

## RADIOGRAPHIC DEMONSTRATION OF UNKNOWN SITES OF GASTROINTESTINAL BLEEDING

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The preoperative diagnosis of the site of massive gastrointestinal bleeding can often be made by means of conventional barium contrast examination and endoscopy, but in a small percentage of patients the sites are undiagnosed at the time of laparotomy. This group is reported to constitute 20% of patients operated upon for massive bleeding (1). When the entire gastrointestinal tract is filled with blood, the surgical exploration is frequently unsuccessful in locating the point of hemorrhage. A simple technique, suited for clinical use, has been sought. Of the various procedures evaluated, percutaneous celiac, superior mesenteric, and inferior mesenteric arteriography has been consistently successful in localizing the site of surgically induced bleeding points of the gastrointestinal tract of dogs.

The following techniques were evaluated in 25 dogs for simplicity, morbidity of procedure, and successful demonstration of the bleeding point.

I. Injection of radioactive isotopes,  $P_{32}$  and  $I_{131}$ -tagged serum albumin. (a) Intravenous injection: 100  $\mu$ c of  $P_{32}$  was injected after bleeding points were made in the gastrointestinal tract. The monitoring of the exposed bowel with a small Geiger probe at laparotomy failed to give a significant increase in count over the site of bleeding. Similar studies with  $I_{131}$ -tagged serum albumin were also unsuccessful. (b) Segmental arterial injection of  $P_{32}$  and  $I_{131}$ : the background count over the portion of the gut supplied by the segmental artery was too high to allow localization of the bleeding point within this segment. Both radioisotopic methods were discarded.

II. Aortography by means of a midstream injection: The concentration of the contrast material in the smaller arteries of the GI tract was not sufficient to demonstrate bleeding points of 3 to 4 cc./min. Aortography after occlusion of the aorta with a balloon catheter above the level of the celiac axis successfully demonstrated the bleeding point, but the procedure was considered too hazardous for clinical use.

III. Operative segmental mesenteric arteriography: This technique was successful in demonstrating small bleeding points, but the procedure is time-consuming and hazardous. Since each arcade must

be examined separately, at least 10 injections are required to evaluate the small bowel. Each injection required dissection of the artery and replacement of the needle or polyethylene catheter.

IV. Percutaneous selective arteriography: By use of the Seldinger (3) retrograde femoral technique, the celiac, superior mesenteric, and inferior mesenteric arteries were selectively catheterized. Bleeding points were made in various portions of the gastrointestinal tract by means of a catheter placed in a small segmental artery and passed through an enterotomy directly into the lumen of the intestine. The injection of the contrast material was made with an automatic injector, and several films were taken at 1 sec. intervals. By varying the diameter of the catheter used, different bleeding rates could be obtained. This technique was successful in demonstrating bleeding points of 0.5 cc./min.

### RESULTS AND DISCUSSION

Of the various techniques described, only the preoperative selective arteriography of the celiac, superior mesenteric, and inferior mesenteric arteries fulfilled the criteria of simplicity, accuracy, and low morbidity. In addition to demonstrating the site of bleeding, selective arteriography frequently showed the nature of the lesion. During the past 6 months, we have studied 2 patients with abdominal hemorrhage. One had an arterial malformation in the wall of the duodenum, and the other had an incomplete splenic rupture. Both conditions were correctly diagnosed preoperatively by the techniques of selective arteriography. To date, we have performed 75 selective celiac and superior mesenteric arteriograms in patients for a variety of indications. Our experience has been similar to that of Odman (2) in that the technique is simple and safe with no adverse reactions encountered, either at the femoral puncture site or the viscera. Only diatrizoate contrast agents have been used, since mesenteric necrosis has been described following the injection of other agents.

### REFERENCES

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