Hydrosonography in the evaluation of colorectal polyps

Ung-Paw Ling, Jia-Yuh Chen, Chi-Jou Hwang, Chin-Kun Lin, Mei-Hwei Chang

Abstract
Prewarmed saline enemas and transabdominal ultrasound (hydrosonography) were used to evaluate 17 consecutive children with rectal bleeding before colonoscopy. Twelve patients with polyps were identified (10 by ultrasound, 10 by endoscopy): these included multiple hyperplastic polyps (1), multiple polyps (1), solitary polyps (9), and pseudopolyps (1). Ultrasound identified 11 polyps in 10 patients, missing two patients with small polyps less than 0.5 cm in diameter. The polyps were hyperechoic ovoid masses fixed to the colonic wall, with a stalk (7), submucosal infolding (5), and intraluminal floating (5). There was one false positive. Colonoscopy was refused by one patient and failed to reach beyond the distal sigmoid in another following previous surgery for malrotation. Colonoscopy was superior in identifying finer mucosal detail (colitis, ulcers, proctitis, anal fissure) and in detecting smaller polyps (sessile polyps, hyperplastic polyps). Hydrosonography of the colon is a simple, relatively non-invasive procedure that provides an alternative, radiation-free examination of the whole colon before colonoscopy. It is complementary to colonoscopy in the management of rectal bleeding in children.

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Keywords: hydrosonography, juvenile colorectal polyps.

Juvenile polyps are relatively common, affecting 1–1% of preschool and school aged children. They occur in isolated, multiple, and/or familial forms. The majority are between 1 to 2 cm in diameter, 72–77% greater than 1 cm; 60–97% are pedunculated. Mazier et al proposed that polyps approaching 1 cm in diameter had a tendency to prolapse from the colonic wall, drawing out a pedicle of intestinal mucosa. Loss of pedicle integrity would result in spontaneous expulsion of polyps, an incidence of 5 to 12% observed over several years. Furthermore, in series with adequate follow up, there was between 17% to 25% recurrence of juvenile polyps. In children suspected of juvenile polyps, diagnostic evaluation usually includes barium enema and sigmoidoscopy or colonoscopy. When combined with double contrast barium enema, colonoscopy is a highly accurate means of evaluating colonic lesions in adults. Recent pioneering work by Limberg showed that hydrosonography of the colon was almost as sensitive as colonoscopy in detecting colonic polyps larger than 0.7 cm in diameter, including those located proximal to the sigmoid colon. It might therefore be appropriate to apply sono- graphy in pre-endoscopic examination of the whole colon in children suspected of colorectal polyps.

Subjects and methods
From January 1991 to October 1994, children with rectal bleeding were evaluated with hydrosonographic evaluation of the whole colon followed by colonoscopy. Seventeen children, mean age 4–7 years (range 1–3–10–0 years), were examined by the same sonographer (U-PL). Bowel preparation before hydrosonography included magnesium citrate syrup (30 ml/year of age, maximum 300 ml), bisacodyl (5 mg for child less 10 kg, 10 mg otherwise), and dimethicone (4 mg/kg) by mouth 20 to 24 hours before the procedure. Clear liquid intake was encouraged over this period, for older children, 500 ml or more over the first two to three hours. Each patient received bisacodyl (10 mg/dose) rectal suppositories twice, at eight and four hours before sonography. Except for the older children who could cooperate, most patients (n = 13) were mildly sedated with rectal quinalbarbitone or chloral hydrate.

Prewarmed normal saline was used for retrograde enemas. After initial filling of the rectum, the patient was supported in the sitting position while saline was infused to obtain optimal filling of the sigmoid. During sonography, postural changes were required to obtain maximal saline filling of each segment of interest and to circumvent the presence of air. The rectum was examined with the patient in supine and right lateral decubitus positions while the transverse colon was examined in the supine and right or left lateral decubitus position with addition of cross table scanning. The colonic flexures were examined with subcostal and lateral intercostal scanning. The ascending and descending colon could be readily evaluated in the supine position. Using longitudinal and transverse scans, repeated transabdominal sonographic evaluation of each segment of interest was performed with a 5 MHz transducer (Aloka SSD-630, Japan) with intermittent video recording.

