

Katarzyna Kamila Bąk-Drabik¹, Monika Prokurat², Agnieszka Szymlak¹,
Anna Jarzumbek¹, Paweł Ziora³, Jarosław Kwiecień¹

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Why is it worth looking for colorectal polyps in children using ultrasound? A case report and literature review

Dlaczego warto szukać polipów jelita grubego w badaniu ultrasonograficznym?

Opis przypadku i przegląd literatury

¹ Department of Paediatrics, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Katowice, Poland

² Students Scientific Association at the Department of Paediatrics, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Katowice, Poland

³ Department of Pathomorphology, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Katowice, Poland

Correspondence: Katarzyna Kamila Bąk-Drabik, Department of Paediatrics, Faculty of Medical Sciences in Zabrze, Medical University of Silesia, Poniatowskiego 15, 40-055 Katowice, Poland,
e-mail: katarzyna.drabik@sum.edu.pl

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ORCID iDs

1. Katarzyna Kamila Bąk-Drabik <https://orcid.org/0000-0002-3793-2771>

2. Monika Prokurat <https://orcid.org/0009-0001-3924-9327>

3. Agnieszka Szymlak <https://orcid.org/0000-0002-8371-8514>

4. Anna Jarzumbek <https://orcid.org/0000-0002-1507-8404>

5. Paweł Ziora <https://orcid.org/0000-0002-3201-3215>

6. Jarosław Kwiecień <https://orcid.org/0000-0002-6764-8261>

Abstract

Colorectal polyps are found in about 6% of all paediatric colonoscopies and 12–15% of those performed for lower gastrointestinal bleeding. The purpose of this report is to describe the experience of ultrasound detection of colorectal polyps in children and evaluate the diagnostic value of ultrasonography. The paper includes a case report of five Polish children with rectal bleeding. The children had a median age of 5.25 years (range: 2–14), and four were girls. Symptoms had been present for 3–6 months before diagnosis. The common ultrasound finding for all polyps was an isolated oval or roundish, well-vascularised structure of varying sizes. Earlier visualisation of the polyp allowed for more accurate and safer therapeutic decisions. Ultrasound is a convenient, non-invasive, and feasible method for diagnosing colonic polyps.

Keywords: colorectal polyp, ultrasound, children

Streszczenie

Polipy jelita grubego stwierdza się u około 6% kolonoskopii u dzieci i 12–15% kolonoskopii wykonywanych z powodu krwawienia z dolnego odcinka przewodu pokarmowego. Celem pracy było opisanie doświadczeń autorów w ultrasonograficznej diagnostyce polipów jelita grubego u dzieci oraz ocena wartości diagnostycznej badania ultrasonograficznego. W pracy przedstawiono opisy przypadków pięciorga polskich dzieci, u których wystąpiło krwawienie z odbytu. Mediana wieku dzieci wynosiła 5,25 roku (zakres: 2–14 lat), czworo z nich było dziewczynkami. Objawy występowały przez 3–6 miesięcy przed rozpoznaniem. W badaniu ultrasonograficznym cechą charakterystyczną polipów była różnej wielkości owalna lub okrągła, izolowana struktura, dobrze unaczyniona. Wcześniejsze wykrycie polipa w badaniu ultrasonograficznym pozwoliło na dokładniejsze i bezpieczniejsze decyzje terapeutyczne. Ultrasonografia jest wygodną, nieinwazyjną i dostępną metodą diagnozowania polipów jelita grubego.

Słowa kluczowe: polipy jelita grubego, ultrasonografia, dzieci

INTRODUCTION

The tissue in the intestines undergoes continuous repair, replacing old cells with new ones. As a result of this process, uncontrolled hypertrophy of the intestinal wall can occur, i.e. the formation of polyps, which are protrusions of tissue towards the intestinal lumen, above the surface of the mucosa⁽¹⁾.

