Contrast barium enema is a 60-200% solution of barium sulphate, administered rectally. It is used not only in the diagnostics of colorectal diseases, but also as a therapeutic option in case of intussusception or treatment of lower gastrointestinal tract bleeding. The latter indication raises most controversies amongst surgeons. Opponents argue that 70-80% of cases of lower gastrointestinal bleeding resolve spontaneously, barium enema hinders further diagnostics (colonoscopy, abdominal CT), and the potential complications (perforation with chemical peritonitis, intravasation possibly leading to thromboembolic complications or sudden cardiac arrest) might significantly deteriorate the patients’ condition (1).

On the other hand, the supporters of the method cited numerous publications showing that the percentage of spontaneous bleeding control by means of conservative therapy is much lower, amounting to 30%, significant complications associated with the enema are rarely observed (perforation) (0.04% of cases), and the method may prevent the patient from extensive surgery (2, 3).

The aim of this study was to review literature data in evaluating the usefulness of barium enema in the treatment algorithm of lower gastrointestinal tract bleeding, based on evidence-based medicine.

The following databases were searched-Pubmed, Ovid Medline, Science Direct, and Springer using the key words: “lower gastrointestinal bleeding,” “contrast barium enema”, “gastrointestinal bleeding control”, and “barium enema”. The study included all methodologically correct investigations concerning the above-mentioned problem.

The first publication concerning the usefulness of barium enema in the treatment of lower gastrointestinal bleeding dates back to 1970. Adams et al. observed bleeding control in 26 of 28 patients, and lack of hemostasis in the remaining two patients was an indication for surgical intervention. The only observed infusion-related complication was rupture of the rectal mucosa (4). The following publication of the author (1974) showed an increased number of patients to 49 subjects, with bleeding control after barium enema observed in 47. The efficacy of the method amounted to 96% (5).

Koperna et al. published the only available prospective study concerning therapeutic barium enema in the management of lower gastrointestinal bleeding. The study group comprised 102 patients with bleeding as a complication of diverticular disease. Hemostasis was obtained in 84% (53 of 63) of patients. The authors concluded that barium enema has a higher efficacy in the treatment of bleeding, as compared to conservative therapy. Recurrence of bleeding in case of conservative therapy was observed in 43.3% of patients, as
compared to the barium enema group-15.9% (p=0.009). Considering patients subject to surgical intervention, recurrence of bleeding was not observed, however, mortality was statistically higher (33% vs 1%; p=0.0001). The authors concluded that barium enema should be the therapeutic method of choice in case of a first episode of diverticular bleeding. In case of recurrence, surgical intervention is recommended (6).

Iwamato et al. described four cases of male patients (average age-67 years) with complications of diverticular disease who were subjected to successful barium enema treatment. These patients previously underwent colonoscopy and angiography without hemostasis control. All patients were initially subjected to endoscopic hemostatic diverticula clipping, being the source of bleeding. During hospitalization recurrence of bleeding was observed in all patients, controlled by means of barium enema. During the observation period which lasted between 17 and 35 months, recurrence of bleeding was not observed (7).

Fujimoto et al. retrospectively compared the efficacy of endoscopic hemostasis (37 patients) with contrast barium enema (11 patients). The study group also included patients subjected to endoscopic hemostasis supplemented by barium enema (9 patients). No complications associated with the enema were observed. No statistically significant differences were observed considering recurrence, during a 7-month observation period [18/37 (48.6%), 6/11 (54.5%) and 2/9 (22.2%; p=0.4)]. The authors concluded that barium enema is as effective as endoscopy in the prevention of recurrent lower gastrointestinal bleeding in case of diverticular disease complications (2).

Pausawasdi, Matsuhashi, and Chorost published case reports concerning the use of barium enema in the management of diverticular bleeding, preceded by unsuccessful endoscopic hemostasis or endoscopic/angiographic location of the bleeding source. Matsuhashi described an interesting case, which used a mixture of concentrated barium sulphate and 1mg of adrenalin. No other publication mentioned the above-mentioned (8, 9, 10).

Table 1 showed different publications concerning the efficacy of barium enema in the treatment of gastrointestinal bleeding.

### DISCUSSION

Lower gastrointestinal bleeding is responsible for 14-20% of all episodes of digestive tract hemorrhage in adult patients. The incidence increases with patient age (64% of patients >70 years). The most common reasons for bleeding include diverticula (up to 40% of cases) and angiodysplasia (up to 20% of cases) (11).

15-40% of patients with diverticular disease will develop complications, such as bleeding. In case of 5% of patients bleeding will be classified as massive, possibly leading towards circulatory insufficiency. According to literature data, 75% of episodes of bleeding cease spontaneously. As previously mentioned, there are publications where the above-mentioned percentage does not exceed 30%. Recurrence of bleeding may be observed in case of 14-53% of patients subject to conservative treatment (12, 13).