The presence of colonic polyps, that is any lesion raised above the surface of the mucosa, was identified sonographically by evidence of an intraluminal ovoid, homogenously
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An echogenic mass that is relatively fixed to the colonic wall. Small lesions, especially those less than 0.7 cm, could be mistaken for colonic haustra. Circumferential orientation of the haustra on transverse scan and elongation or convergence of two or more opposing folds on longitudinal scan usually differentiated them. Identification of a stalk or infolding of the submucosa into the pedicle assisted in this aspect of investigation (fig 1).

Small polyps need to be differentiated from adherent faecal masses, which are otherwise seen as free floating, hyperechoic intraluminal masses with irregular shape and outline. This includes movement observed during postural changes, percutaneous compression, further saline infusion on subsequent scanning, and presence of air microbubbles. Colonoscopy was performed within a week of hydrosonography. When a polyp was identified, polypectomy and histological examination were performed.

Results

The normal colon appears as an echo free tubular lumen 1.5 to 5 cm in diameter, with frequent echogenic sawtooth structures projecting into the lumen (colonic haustra). In the rectum, two to four rectal valves of Houston could be identified. Typically, these could be traced on their circumferential span on the rectal wall.

Whenever pockets of gas or accumulated faecal material prevented adequate visualisation of a particular loop of bowel, postural changes and/or further saline infusion usually permitted satisfactory sonographic examination. Particular faecal residues, accumulating in the right colon, were observed in 13 of 17 patients (76.5%). None the less, the colonic wall could be readily outlined. Further infusion of saline to decrease the concentration of faecal residues always improved the clarity of colonic wall identification. After initially learning how to differentiate colonic haustra, adherent faecal masses, the ileocecal valve and the rectal valves of Houston from polyps, a satisfactory evaluation of the whole colon could be completed within 30 minutes.

Seventeen children underwent hydrosonographic investigation for rectal bleeding (table). It was well tolerated and there were no side effects. Two of them received single contrast barium enemas (patient 1 and 2). Barium enema failed to demonstrate a large splenic flexure polyp, measuring 2.5 cm in diameter, in patient 1 while patient 2 had an indeterminate rectal filling defect. Patient 3 had undergone barium enema and colonoscopic polypectomy six months previously and suffered recurrent bleeding for one month. Pre-endoscopic hydrosonography determined with certainty the presence of colorectal polyps.

Colonoscopy and hydrosonography were complementary in several patients. Patient

Clinical data of 17 patients evaluated with colon hydrosonography including 11 patients with juvenile polyps and one with pseudopolyposis