Polyps smaller than 5 mm in diameter are inflammatory or metaplastic lesions. Medium-sized (6–9 mm) and large (10 mm and more) polypoid lesions are frequently neoplastic, including adenomas or hamartomatous polyps⁽²⁾. In children, colonic polyps are usually benign, with a typical inflammatory or hamartomatous histology and minimal risk of developing dysplasia or malignancy⁽²⁾.

The incidence of colorectal polyps detected during paediatric colonoscopy oscillates around 6.1%⁽³⁾. Juvenile polyps account for 70% to 80% of paediatric colonic polyps, of which 60% to 70% are solitary and located in the recto-sigmoid colon. Lymphoid polyps (15%) and adenomatous polyps (3%) follow in frequency^(4,5).

Bloody stool, crampy abdominal pain, intussusception, and progressive anaemia are frequent clinical features of colorectal polyps in children⁽³⁾. Digital rectal examination, barium enema, and ultrasonography are typically used to confirm the diagnosis before colonoscopy, which can be used both for diagnosis and treatment. Hence, it is the usual standard for diagnosis⁽³⁾.

Routine laboratory tests were conducted. Without prior preparation, abdominal ultrasound examination using the graded compression technique was performed. A Samsung RS85 scanner with 3–5 MHz convex and 5–12 MHz high-frequency linear transducers was used in all children. The clinical details of the children are presented in Tab. 1.

Patient No. 1

The first patient (3 years old), presenting symptoms of bloody stools for three months, was admitted to the hospital for an elective colonoscopy. An intestinal ultrasound was performed upon admission, revealing a single, well-vascularised, oval-shaped mass measuring 17 × 15 mm in the distal sigmoid colon. Colour Doppler sonography revealed abundant vascularity within the tumour (Fig. 1). Before admission, the girl underwent two ultrasound examinations, neither of which detected the presence of a polyp. The faecal calprotectin level was high (1,100 µg/g).

In the beginning, the girl was scheduled for a colonoscopy. However, due to high suspicion of a polyp and the unavailability of an experienced specialist for polypectomy, the procedure was rescheduled for a different date.

During the colonoscopy, performed under general anaesthesia, a solitary polyp on a short stalk with a smooth continuous surface was detected in the distal sigmoid colon. No other polyps were detected after total colonoscopy.

Case	Sex	Age	Time to diagnosis	Clinical picture	Diagnosis	Localisation	Number of polyps on US	Number of polyps on colonoscopy	Treatment
No. 1	F	3 years	4 months	Bloody stools	Juvenile polyp	Sigmoid colon	1	1	Polypectomy during colonoscopy
No. 2	M	14 years	12 months	Bloody stools	Inflammatory polyp	Rectum	1	3	Surgical removal in divulsion
No. 3	F	2 years	2 months	Bloody stools	Juvenile polyp	Rectum	1	1	Polypectomy during colonoscopy
No. 4	F	2 years	5 months	Bloody stools	Juvenile polyp	Sigmoid colon	1	1	Polypectomy during colonoscopy
No. 5	M	2.5 years	4 months	Bloody stools	Juvenile polyp	Anus	1	1	Surgical removal in divulsion

F – female; M – male; US – ultrasonography.

Tab. 1. Characteristics of the study group

Polyp detection is becoming more feasible every year with advancements in ultrasound technology and improved skills among ultrasonographers⁽⁶⁾. This paper describes a case series of five patients in whom a polypoid lesion was detected during ultrasonography, which allowed a safe polypectomy during colonoscopy, along with a review of the current literature.

CASE REPORTS

Five children were admitted to the Public Clinical Hospital, Gastroenterology Department, with a history of bloody stools between 2021 and 2023. The children did not show any alarm symptoms. Their median age was 5.25 years (range: 2–14), and four were girls. All patients had symptoms for 3–12 months before the diagnosis, with no reported alarm symptoms.