<table>
<thead>
<tr>
<th>Publication</th>
<th>n</th>
<th>M/F</th>
<th>Barium concentration</th>
<th>Efficacy</th>
<th>Recurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams TJ (1970)</td>
<td>28</td>
<td>b.d.</td>
<td>20%</td>
<td>26 (93%)</td>
<td>9</td>
</tr>
<tr>
<td>Adams JK (1974)</td>
<td>49</td>
<td></td>
<td>lack of data</td>
<td>47 (96%)</td>
<td>9</td>
</tr>
<tr>
<td>Chorost MI (2000)</td>
<td>1</td>
<td>1/0</td>
<td>20% (b.d.)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Matsuhashi N (2001)</td>
<td>1</td>
<td>0/1</td>
<td>200% + 1 mg adrenalin (1200 ml)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Koperna T (2001)</td>
<td>63</td>
<td>42/21</td>
<td>lack of data</td>
<td>53</td>
<td>10</td>
</tr>
<tr>
<td>Iwamoto JI (2008)</td>
<td>4</td>
<td>4/0</td>
<td>200% (400 ml)</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Fujimoto A (2011)</td>
<td>11+9*</td>
<td>10/1 + 6/3</td>
<td>60% (1000 ml)</td>
<td>11+9 (100%)</td>
<td>6 + 2</td>
</tr>
<tr>
<td>Pausawasdi N (2011)</td>
<td>1</td>
<td>0/1</td>
<td>98% (800 ml)</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

(n) – number of study group patients; M/F – male and female patients

* 9 patients subjected to primary endoscopic hemostasis
Considering bleeding associated with diverticular disease, in more than 90% of cases the source of bleeding is associated with right colonic diverticula. The cause of the above-mentioned remains unknown (14).

The therapeutic algorithm in case of lower gastrointestinal bleeding assumes the need to perform gastroscopy, in order to exclude upper gastrointestinal tract bleeding, which is observed in approximately 15% of cases. Subsequently, anoscopy or rectoscopy are recommended, in order to confirm/exclude hemorrhoids or other cause of bleeding. In cases where no active bleeding was located, one should consider colonoscopy or angiography. Both above-mentioned methods proved effective in case of diagnostics and treatment of lower gastrointestinal bleeding. However, they are helpless if the source of bleeding cannot be located. The most common problem encountered by the endoscopist is poor bowel preparation. Although the prokinetic and mechanical effect of blood significantly facilitate fecal evacuation, in case of massive bleeding, blood and accompanying clots prevent from the location of the bleeding source. Similarly, in case of angiography, which often fails to locate the source of bleeding, especially when there are many bleeding lesions. In such cases, surgical intervention is recommended.

Diverticular disease is the most common cause of lower gastrointestinal bleeding, mostly concerning elderly patients with concomitant diseases, in whom surgery is associated with high-risk of complications and increased mortality. Based on many studies, the mortality rate in case of patients subject to colectomy, due to diverticular bleeding amounted to 27-30% (15, 16). In such cases one should consider contrast barium enema. According to literature data, such an enema is safe. Complications are rarely observed, significant complications were absent. Considering barium enema performed in case of diagnostics, perforation was observed in 0.04% of 13 000 patients (3). Additionally, the examination is effective (139 study group patients- in case of 12, hemostasis was not observed; efficacy amounted to 93%). However, it should be noted that most patients cited in the above-mentioned publications were previously subjected to an endoscopic/angiographic attempt to locate the bleeding source and hemostasis control.

Thus, barium enema was performed in the absence of a visible source of bleeding, unsuccessful hemostasis, or when one observed more than one source of bleeding. Considering the prevention of recurrent bleeding, rectal barium enema by far exceeds the efficacy of conservative treatment (Koperna et al.: 15.9% vs 43.3%). The longest observation period was 37 months. Although it gives way to surgical treatment, considering the recurrence rate, mortality is absent. However, there is lack of data in the cited studies concerning the future of patients in whom the barium enema proved ineffective, and they required surgery.

Also interesting is the fact that in the cited material concerning the use of contrast barium enema, male patients predominated (twice as many). Is this evidence that the male gender is a risk factor of ineffective endoscopy, inability to locate the source of bleeding, or bleeding from yet another location? Unfortunately, literature data lacks information which would enable detailed analysis of the above-mentioned problem.

The only study evaluating the mechanism of barium enema was published by Miller et al. in 1975. The Authors concluded that there is no evidence considering the efficacy of barium in the activation of the coagulation system, and its efficiency during hemostasis is associated with its mechanism. When the colon is filled with a 20% solution of barium and the ileocecal valve is efficient, one may observe pressure affecting the intestinal wall (110 cm-H₂O), which exceeds the intravascular pressure-90 cm H₂O. A similar effect on clot formation was observed in case of water enema! (17).

However, there are no large, prospective, and randomized studies evaluating the efficacy and place of contrast barium enema in the treatment of lower gastrointestinal bleeding.

CONCLUSIONS

Contrast barium enema is a safe and effective method (both in case of bleeding control and prevention of recurrence) indicated in case of inability to visualize the source of bleeding, hemostatic failure, and when there are many sources of bleeding, especially in case of elderly patients with concomitant diseases (high-risk group of postoperative complications).
REFERENCES


Received: 2.03.2013 r.
Adress correspondence: 31-202 Kraków, ul. Prądnicka 35-37
e-mail: jkenig@cm-uj.krakow.pl