<table>
<thead>
<tr>
<th>Patient No</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Duration of bleeding</th>
<th>Hydrosonography</th>
<th>Colonoscopy</th>
<th>Pathology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>2.3</td>
<td>1 y*</td>
<td>2X2.5 cm polyp in descending colon. Echo follow up</td>
<td>Large polyp in descending colon</td>
<td>JP</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>4.0</td>
<td>1 y*</td>
<td>1.1X2.5 cm polyp on posterior wall of rectum</td>
<td>Rectal polyp</td>
<td>JP</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>5.5</td>
<td>1 m†</td>
<td>1.5X1.3 cm polyp on posterior wall of rectum</td>
<td>Rectal polyp</td>
<td>JP</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>7.0</td>
<td>2 y</td>
<td>0.8X0.6 cm polyp on anterior wall of distal rectum</td>
<td>Rectal polyp</td>
<td>JP</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>3.0</td>
<td>6 m</td>
<td>1.3X0.8 cm polyp on anterior wall of proximal rectum</td>
<td>Refused colonoscopy. Echo follow up</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>4.0</td>
<td>2 m</td>
<td>2 polyps: 1.6X0.8 cm in the rectum and 0.6X0.4 cm in the sigmoid</td>
<td>3 polyps: rectum, sigmoid, hepatic flexure (0.3X0.4 cm)</td>
<td>JP</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>5.0</td>
<td>1 m</td>
<td>0.9X0.8 cm polyp on anterior wall of distal rectum</td>
<td>Rectal polyp</td>
<td>JP</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>4.0</td>
<td>1 y</td>
<td>2.3X1.8 cm polyp in descending colon</td>
<td>Failed</td>
<td>NA</td>
</tr>
<tr>
<td>9</td>
<td>M</td>
<td>7.0</td>
<td>1 w</td>
<td>1.6X1.5 cm polyp on posterior wall of distal rectum</td>
<td>Rectal polyp</td>
<td>JP</td>
</tr>
<tr>
<td>10</td>
<td>M</td>
<td>6.0</td>
<td>5 w</td>
<td>No finding</td>
<td>Flat sessile polyp less than 0.5 cm</td>
<td>JP</td>
</tr>
<tr>
<td>11</td>
<td>M</td>
<td>0.7</td>
<td>1 m</td>
<td>No finding</td>
<td>Multiple hyperplastic polyps in ascending colon</td>
<td>NA</td>
</tr>
<tr>
<td>12</td>
<td>M</td>
<td>5.5</td>
<td>2 w</td>
<td>No finding</td>
<td>Multiple small ulcers from caecum to descending colon</td>
<td>NA</td>
</tr>
<tr>
<td>13</td>
<td>M</td>
<td>5.0</td>
<td>1 w</td>
<td>No finding</td>
<td>Pseudo membranous colitis, colonic ulcer, rectal pseudopolyposis</td>
<td>NA</td>
</tr>
<tr>
<td>14</td>
<td>F</td>
<td>10.0</td>
<td>1 m</td>
<td>No finding</td>
<td>Pseudomembranous colitis, colonic ulcer, rectal pseudopolyposis</td>
<td>NA</td>
</tr>
<tr>
<td>15</td>
<td>M</td>
<td>5.4</td>
<td>5 y</td>
<td>Enlarged rectum</td>
<td>Proctitis</td>
<td>NA</td>
</tr>
<tr>
<td>16</td>
<td>M</td>
<td>2.0</td>
<td>1.5 y</td>
<td>Small polyp 0.5X0.5 cm in descending colon</td>
<td>Enlarged rectum</td>
<td>NA</td>
</tr>
<tr>
<td>17</td>
<td>M</td>
<td>5.0</td>
<td>2 w</td>
<td>0.8 cm polyp with hazy margins in mid-reculum</td>
<td>Pseudo membranous colitis, colonic ulcer, rectal pseudopolyposis</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Barium enema showed no polyps in patient 1 and a rectal filling defect in patient 2.
†Recurrent bleeding with previous barium enema and colonoscopic polypectomy in patient 3.
‡Colonoscopy failed in patient 8 with previous operation for malrotation.
JP = juvenile polyps; NA = not available; NSI = non-specific inflammation; y = years; m = months; w = weeks.
5 had a pedunculated rectal polyp on sonography but refused therapeutic colonoscopy and opted for ultrasound follow up. Patient 8, who had surgery at birth for malrotation, had a large polyp in the descending colon detected by ultrasound (fig 2). Colonoscopy failed to reach beyond the distal sigmoid and was aborted. Ultrasound missed one small polyp (0.3 x 0.4 cm in the transverse colon) in patient 6 with multiple polyps. Hydrosonography also failed to detect a small, flat sessile polyp raised less than 0.5 cm above the mucosal surface in patient 10 and multiple hyperplastic polyps in the ascending colon in patient 11 (table). In patient 17, rectal bleeding occurred for two weeks after four weeks of antibiotic treatment for diarrhoea. Colonoscopy revealed pseudomembranous colitis with a polypoid inflammatory mass in the rectum and scattered ulcers in the sigmoid and descending colon.