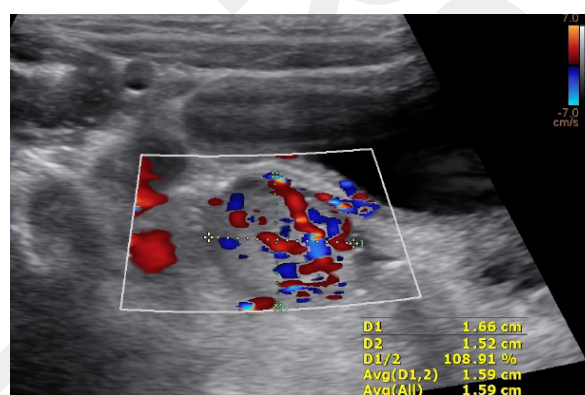


Fig. 1. Patient No. 1. Abdominal ultrasonography revealed a well-vascularised, oval-shaped mass measuring 17 × 15 mm in the distal sigmoid colon



Fig. 2. Patient No. 1. Solitary, well-vascularised, oval-shaped mass measuring 17 × 15 mm in the distal sigmoid colon

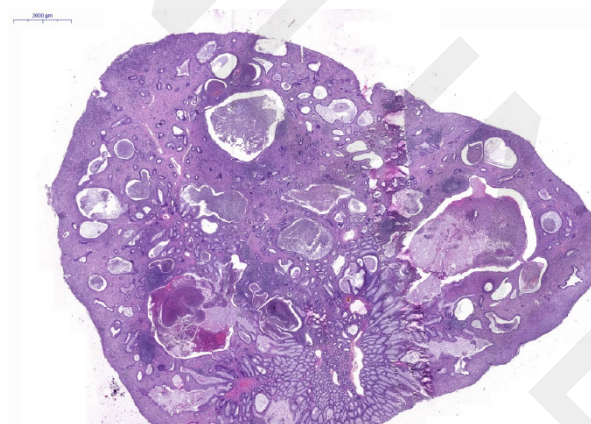


Fig. 3. Patient No. 1. Juvenile polyps. Polyps with oedematous lamina propria with inflammatory cells and cystically dilated glands. Glands are lined by epithelium with reactive changes. Some of the glands are filled with mucus and inflammatory debris

(Fig. 2). The polyp was successfully removed with a polypectomy snare (current 20 W for excision). One clip was applied to the resected site to prevent delayed bleeding after polypectomy. The polyp was retrieved for histological analysis, which confirmed a juvenile polyp with severe inflammation (Fig. 3). There were no complications after the polypectomy, and the patient was discharged two days later.

Patient No. 2

The second patient (14 years old) was referred to from a district hospital due to the presence of a polyp with a broad base and uneven surface in the rectum, detected during colonoscopy. Histopathological examination identified it as a fibroepithelial polyp. Colonoscopy under general anaesthesia was performed because of the presence of blood in the stool. An ultrasound examination conducted on admission revealed a solid mass that measured 25 × 15 mm

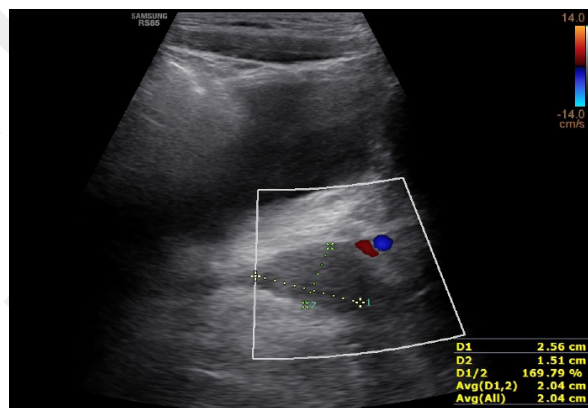


Fig. 4. Patient No. 2. Abdominal ultrasonography revealed a solid, oval-shaped mass measuring 25 × 15 mm in the distal sigmoid colon

