the treatment of aseptic meningitis, which is an inflammatory disorder involving the leptomeninges with negative routine bacterial cultures, and enteroviruses are the most common etiologic

Table 1 Clinical details of reported cases of PCI associated with corticosteroids

	Onset age (years)/sex	Indication of corticosteroids	Main involved site	Probable cause of PCI
Akiko Ezuka et al.[4]	62/F	Bronchial asthma	AC	PSL
Pruitt et al.[9]	58/F	SLE	AC	PSL
Atsumi et al.[9]	51/F	SLE	ND	PSL
Nonaka et al.[9]	51/F	SLE	AC	PSL, IVCY
Hiraishi et al.[9]	13/F	SLE	AC, TC	PSL, CyA
Yamaguchi et al.[9]	33/F	SLE	AC, TC	PSL
Mizoguchi et al.[9]	35/F	SLE	AC	PSL, mediastinal emphysema
Yasuhiro Shimojima et al.[9]	48/M	NPSLE	AC	PSL, NPSLE, DM, αGI
Byoung Geun Han et al.[7]	38/M	MCD	ND	PSL
Masataka Saito et al.[8]	53/F	Dermatomyositis	AC, DC	PSL, αGI, methotrexate, dermatomyositis
Our patient	46/M	AGEP	AC	Betamethasone

SLE systemic lupus erythematosus, *AC* ascending colon, *ND* not described, *TC* transverse colon, *DC* descending colon, *PSL* prednisolone, *IVCY* intravenous cyclophosphamide, *CyA* cyclosporin A, *NPSLE* neuropsychiatric systemic lupus erythematosus, *DM* diabetes mellitus, *αGI* alpha-glucosidase inhibitor, *MCD* minimal change disease, *AGEP* acute generalized exanthematous pustulosis

pathogens in such condition. The common symptoms of aseptic meningitis include fever, headache, and meningeal irritation [5]. However, data that support the association between aseptic meningitis and PCI are not available.

The pathogenesis of PCI is still unclear. Three pathophysiologic mechanisms underlying PCI have been proposed, which include intraluminal gastrointestinal gas, bacterial production of gas, and pulmonary gas. In addition, a recent research has shown the possible causes of benign PCI, which include pulmonary diseases, systemic diseases, intestinal disorders, iatrogenic injuries, use of medications, organ transplantation, and primary pneumatosis. The medications associated with the development of PCI include corticosteroids, chemotherapeutic agents, lactulose, sorbitol, and voglibose [2]. In particular, corticosteroids are the most common drugs associated with PCI. Such drugs reduce the lymphocytes in Peyer's patches, leading to mucosal damage that causes easy penetration of intraluminal gas into the bowel wall [6].

In this case report, the patient who did not have any history of pulmonary diseases, systemic diseases, intestinal disorders, iatrogenic injuries, and organ transplantation was prescribed with betamethasone at the time of PCI diagnosis. The administration of corticosteroids was the only presenting factor that might have contributed to the development of PCI. The clinical details of the 10 reported cases of PCI associated with the use of corticosteroids are summarized in Table 1 [4, 7–9]. The main involved site of corticosteroid-induced PCI seems to be the ascending colon, and the same condition can be found in our patient. In addition, all the reports in Table 1 had revealed that PCI might be attributed to the long-term use of and high-dose corticosteroids. Moreover, in previous reports, 7 of 10 patients had SLE, which could be an independent risk factor of PCI itself. Some case reports have revealed that vasculitis associated with SLE, which cause bowel wall weakness and probably lead to the invasion of air, may result in the development of PCI. The hypothesis was based on improvement in PCI in some patients who were treated with steroids and/or cyclophosphamide [9, 10].

However, in this study, the patient who did not present with autoimmune disease but received short-term corticosteroid treatment could have developed PCI.

In conclusion, PCI in a patient who did not present with risk factors may be caused by the short-term use of corticosteroids. As the outcomes of PCI range from benign to life-threatening, an accurate diagnosis must be made to prevent unnecessary abdominal surgeries, which are dangerous for patients.

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Authors' contributions Nien-Ying Tsai collected data and wrote the manuscript.

Chung-Hsing Chou treated the patient and interpreted the data.

Yi-Chiao Cheng did diagnostic laparoscopy and colonoscopy and was a supervisor.

All the authors read and approved the final manuscript.

Data availability All the data regarding the findings are available within the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethics approval and consent to participate The authors have declared no ethical conflicts.

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