Enhanced CT for initial localization of active lower gastrointestinal bleeding

T. Yamaguchi, K. Yoshikawa
Division of General Surgery, Mimihara General Hospital, 4-465, Kyowacho, Sakai City, Osaka 590-8505, Japan

Abstract
Background: Active lower gastrointestinal (GI) bleeding is a potentially dangerous situation because patients with this condition may fall into shock. Colonoscopy, angiography, and scintigraphy have been widely used to localize the source of bleeding, but time is needed to perform these examinations. The purpose of this study was to illustrate how vividly enhanced computed tomography (CT) may show active lower GI bleeding in a short time.

Methods: Five of 10 patients with active lower GI bleeding underwent dynamic enhanced CT. Scans were obtained 0.5 and 5 min after intravenous contrast.

Results: Pooling of contrast medium was found in four of five patients. Among the five patients, three had diverticular disease of the colon, one had a rectal ulcer, and one had small intestinal ulcer. The localization procedure completed within 15 min in all patients. Extravasations of medium were confirmed by two surgeons.

Conclusion: Enhanced helical CT was useful for the detection of an active lower GI bleeding source. The procedure was brief, less invasive, and less demanding. Enhanced CT may be the first step for diagnosing lower GI tract bleeding.

Key words: Gastrointestinal bleeding—Enhanced helical computed tomography.

Lower gastrointestinal (GI) bleeding is a frustrating condition as opposed to upper GI bleeding. Especially if it is massive, bleeding may cause the patient to lapse into a state of shock. Colonoscopy and enteroscopy are not useful for finding the source of bleeding because of the difficulty in obtaining access to it.

Although angiography or scintigraphy has been a first choice in the search for lower GI bleeding, these examinations delay decision making because they require some time to be performed.

If enhanced helical computed tomography (CT) is capable of revealing the site of GI bleeding, it may become the first choice for localizing the source of lower GI bleeding because of its simplicity.

Materials and methods
The subjects of the present study were 10 consecutive patients with active lower GI bleeding who were in a preshock state or had massive hemorrhage. In this study, patients were regarded as having "massive bleeding" when they fell into a shock or preshock state (systolic blood pressure < 90 mmHg).

The databases of these patients, obtained between January 1999 and September 2001, were reviewed retrospectively. Enhanced CT was performed in five patients. We used a Pro Seed CT scanner (with 10-mm collimation and 10-mm/s table speed; GE Yokogawa Medical, Tokyo, Japan), and 100 mL of non-ionic contrast agent (Omnipaque 300, DaiichiPharmaceutical Co. Ltd., Tokyo, Japan) was injected intravenously at a rate of 2 mL/s. Scans were obtained 0.5 and 5 min after injection. Hemoglobin (Hgb) level was measured on the day after the shock episodes. No positive oral contrast was used in any patient. All CT data were reviewed by the same two surgeons.

Results
Of 10 patients who had massive bleeding, dynamic enhanced helical CT was performed in five. As shown in Table 1, pooling of contrast medium in the GI tract was seen in four patients (Figs. 1–4). Among the five patients, one had bleeding originating from the small intestine and four had bleeding from the colorectal region.
Table 1. Clinical findings on dynamic enhanced helical computed tomography

<table>
<thead>
<tr>
<th>Patient no.</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Pre-Hgb (g/dL)</th>
<th>Post-Hgb (g/dL)</th>
<th>Massive bleeding</th>
<th>Transfusion requirements</th>
<th>Pooing of contrast medium</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67</td>
<td>Male</td>
<td>9</td>
<td>5.6</td>
<td>Yes</td>
<td>10 units</td>
<td>Yes</td>
<td>Small intestinal ulcer</td>
</tr>
<tr>
<td>2</td>
<td>37</td>
<td>Male</td>
<td>14.2</td>
<td>9.5</td>
<td>Yes</td>
<td>—</td>
<td>Yes</td>
<td>Diverticular disease of the colon</td>
</tr>
<tr>
<td>3</td>
<td>64</td>
<td>Female</td>
<td>—</td>
<td>6.7</td>
<td>Yes</td>
<td>2 units</td>
<td>Yes</td>
<td>Diverticular disease of the colon</td>
</tr>
<tr>
<td>4</td>
<td>65</td>
<td>Male</td>
<td>11.4</td>
<td>7.9</td>
<td>Yes</td>
<td>—</td>
<td>No</td>
<td>Diverticular disease of the colon</td>
</tr>
<tr>
<td>5</td>
<td>77</td>
<td>Male</td>
<td>9.1</td>
<td>7.9</td>
<td>Yes</td>
<td>2 units</td>
<td>Yes</td>
<td>Rectal ulcer</td>
</tr>
</tbody>
</table>

