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Case report: Tension pneumoperitoneum after diagnostic colonoscopy in an 11 y/o boy with Crohns disease

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ABSTRACT

INTRODUCTION: Endoscopy is an established diagnostic and therapeutic tool in paediatric gastroenterology and a safe method with rare complications.**PRESENTATION OF CASE:** We present the case of an 11-year-old Caucasian boy with a long history of inflammatory bowel disease. Three years prior an ileostomy was created and is still in position. After diagnostic panendoscopy (colonoscopy, gastroscopy, endoscopy of small intestine via ileostomy) the patient showed progressive abdominal distension and pain. After diagnosis of tension pneumoperitoneum by radiological proof of massive intraabdominal air and altered vital signs, we initiated emergency laparotomy. Surgical intervention ruled out a free gastrointestinal perforation as well as peritonitis. There was a gaseous insufflation of the mesenteric tissue of the sigmoid and upper rectum most likely according to microperforations to the mesentery. Due to the pre-existing ileostomy, we took no further surgical action. The abdomen was lavaged and drains inserted. Upon further conservative treatment with intravenous antibiotics, the patient showed quick recovery and was discharged on postoperative day 6.**DISCUSSION:** With an incidence of 0.01%, perforation after diagnostic colonoscopy in children is very uncommon. The zone most frequently affected is the sigmoid colon due to direct penetration or indirect force due to flexure, or insufflation. Even without macroscopic perforation, the development of a tension pneumoperitoneum seems to be possible.**CONCLUSION:** Even though Colonoscopy in children is a safe tool, the treating physician must never underestimate the risks of such an intervention. Especially chronically altered intestine as in long-time persisting chronic inflammatory bowel disease demand special care and intensive observation of the patient after intervention.© 2020 The Authors. Published by Elsevier Ltd on behalf of IJS Publishing Group Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Endoscopy is a diagnostic and therapeutic tool in paediatric gastroenterology that has been part of clinical practice for several decades. It is a safe and effective means for acquiring both visual and histologic information on the intestinal structures. Colonoscopy is a routine procedure with low incidence of complications [1].

Geenen et al. discussed the importance of experienced examiners to avoid perforations and bleeding [2]. Since then there was continuous refinement in technical quality, as well as in practical routine. Nevertheless, a risk for serious complications remains.

Abbreviations: PICU, paediatric intensive care unit; GI, gastrointestinal; IBD, inflammatory bowel disease.

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Pneumoperitoneum after colonoscopy appears in 1% of diagnostic and 3% of therapeutic colonoscopies and in 85–95% of cases pneumoperitoneum is caused by visceral perforation [3–8]. However, there is also a so-called benign pneumoperitoneum described, representing free air within the abdominal cavity without any presence of peritonitis. The incidence is rare with 0–3% [1]. In asymptomatic patients, benign pneumoperitoneum caused by transmural passage of insufflated air can be treated by intravenous antibiotics and bowel rest. Symptomatic free air needs surgical intervention. Tension pneumoperitoneum denotes an extreme form of pneumoperitoneum in which the elevated intraabdominal pressure causes haemodynamic instability and respiratory failure [9,10]. Progressive air within the abdomen can elevate the intraabdominal pressure leading to intra-abdominal hypertension and finally abdominal compartment syndrome.