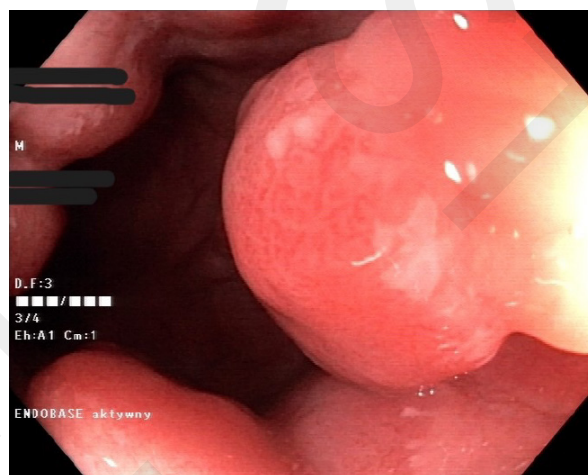


Fig. 5. Patient No. 2. One of three polyps on the inner edge of the anal canal, on a short stalk, 15 mm in diameter

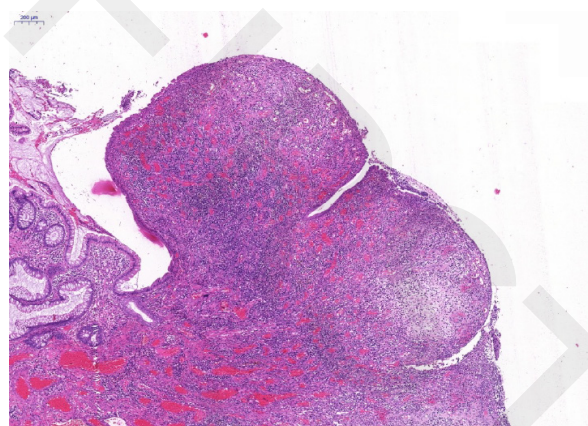


Fig. 6. Patient No. 2. Inflammatory polyp. Polyp with surface erosion, abundant granulation tissue, thin-walled dilated vessels, surrounded by mixed neutrophilic and lymphoplasmacytic inflammation

in the left lower quadrant of the abdomen, with no visible vascularisation (Fig. 4). The mass appeared as a heterogeneous hypoechoic solid nodule and in close contact with

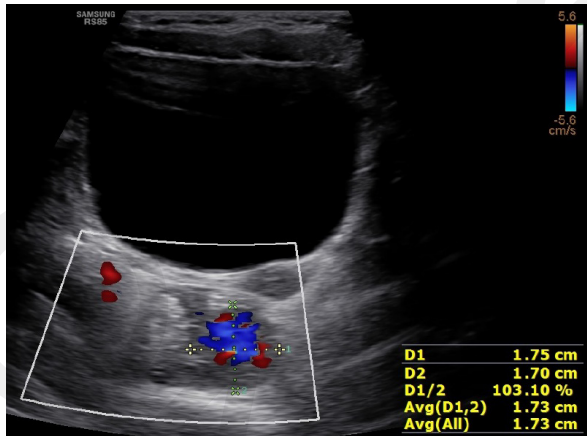


Fig. 7. Patient No. 3. Abdominal ultrasonography revealed a well-vascularised, oval-shaped, pedunculated mass measuring 17 × 15 mm in the distal sigmoid colon



Fig. 8. Patient No. 3. Semi-stitched polyp in the middle part of the rectum, measuring 17 × 17 mm. The polyp was successfully removed with a polypectomy snare (current 20 W for excision)

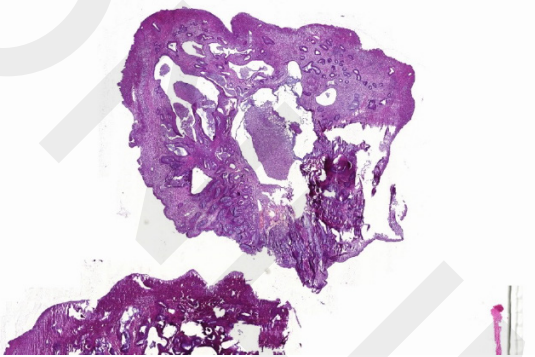


Fig. 9. Patient No. 3. Juvenile polyps. Polyps with oedematous lamina propria with inflammatory cells and cystically dilated glands. Glands are lined by epithelium with reactive changes. Some of the glands are filled with mucus and inflammatory debris

the colonic wall. No previous ultrasound examination showed the presence of the polyp. A repeat colonoscopy at the

