outcomes in PSC patients (5). First, NAC (fluimucil, 600 mg effervescent tablet; Zambon Group, Bresso, Italy) was diluted with NS (12 mg/ml) and injected into the nasobiliary. Serum bilirubin decreased. A continuous infusion of NAC was then performed (4 mg/ml, 50 ml/h) using an infusion pump for 24 h per day (**Supplementary Video 1** online). Serum bilirubin gradually decreased to about 100 umol/l (**Figure 2**). Four weeks later, the patient was discharged and continuous infusion of NAC was performed during family therapy. Six months later, the patient died from lung infection. Infusion of NAC by nasobiliary was observed to be safe, convenient, and effective for the remarkable improvement of biliary obstruction of IPMN-B. This case series is limited by the rarity of the condition, and larger controlled studies would help clarify these preliminary findings.

Declaration

The method was approved by the Ethics Committee of Changhai Hospital, Shanghai, China. The patient was informed and accepted the therapy.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Colonoscopic Fecal Microbiota Transplant for Recurrent *Clostridium difficile* Infection in a Child

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To the Editor: We read with great interest the article "Long-Term follow-up of colonoscopic fecal microbiota transplant for recurrent *Clostridium difficile* infection" by Brandt *et al.* (1). They report adult patients who had received colonoscopic fecal microbiota transplant (FMT) for recurrent *Clostridium difficile* infection (CDI) had a primary cure rate of 91%, a secondary cure rate of 98%, and no serious adverse events. Their findings highlight not only the remarkable efficacy of FMT but also the importance of this therapy in an era of increasingly prevalent and virulent CDI (2).

The FMT Working Group recently published guidelines (3), and FMT is now accepted as the first-line therapy for recurrent/refractory CDI in adults; however, its safety and efficacy in children has not been established. The only reported pediatric case was a 2-year-old with recurrent CDI, who was successfully treated with nasogastric FMT (4). We report here the first pediatric case of recurrent CDI that was treated with colonoscopic FMT.

We were consulted for a 16-month-old boy who had 6 episodes of recurrent CDI, all confirmed by *Clostridium difficile* toxin PCR. His first infection, at 11 months of age, followed treatment with Azithromycin for bronchitis. He presented with four to six foul-smelling watery stools, fever, irritability, vomiting, abdominal pain, and a one to two pound weight loss. He received a 10-day course of metronidazole. His symptoms resolved and subsequent PCR testing was negative. One month later, he developed the same symptoms with PCR-confirmed CDI and was again treated with metronidazole. The symptoms resolved and repeat PCR was negative. His third, fourth, fifth and sixth PCR-confirmed episodes of CDI occurred in a similar pattern and were treated with 10 days of vancomycin, a 1-month pulsed course of vancomycin, followed by two month-long pulsed courses of metronidazole and *Saccharomyces boularddi*.

Past medical and surgical history was significant for bronchitis at 11 months, recurrent otitis media, and myringotomy tube placement. He lived at home with both parents and attended daycare, but had no history of exposure to *Clostridium difficile* or high-risk contacts. Birth and family history were non-contributory. On examination, his weight was 10.6 kg (28th%) and length was 79.4 cm (41st%). He was a well-appearing toddler with no abnormalities noted on physical examination, except for a mild abdominal distention. Complete blood count and quantitative immunoglobulins were normal. Stool studies were negative for *Salmonella*, *Shigella*, *Campylobacter*, Shiga Toxin 1 and 2, *E. Coli* 0157, rotavirus, ova, and parasites. Fecal calprotectin was $<15\,\mu g/g$ and lactoferrin was positive. Given that he had six PCR-confirmed episodes of symptomatic CDI, he was evaluated for FMT. The risks, benefits, and FMT donor selection were discussed with the parents.

Antibiotics were discontinued 2 days before the procedure, and the patient received standard bowel lavage the day prior. Fresh stool (<6 h) was collected and prepared in saline according to the FMT Working Group Guidelines, with stool donated by his mother who had undergone the recommended screening and testing.(3) Esophagogastroduodenoscopy and colonoscopy were grossly normal. Approximately 140 cc of fecal matter was delivered to the terminal ileum and cecum. The patient was recovered in reverse Trendelenburg position and given a dose of loperamide to improve retention. Pathology revealed only mild superficial colonic epithelial damage due to chronic

diarrhea or bowel prep, but was otherwise normal. Within 24 h the patient's symptoms resolved completely. One week post-FMT, *Clostridium difficile* toxin PCR was negative and 2 months post-FMT he remains asymptomatic.

This case offers further support for FMT as a treatment for recurrent CDI in children. Additional studies exploring safety and efficacy in this special population are necessary.

CONFLICT OF INTEREST

Guarantor of Article: Stacy A. Kahn, MD.

Specific author contributions: Stacy A. Kahn developed the protocol, researched the topic, wrote the manuscript, and was the treating physician. Sona Young helped to edit the manuscript and was involved in this patient's care. David T. Rubin developed the protocol, provided critical review, and edited the manuscript. All of the authors have approved the final draft submitted.

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