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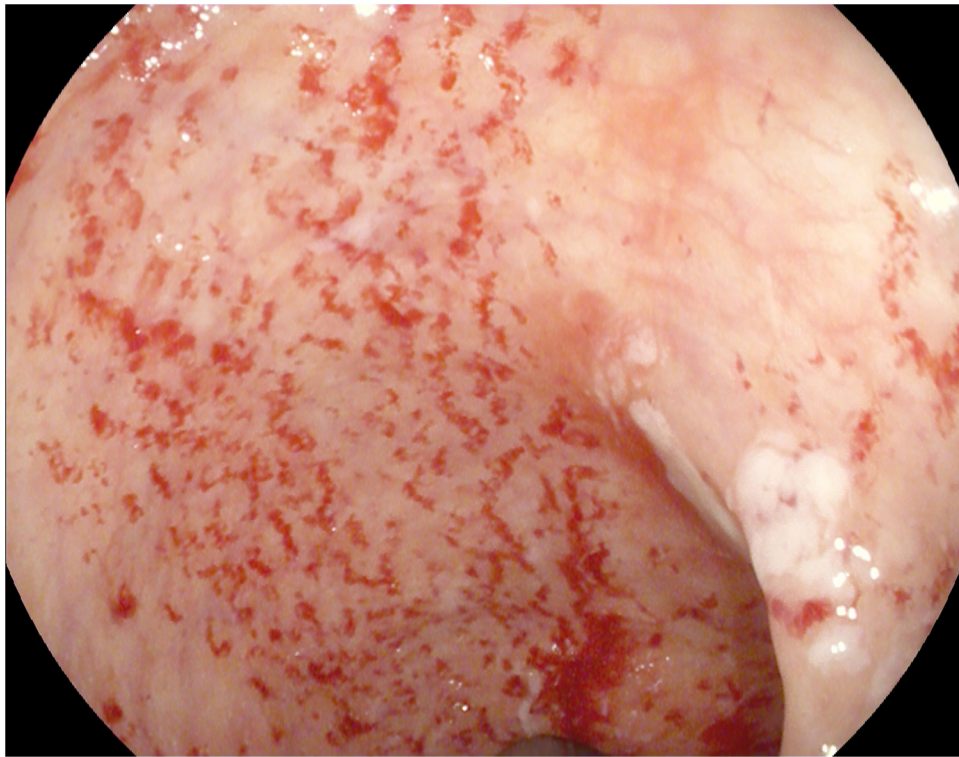


Fig. 1. Endoscopic view of the sigmoid intestinal wall.

To our knowledge, we present the first case of increased intraabdominal pressure, leading to an intraabdominal compartment syndrome without free perforation of the intestinal wall.

The work has been reported in line with the SCARE criteria [11].

2. Presentation of case

We present the case of an 11-year-old Caucasian boy with underlying diagnosis of a very early onset inflammatory bowel disease (IBD) diagnosed at 4 years of age. He presented to our department of paediatric gastroenterology for a routine endoscopy. Prior in his course of treatment, there were several unfortunate events, including pseudo-membranous colitis 4 years ago, as well as severe Crohn-colitis leading to the necessity of an ileostomy 3 years ago, which is still present. The patient underwent repeated rectal balloon dilation and excision of multiple paraproctical fistulas. Medical therapy changed several times due to insufficient response. Currently, using Methotrexate and Infliximab, the patient showed favourable development of IBD for the last 2 years. Upon admission, the patient presented in stable condition.

An experienced paediatric gastroenterologist performed oesophageo-gastro-duodenoscopy, colonoscopy and endoscopy of the ileostomy in unproblematic analgesedation. She took stepped biopsies of the entire GI tract as part of the routine examination. The endoscopy took 40 min showing minor signs of inflammation as well as bloody stretch marks on the sigmoid [see Fig. 1]. There were no signs of bleeding or iatrogenic trauma. Histological examination showed minor chronic inflammation of the large intestine as well as superficial mucosal defects.

After intervention, the patient remained in the endoscopy department until the effects of sedation waned and was then moved to the paediatric ward. Here the mother first noticed a slight distension of the abdomen. Upon clearing up, the patient complained about abdominal pain. Both patient and mother were not worried about these complaints. Retrospectively the

mother did describe them as atypical compared to former colonoscopies, with no passing of gas. The patient received Infliximab as planned. Upon persistence of pain and abdominal distension, the attending paediatrician was informed. She noticed significant abdominal distension, a firm and painful abdomen and absence of bowel sounds. The vital signs remained normal apart from tachycardia up to 120/min. An abdominal X-Ray in left lateral position was taken [see Fig. 2] showing significant pneumoperitoneum.