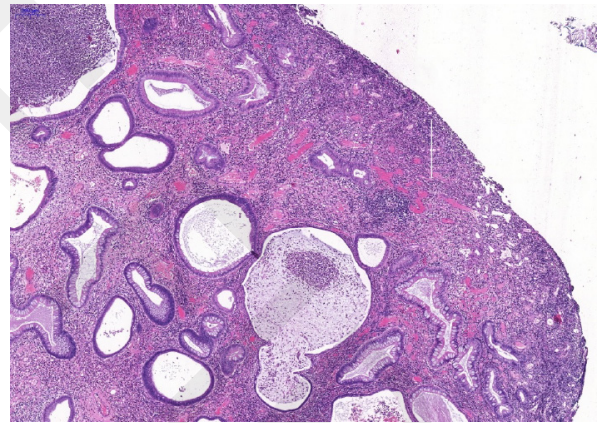


Fig. 10. Patient No. 4. Juvenile polyps. Polyps with oedematous lamina propria with inflammatory cells and cystically dilated glands. Glands are lined by epithelium with reactive changes. Some of the glands are filled with mucus and inflammatory debris

hospital identified three polyps: one on the inner edge of the anal canal, on a short stalk, 15 mm in diameter, and two flat polyps in the anal canal (Fig. 5). Endoscopic polypectomy was not performed due to a risk of complications, so the polyp was removed during a surgical procedure in divulsion. Histopathological examination confirmed the presence of inflammatory polyps (Fig. 6).

Patient No. 3

The third patient (2 years old), with a history of several episodes of dark red bloody stools over the previous two months, along with prolapse of a dark red structure from the anus, was admitted to the hospital with a suspected polyp. Ultrasound performed on admission revealed a round, well-vascularised structure measuring 17 × 17 mm (Fig. 7). A previous outpatient ultrasonography examination showed no polyp. Colonoscopy confirmed the presence of a semi-stitched polyp in the middle part of the rectum (Fig. 8). The polyp was successfully removed using a polypectomy snare (current 20 W for excision). One clip was applied to the resected site to prevent delayed bleeding after the procedure. Histopathological examination confirmed a juvenile polyp (Fig. 9).

Patient No. 4

The fourth patient (2 years old), presenting with symptoms of bloody stools for five months, was admitted to the hospital for an elective colonoscopy. Ultrasound examination performed in the hospital revealed the presence of a well-vascularised, round structure at the rectal-sigmoid junction, measuring 14 × 19 mm (Fig. 10). As in previous cases, this was the first ultrasound showing any abnormalities. Because of high suspicion of a polyp, the colonoscopy appointment was changed so that an experienced endoscopic team would be present during the examination to ensure the highest possible safety. Colonoscopy revealed a 15 mm



Fig. 11. Patient No. 4. Polyp with a diameter of 15 mm, on a short wide peduncle in the distal sigmoid colon

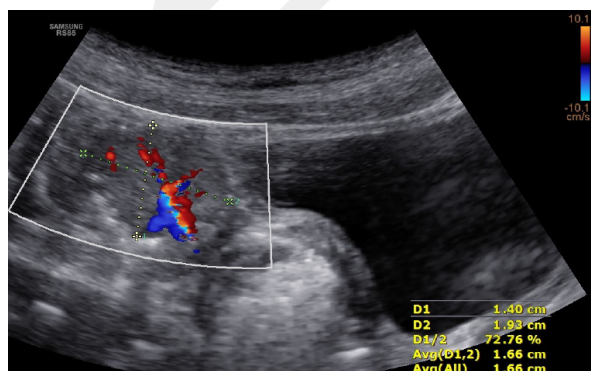


Fig. 12. Patient No. 4. Abdominal ultrasonography revealed a solitary, well-vascularised round structure measuring 14 × 19 mm in the distal sigmoid colon

diameter polyp on a short but wide peduncle in the distal sigmoid colon (Fig. 11). The polyp was removed using a polypectomy snare (current 20 W for excision). A juvenile polyp was diagnosed (Fig. 12).