* The hemoglobin (Hgb) level measured within 1 month before the episodes was used as the pre-Hgb level in this study.

* In this study, patients were regarded as having "massive bleeding" when they fell into a shock or preshock state (systolic blood pressure <90 mmHg).

* One unit is composed of 200 mL of blood, hence, approximately 2 units in Japan equals 1 unit in the United States.

Fig. 1. Case 1. A 67-year-old man with small intestinal ulcer. Pooing of contrast medium is evident in the lumen (arrow) in the early phase of CT.

In case 3, bleeding due to diverticular disease of the right colon was confirmed through colonoscopy, and active bleeding was stopped with the use of clips.

In case 5, bleeding was caused by a ruptured vessel in a rectal ulcer. Active bleeding was confirmed by colonoscopy, and the vessel was ligated by using a transfixed technique via the anus. In case 1, a small intestinal ulcer was confirmed by colonoscopy, but the bleeding stopped spontaneously. In case 2, diverticular disease of the colon was confirmed by colonoscopy after the bleeding had stopped.

Cases 1, 3, and 5 required 10, 2, and 2 units, respectively, of blood by transfusion. Although transfusion was judged to be required in case 4, the patient refused.

Discussion

Many studies have indicated that angiography and scintigraphy are conventional methods to localize GI bleeding. Enhanced CT has not been commonly used for this purpose. In fact, only a few cases using enhanced CT have been reported [1, 2]. There has been no report comparing outcomes of enhanced CT with those of angiography in patients with GI bleeding.

We believed that enhanced helical CT had the potential to show active GI bleeding. There is evidence that CT is superior to angiography in pinpointing a source of bleeding in the visceral organs [3]. Although our results are preliminary and a direct comparison between CT and angiography was not made, positive rates for GI bleeding on CT reached 80% (four of five patients). The reported sensitivity of angiography for patients with acute lower GI bleeding is 47% (range = 27–77%) [4, 5]. Therefore, we believed that CT might have advantages in finding active lower GI bleeding.

Approximately 70% of lower GI bleeding is due to diverticular diseases, neoplasms, and benign anorectal diseases that have a focal bleeding site. Moreover, CT has advantages in showing pathologic findings such as diverticular disease and tumor. Bleeding due to diverticular
disease is the most common, representing 40% of causes of lower GI bleeding [6], because diverticula are intimately related to small arteries. Thus, if bleeding is massive, there is a better chance to show extravasation of contrast medium by enhanced helical CT. Currently, it is not known which type of bleeding can be detected with an acceptable positive rate with the use of enhanced helical CT. In the present study, we focused on massive bleeding. Moreover, it was necessary to immediately find the source of bleeding in these emergency cases. Enhanced helical CT took only 10 min and ensured safety in most cases. In addition, this procedure has been used in most emergency departments, and it is less expensive, invasive, and demanding than angiography.

Enhanced helical CT might provide information about the site of bleeding and indicate a specific diagnosis, but it was only a diagnostic tool and never therapeutic. When pooling of contrast material was found in the lower GI tract, the next strategy was adopted immediately. For example, if the bleeding site was the rectum, as in case 5, proctoscopy or colonoscopy was chosen, followed by angiography. Conversely, if the bleeding site was in the right colon or small intestine, angiography was the first choice because of colonoscopic difficulties in reaching the bleeding portion. The search for and control of the area of bleeding should be done quickly to prevent patients from lapsing into shock. When enhanced CT promptly provides a map of the bleeding site, then appropriate treatment methods (e.g., colonoscopy and angiography) can be selected.

Conclusion

Dynamic helical enhanced CT could be the first choice to search for the source of lower GI bleeding, especially in active massive cases.

References