Immediately, the paediatric surgeons were informed and the patient was then taken to the paediatric intensive care unit (PICU) where he received i.v.-antibiotics (Cefuroxime, Metronidazole). The vital signs remained stable, however even upon adequate analgesia and fluid resuscitation the patient showed persistent tachycardia with blood pressures slowly rising. The patient consistently showed an elevated respiratory rate of about 30–35/min, with superficial breathing. Peripheral perfusion and oxygenation never showed any signs of deterioration. The patient remained awake and responsive to clinical examination.

Immediately, the patient was taken to the operating room for exploratory laparotomy. Upon peritoneal incision, a large amount of air without foul odour passed from the abdomen. Exploration of the abdominal cavity showed small amounts of clear ascites. There was no sign of peritonitis. Inspection of the small intestine, as well as the stoma sites did not show any irregularities and there was no gastroduodenal perforation. Following the large intestine there was a long serosa-lesion of about 6 cm on the transverse colon immediately distal to the right flexure. Adaptation was performed using interrupted sutures. Upon further examination, we found a series of 6 serosa-lesions beginning in the distal sigmoid reaching to the upper rectum – each about 3 cm in diameter [see Fig. 3]. Mesosigmoid and appendices epiploicae were undermined by multiple gas bubbles, but perforation was not identified. As an ileostomy existed, we took no further surgical action. The abdomen was lavaged and drains inserted.

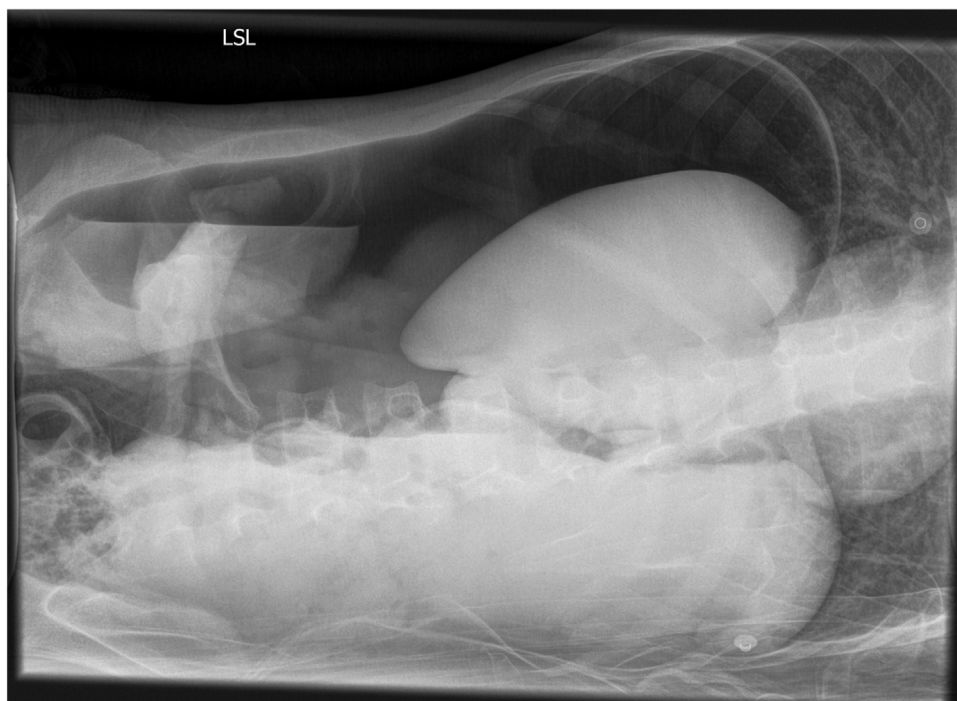


Fig. 2. Abdominal X-Ray showing significant pneumoperitoneum.



Fig. 3. Serosa-lesions of the sigmoid with adjacent gas bubbles.

The patient remained at our PICU for the night for close observation and was moved to the paediatric surgical ward the next day. The following days showed steady increase in his general well-being. Foley-catheter and Drains were removed within the first couple of days. The patient was allowed to drink with an open gastric tube. As bilious secretion subsided and the patient showed no nausea upon blocking the tube, it was removed and

oral food intake from the third day onward was started. Pain medication was reduced step-by-step alongside early mobilisation. He received antibiotics for seven days. Upon a short episode of mild temperature, we removed the central catheter. The patient showed a quick recovery and was discharged on the 6th postoperative day.