Patient No. 5

The fifth patient (2.5 years old) was admitted to the hospital due to bloody stools for four months. The parents observed the presence of vivid blood after passing properly formed stool and prolapse of a roundish, easily retractable structure. The patient had no abdominal pain and maintained a normal appetite. Ultrasound examination performed at the hospital showed a well-vascularised round structure measuring 13 × 11 mm in the anus (Fig. 13). The child was scheduled for colonoscopy in the operating room, with the surgeon present in case surgery or polypectomy via divulsion was necessary. Colonoscopy showed a 13 mm polyp located 35 mm from the inner edge of the anal canal on a short stalk (Fig. 14). Due to the high risk of endoscopic polypectomy, the procedure was performed via divulsion. Histopathological examination confirmed a juvenile polyp (Fig. 15).

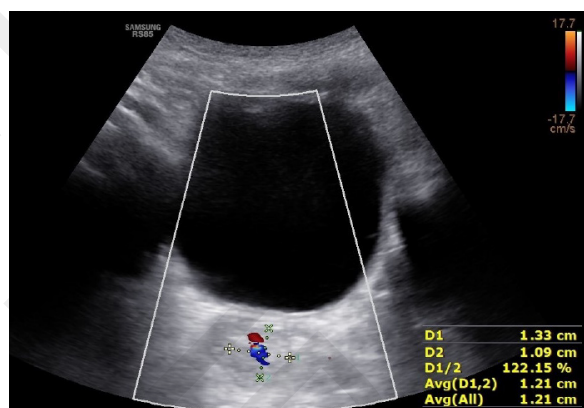


Fig. 13. Patient No. 5. Abdominal ultrasonography revealed a solitary, well-vascularised, oval-shaped, pedunculated mass measuring 13 × 10 mm in the anus



Fig. 14. Patient No. 5. Well-vascularised round structure measuring 13 × 11 mm in the anus

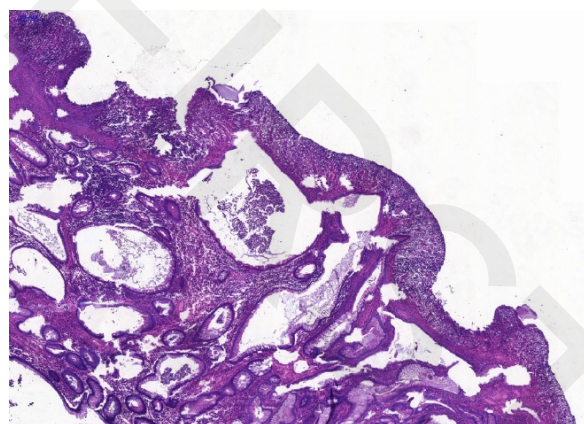


Fig. 15. Patient No. 5. Well-vascularised round structure measuring 13 × 11 mm in the anus

The ultrasonic finding common to all polyps was an isolated intraluminal nodular or massive protrusion associated with multiple mesh-like fluid areas of varying sizes. Colour Doppler imaging showed abundant blood flow signals within all polyps and pedicles, appearing in the shape of branches or umbrellas.

DISCUSSION

This study presents the cases of five patients in whom none of the ultrasounds performed before admission to the hospital showed signs of a polyp. Yet, an ultrasound performed by an experienced operator in the hospital revealed a polyp in the colon. This is likely the first Polish case report with a literature review describing ultrasound detection of polyps in children. On the one hand, detection in children is easier because of better visualisation but, on the other hand, cooperation with children during the examination is more challenging. In these cases, ultrasonography was performed intentionally due to lower gastrointestinal bleeding, but in many cases, polyps are found accidentally. Kuzmich et al. reported 50 polyps in adults that were identified during routine ultrasound⁽²⁾. They stated, similar to other researchers, that colonic polyps larger than 1.0 cm in diameter can be discovered on conventional ultrasound using a 6–10 MHz linear transducer, often without any prior preparation.

