Technique

Use of a duodenal capsule for localization of upper gastrointestinal haemorrhage

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Patients with acute gastrointestinal haemorrhage may initially be too ill or uncooperative to undergo diagnostic procedures such as endoscopy, barium x-ray studies, or selective abdominal arteriography. Determination of the bleeding site, however, can be an early and useful clue as to the most likely source. Thus, bleeding mucosal lesions of the oesophagus will show blood at approximately 25 to 40 cm, of the stomach at 40 to 55 cm, and of the proximal duodenum at 55 to 75 cm. The use of various 'string tests' for localization of gastrointestinal haemorrhage has been the subject of several previous articles (Einhorn, 1909; Hayes and Pittman, 1960; Smith, 1961; Pittman, 1964; Nissenbaum, Attia, DiBianco, and Groisser, 1965).

Our experience with over 60 patients using umbilical tapes and either a small lead shot (Smith, 1961) or mercury-filled finger cot (Haynes and Pittman, 1960) as the weighted end has shown 40% unable to swallow the string or to keep it down. Switz and Roth (1970) reported that seven of 22 subjects who were not bleeding could not swallow a $\frac{1}{4}$ in. braided tape. They also found that 12 of the 15 subjects had blood on the retrieved string, and six tests were strongly positive. The cause of these false-positive tests was attributed possibly to mucosal trauma from the weighted ends. Nissenbaum *et al* (1965) noted that six of 91 patients could not swallow a 50-in. length of a weighted plastic tube used as a fluorescein string test.

In previous studies (Beal, Viens, Grant, and Hughes, 1970; Bezjak, 1972), using a capsule designed by one of us (CBB), over 600 patients have swallowed the device without difficulty. We believe that this capsule is superior to previous string devices in terms of safety, acceptability to patients, and reliability, and would like briefly to describe its use in 50 patients with upper gastrointestinal haemorrhage.

Method

The duodenal capsule¹ (see fig) is a size 00 gelatin capsule containing a silicone rubber bag. Attached to the bag and packed within the capsule is a 140 cm yarn line. As the patient swallows the device, the free end is held outside the mouth, and then securely taped to the cheek when the capsule has reached the stomach. The gelatin then dissolves, and with time, the weighted rubber bag goes into the duodenum. The line is left in for six to eight hours, and when pulled out, the rubber bag separates from it, and passes out later in the stool. One measures from the lip margin to any spots of visible blood on the retrieved line. If no blood is seen, the test is judged adequate only if a bile stain is noted at 55 or 60 cm or more distally.

Fig The duodenal capsule. Note the size 00 gelatin capsule with the free end of yarn emerging from one end.

Results

We have now used the duodenal capsule in over 700 patients and found it entirely safe and without any side effects. Only two patients (less than 1%) have been unable to swallow it, and some have accomplished the test at home without the need for direct medical supervision. Moreover, we have yet to see a

¹Entero-Test supplied by Health Development Corporation, Palo Alto, California, 94303, USA.

Case	Maximum Bleeding Point (cm from teeth)	Diagnosis ¹
1	35	Oesophageal varices E, R, S
2	35	Oesophageal varices R, N
3	30	Oesophageal varices E, R, S
4	35	Oesophageal varices E, R
5	38	Oesophageal varices E, R
6	40	Oesophageal varices E, R
7	36	Oesophageal varices R, S
8	34	Oesophagitis E
9	35	Oesophagitis E
10	30	Oesophagitis E
11	32	Oesophagitis E
12	50	Gastritis R, S
13	55	Gastritis E
14	58	Gastritis E
15	56	Gastritis E
16	50	Gastric ulcer R, S
17	52	Gastric ulcer E, R, S
18	55	Gastric ulcer R, S
19	52	Gastric ulcer E, R
20	50	Gastric ulcer E
21	54	Gastric ulcer E, R
22	65	Duodenal ulcer R
23	68	Duodenal ulcer R
24	65	Duodenal ulcer R, S
25	55	Duodenal ulcer R, S
26	66	Duodenal ulcer E, R
27	60	Duodenal ulcer E, R
28	64	Duodenal ulcer R
29	64	Duodenal ulcer E, R
30	70	Duodenal ulcer R, S
31	66	Duodenal ulcer R
32	61	Duodenal ulcer R
33	60	Duodenal ulcer R
34	74	Duodenal ulcer E, R
35	62	Duodenal ulcer E, R
36	70	Duodenal ulcer E, R
37	72	Duodenal ulcer E, R, S
38	68	Duodenal ulcer R, S
39	66	Duodenal ulcer R
40	60	Duodenal ulcer R
41	58	Duodenal ulcer R
42	59	Duodenal ulcer E, R
43	62	Duodenal ulcer E, R
44	69	Duodenal ulcer R, S
45	66	Duodenal ulcer E, R
46	64	Duodenal ulcer R
47	68	Duodenal ulcer E, R
48	None	Gastric ulcer R
49	None	None R
50	None	None E, R

Table Results in localizing the site of haemorrhage

¹Diagnosis confirmed by endoscopy (E), x-ray film (R), surgery (S), or necropsy (N).

blood spot on the retrieved line in this large group of subjects who by history did not have gastrointestinal bleeding. Thus, false positive tests must be extremely rare.

We have passed the capsule in 50 patients with acute upper gastrointestinal bleeding in an attempt to localize the bleeding site. Forty-seven showed evidence of bleeding on the yarn line in areas that accurately coincided with a source diagnosed clinically (radiographs and/or endoscopy), at surgery, or at necropsy. These included oesophagitis (4), oesophageal varices (7), erosive gastritis (4), gastric ulcer (6), and duodenal ulcer (26). Three tests were negative. In two, a cause of the bleeding was never uncovered, and the third patient showed a gastric ulcer on barium examination of the stomach 48 hours after the acute haemorrhage.

References

- Beal, C. B., Viens, P., Grant, R. G. L., and Hughes, J. M. (1970). A new technique for sampling duodenal contents. *Amer. J. Trop. med. Hyg.*, 19, 349-352.
- Bezjak, B. (1972). Evaluation of a new technic for sampling duodenal contents in parasitologic diagnosis. *Amer. J. dig. Dis.*, 17, 848-850.
- Einhorn, M. (1909). A new method of recognizing ulcers of the upper digestive tract and of localizing them. *Med. Rec.*, 75, 549-552.
- Haynes, W. F., Jr., and Pittman, F. E. (1960). Application of the fluorescein string test in 32 cases of upper gastrointestinal hemorrhage. *Gastroenterology*, 38, 690-697.
- Nissenbaum, G., Attia, A., DiBianco, J., and Groisser, V. W. (1965). A new device (Diagnostotube) for the localization of upper gastrointestinal bleeding. *Gastroenterology*, 49, 662-666.
- Pittman, F. E. (1964). The fluorescein string test. *Ann. intern. Med.*, 60, 418-429.
- Smith, V. M. (1961). String impregnation test ('String Test') for lesions of the upper digestive tract. *Ann. intern. Med.*, 54, 16-29.
- Switz, D. M., and Roth, H. P. (1970). Evaluation of a string test in nonbleeding individuals. *Gastroenterology*, 58, 185-188.