Overall, hydrosonography was able to detect with certainty the presence of polyps in 11 of the 17 patients, with an identifiable stalk (7), submucosal infolding (5), and floating within the lumen (5). Two patients, in whom colonoscopy failed or was refused, received further sonographic follow up. Colonoscope derived histological specimens were available from eight patients with juvenile polyps, showing cystic dilatation of glands lined by mucus secreting tall columnar epithelium with goblet cells and loose, oedematous stroma.

Discussion
Rectal bleeding is a common symptom in children, which may be alarming. Causes include abrasion, trauma, anal fissure, constipation, infectious colitis, allergic enterocolitis, or potentially life threatening events such as intussusception, Meckel’s diverticulum, volvulus, or blood dyscrasias. Clinical history, physical examination, and laboratory investigation usually differentiate these. Imaging procedures may include sonography, barium enema, sigmoidoscopy or colonoscopy, technetium-99m pertechnetate scan, and angiography. However, for colorectal polyps, the most common cause of painless, intermittent rectal bleeding in childhood, barium enema and colonoscopy are usually performed.

Conventional transabdominal ultrasound cannot detect colonic polyps, due to intraluminal gas and absence of wall infiltration. The exception is when there is incidental bowel loop distension by intraluminal faecal fluid. Water enema was first proposed to overcome intraluminal gas during pelvic sonography. In recent years, hydrosonography has been applied to the diagnosis of inflammatory bowel disease, colonic tumours, and colorectal polyps.

This study confirms the usefulness of hydrosonography in evaluating colonic polyps in children. It is a simple procedure performed in outpatients or as a day case. Radiation-free evaluation of the whole colon is possible before resorting to more invasive procedure such as sigmoidoscopy or colonoscopy. It provides definite precolonoscopic detection and localisation of polyps in a manner similar to colonoscopy (a sensitivity of 97% for polyps over 0.7 cm in diameter). There is also minimal discomfort and we found no side effects. Understandably, there is greater acceptance by parents and patients.

While superior in delineating fine mucosal details and detecting smaller polyps, colonoscopy cannot be used as the ‘gold standard’ for polyp detection. It has been reported to miss 9–12% of colonic polyps. Polyps larger than 2 cm in diameter have been missed by colonoscopy in children. This could be due to a large fold obscuring the lesion, bleeding, polyps submerged in a faecal fluid lake, redundant sigmoid or transverse colon, inadequate colon preparation, or the area could not be reached for technical reasons. In addition, the right side of the colon and caecum cannot be seen at colonoscopy in 10 to 30% of patients.

The advantage of precolonoscopic detection and localisation is therefore considerable, particularly in children, where a highly accurate means of examination for colorectal polyps. Hydrosonography could play an important part in this respect. Double and single contrast radiology miss less than 10% of polyps over 1 cm in diameter, but up to 29% and 30–45% of smaller polyps, respectively, in adults and children, respectively. In children with hydrosonography showed that even with colon preparation, considerable faecal material accumulates in the right colon. This could account for the reduced radiological detection of polyps in the proximal colon. In addition, it is difficult to obtain stringent adherence to a colon preparation regimen for barium enema in children.

Recent reports in children indicate that colonoscopy is superior to single contrast barium enema or sigmoidoscopy combined with double contrast enema in detecting polyps. Colonoscopy identified more plural polyps (more than 50%) and more polyps located proximal to the sigmoid (40 to 60%) than in previous reports of children using sigmoidoscopy combined with single contrast barium enema (14–26%, 10–26%, respectively) or double contrast barium

Figure 2 Hydrosonographic finding of patient 8 who had an aborted colonoscopy due to previous surgery for malrotation. A hyperchoic ovoid mass (arrow head) with pedicle is present, floating within the lumen.
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Whether hydrosonography is superior to barium enema in precolonoscopic evaluation of colorectal polyps in children deserves further study. Interestingly, Walter et al recently reported the diagnosis of a large juvenile polyp by hydrosonography in a 4-year-old boy who had a non-diagnostic barium enema and colonoscopy before a second colonoscopy.

Hydrosonographic colonic imaging is a simple, radiation-free procedure that could play a major part in the evaluation and follow-up of children with rectal bleeding.

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Hydrosonography in the evaluation of colorectal polyps.

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