Colorectal polyps are common in children, occurring in about 12–15% of all paediatric colonoscopies performed for lower gastrointestinal bleeding⁽³⁾. In the cases described here, bleeding from the lower gastrointestinal tract was the predominant symptom, and in two cases, polyp prolapse through the anus was also observed. Other authors have reported similar observations^(3,7).

The median age of the patients in this study was 5.25 years, consistent with other reports^(3,4,7,8). Juvenile polyps occur in childhood, typically between the ages of 2 and 5. Also, the majority of cases involved children up to 3 years old – the 14-year-old patient presented with a different histopathology (an inflammatory polyp).

The typical appearance of a colorectal polyp on ultrasound is a spherical or oval hypoechoic nodule within the colonic lumen^(2,9). In the cases reported here, the shape and structure of juvenile polyps were similar (an oval-shaped mass, hypoechoic solid lesion, with a round structure). In contrast, inflammatory polyps represent areas of elevated inflamed or normal mucosa. These polyps can be either pedunculated or sessile. A differentiating feature from other polyps is that their echotexture is similar to thickened mucosa. In the reported case of the patient with an inflammatory polyp, ultrasonography revealed a heterogeneous hypoechoic solid lesions in close contact with the colonic wall, without visible vascularity.

The diameter of juvenile polyps usually ranges from 1.0 to 2.5 cm, while cysts, visualised within these polyps, range from 2 to 3 mm⁽⁸⁾. The polyps observed in the present study ranged in size from 13 × 11 to 14 × 19 mm. Inflammatory polyps are generally smaller than 5 mm, but the inflammatory polyp observed in one of the patients described here was larger (25 × 15 mm). On colour Doppler sonography, in most juvenile polyps, vessels are symmetrically distributed within the lesion, and smaller vessels radiate peripherally from the centre. The cysts within juvenile polyps are

intestinal glands distended by mucus⁽¹⁰⁾. In four cases of juvenile polyps reported in this study, the observed lesion was very well-vascularised. In contrast, the inflammatory polyp was not visibly vascularised.

Many factors, such as polyp location and the ultrasonographer's experience, can affect the detection of gastrointestinal polyps despite their typical appearance on ultrasound. First, not every ultrasonographer has experience in intestinal examinations, highlighting the need to promote knowledge about intestinal ultrasound. The operator who performed the ultrasound in the present study had completed the International Bowel Ultrasonography Curriculum.

Another problem is polyp location. Kuzmich et al. pointed out that, in their experience, the proximal sigmoid and distal descending colon were common sites for detectable polyps because these colon segments were often accessible via ultrasound without any special preparation. On the other hand, two regions are most challenging to explore, namely the rectosigmoid, splenic and hepatic flexure, mainly because these areas are frequently stool-filled and less amenable to transducer pressure owing to their anatomical position⁽²⁾. Visualisation of polyps also largely depends on the colon's physiological state. In an empty colon, all the details of the colonic wall can be seen. In a semi-filled colon, transducer compression must be used to oppose colonic walls and improve visualisation. When there is much non-compressible stool in the colon, it appears as a continuous haustral pattern because only the wall next to the transducer is visible. Because of these limitations, a negative ultrasound result does not exclude the presence of an intestinal polyp. Also, structures located deep in the pelvis and relatively small polyps are challenging to visualise⁽²⁾.

The use of colonoscopy in young children always carries the risk of sedation-related complications, and it is a heavy burden on gastrointestinal endoscopists to perform polypectomy because the lumen of the intestine is smaller than in adults. In many cases, upper gastrointestinal endoscopy is used. Therefore, it is beneficial for gastrointestinal endoscopists to predict the presence of juvenile polyps before the colonoscopy and to perform this procedure with precise localisation. For this reason, abdominal ultrasonography has recently been recognised as a primary procedure offering high safety and accuracy as a screening tool for polyps in children⁽⁶⁾. In two cases described in this study, detecting the presence of a polyp influenced therapeutic decisions. Due to a high suspicion of a polyp and the lack of an experienced specialist in polypectomy, the colonoscopy was scheduled at a later time to ensure the highest possible safety.