3. Discussion

The reported incidence of adverse events in endoscopic examinations is very low. Adult series showed an incidence of 0.04% to 0.26% for perforations [12]. Tulchinsky et al. found an incidence of 0.058% for perforations in both diagnostic and therapeutic colonoscopies combined [12]. Paediatric endoscopy similarly shows very few complications. Tringali et al. report complications in diagnostic colonoscopy at around 1% [13]. Half these events are sedation-related [14]. Other complications are perforation, bleeding and discomfort post-examination. With an incidence of 0.01%, perforation after diagnostic colonoscopy in children is very uncommon [13,15]. Thakkar et al. could show no significant difference in gender distribution or ASA classification, but a higher risk in younger patients and patients receiving intravenous sedation [15]. Kramer et al. in contrast finds adverse events occurring more frequently in older schoolchildren and teens [15]. However, this over-all higher incidence of complications occurring in paediatric patients supports the advice of the American Society of Gastrointestinal Endoscopy (ASGE) that only well-trained endoscopists should perform gastrointestinal endoscopy in paediatric patients [13,16].

Colonoscopic perforations usually lead to rapid formation of abdominal free air [14,17]. Mechanisms include direct mechanical penetration with the instrument tip, sharp flexion or high pressure on the endoscope or barotrauma as a result of aggressive gas insufflation [12]. Tulchinsky et al. specifically described this in patients with diverticular disease or a strictured, severely diseased colonic segment. The sigmoid colon was most frequently affected, being a high-pressure zone when pushing the endoscope [12]. Even in our patient, the sigmoid was mainly affected.

There are a number of reported cases on adults with tension pneumoperitoneum and abdominal compartment syndrome following perforation [18–20]. One report also showed delayed formation of tension pneumoperitoneum with the patient presenting 12 h post examination [19]. Tension pneumoperitoneum appears to be a rarity in paediatric patients. In contrast, there are also rare cases of free intraabdominal air without any perforation of the intestinal tract, described by Pearl et al. as benign pneumoperitoneum. How often this occurs after a diagnostic colonoscopy is hard to evaluate due to a lack of radiographic proof in asymptomatic patients. The study of Pearl tried to evaluate this issue. In 100 patients there were none with intraabdominal free air after colonoscopy [1]. As no perforation could be found we assume that our patient experienced transmural passage of air that exceeded the findings of a benign pneumoperitoneum. While he only showed minor alteration in his vital signs, the extent of his abdominal free air must be considered as a critical state with high risk of decompensation at any given moment.

To our knowledge, our case presents the first case of abdominal hypertension caused by air penetrating through a chronically altered intestinal wall leading to an abdominal compartment.

4. Conclusion

Although paediatric endoscopy is a safe and effective procedure, the treating physicians must never underestimate the risks of such an intervention. As our case demonstrates, significant adverse and even life-threatening events may yet occur. Postinterventional professional observation is an indispensable requirement. This is further emphasised by the mild symptoms our patient presented, considering the severity of his findings. Any patient showing atypical, prolonged or increasing pain should be critically re-assessed and pneumoperitoneum excluded.

Lastly, we emphasize the necessity of paediatric surgeons being accessible in case of adverse events. We established a close coop-

eration between our paediatric gastroenterology and paediatric surgery, which improves quality of care for all patients.

Declaration of Competing Interest

The authors report no declarations of interest.

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

The study is exempt from ethical approval in our institution. Consent was acquired.

Consent

Written informed consent was obtained from the patient's parents for publication of this case report and accompanying images. This report does not contain any personal information that could lead to the identification of the patient.

Author contribution

Sigurd T Seitz – surgery, literature research, writing the paper.
Aline Rückel – endoscopy, data interpretation.
Gregor Siebenlist – endoscopy.
Manuel Besendörfer – study support.
Vera S Schellerer – surgery, literature research, writing the paper.

Registration of research studies

We do not register case reports that are not first-in-man or animal studies.

Guarantor

Vera S. Schellerer, Manuel Besendörfer.

Provenance and peer review

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