In ultrasound examinations, mechanical bowel preparation is not performed to reduce the influence of gas and stool. Instead, only a graded compression technique is used to move the anterior wall closer to the posterior and displace faeces or gases. Many authors have emphasised the benefits of bowel preparation^(6,9). However, other studies have suggested that ultrasound can detect polyps without bowel preparation or enemas, which is essential, as these

are invasive and impractical interventions, particularly in a paediatric cohort^(10,11). According to Kuzmich et al., colorectal polyps can be detected in the proximal sigmoid and distal descending colon without any special preparation⁽²⁾. Hosokawa et al. revealed that the sensitivity, specificity, and accuracy of ultrasound without any bowel preparation for detecting colorectal polyps were 47% (7/15, 95% confidence interval, 95% CI: 21–73%), 100% (59/59, 95% CI: 94–100%), and 89% (66/74, 95% CI: 80–95%), respectively⁽¹²⁾. Some mistakes may lead to false-positive findings, such as complex haustral folds, a focal bulge in the colonic wall due to the contraction of prominent taenia coli, undigested food, pills or capsules, or impacted diverticula⁽²⁾. Most false-positive results can be avoided by applying better techniques, for example by multiplanar scanning of the colon with liberal transducer angulations that allow obtaining three-dimensional information.

When identifying polyps through sonography, it is essential to assess the presence of vascularity within the lesion on Doppler. Another crucial factor is visualising the polyp pedicle as an extension of the mucosa, with a submucosal muscular layer connecting the polyp head to the colonic wall. Graded compression can help displace faeces or foreign objects. A useful method for distinguishing a polyp from faeces is observing the continuity of the mucosa and submucosa connecting the polyp's head to the colonic wall. Wang and Jia found that ultrasonography has a sensitivity of 97.1% and a specificity of 100% for detecting colorectal polyps in children, while in adults, the sensitivity is 99.4%⁽⁸⁾. Only in one of the cases reported in the present study an elevated level of faecal calprotectin was observed. This marker is markedly elevated in infectious and inflammatory conditions but may also be increased in the presence of a polyp. According to Pauley-Hunter et al., the increase in FC levels in juvenile polyps is due to the high presence of inflammatory cells within the polyp and their subsequent exfoliation, which causes increased levels of faecal inflammatory markers⁽¹³⁾. Olafsdottir et al. reported that children with juvenile polyps had elevated FC levels but lower than those observed in active inflammatory bowel disease (IBD)⁽¹⁴⁾. Contrary to Korean studies, the calprotectin level was as high as in IBD⁽¹⁵⁾. Pauley-Hunter et al. described four children with juvenile polyps aged 2.5, 5.5, 8, and 17 years, with the level of calprotectin (>2,500, >2,500, 1,100, 534 µg/mL, respectively). The authors concluded that faecal calprotectin levels cannot reliably distinguish between IBD, other inflammatory disorders of the colon, and juvenile polyps. However, a normal calprotectin level would make a polyp less likely to be caused by blood in the stool, or it could be helpful in screening to ensure the complete removal of all polyps⁽¹³⁾.

CONCLUSIONS

Ultrasonography cannot replace colonoscopy in diagnosing polyps, but it can serve as a safe, non-invasive polyp screening technique that is well accepted by children. A brief

sonographic examination of the intestine should be promoted and incorporated into routine scanning. In some cases, it may influence future therapeutic decisions.

Conflict of interest

The authors report no financial or personal relationships with other individuals or organisations that could adversely affect the content of the publication and claim rights to this publication.

Author contribution

Original concept of study: KKBD. Collection, recording and/or compilation of data: MP, AS, AJ, PZ. Analysis and interpretation of data: KKBD, AJ, PZ. Writing of manuscript: KKBD, MP. Critical review of manuscript: JK.

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