Pain during flexible sigmoidoscopy and colonoscopy: when and why does it occur?

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Background

Flexible sigmoidoscopy (FS) is usually carried out without any sedation while the majority of colonoscopies are performed using some form of intravenous sedation. These variations in clinical practice are illogical since during *either* flexible sigmoidoscopy *or* colonoscopy the passage of the endoscope frequently causes painful looping of the instrument [1]. As stated in a recent edition of a standard textbook '*some stretching of peritoneal attachments is inevitable, at least transiently, during colonoscopy. This may cause gnawing or acute unpleasant visceral pain. …*' [2].

When unsedated FS is performed using standard 168cm or 130cm colonoscopes, the mean depth of penetration is consistently less than 70cm and over half of these examinations are discontinued because of discomfort. In a recent study[3], magnetic endoscope imaging (MEI)[4] was used to determine the depth of insertion at non-sedated, screening FS using a 60cm FS [5]. Pain was a frequent rate-limiting factor in depth of insertion[5].

Better understanding of the mechanisms of pain during both flexible sigmoidoscopy and total colonoscopy should help a) improve technique b) patient tolerance and c) point the way forward for future instrument design and manufacture.

Methods

Four experienced endoscopists (GDB, DN, JH and JP) carried out the 145 colonoscopies reported. All had MEI[4] with simultaneous "painometer" recording using equipment provided by JSB Medical Ltd. There were 141 patients with intact colons and 4 who had previously undergone colonic surgery (two each with either previous anterior resections and hence no sigmoid or descending colon, or AP resection with left sided colonoscopy leading into upper descending colon). Of these patients,108 were intubated with either 12.8mm or 13.2mm, 165cm long adult colonoscopes and 37 with a prototype Olympus 10mm thin and floppy 130cm MS230I scope. Thirty-two patients had their colonoscopies carried out without sedation while 113 had light sedation.

Forty of the patients examined with an adult scope and all 37 with the MS230I scope had a stiffening sigmoid overtube (OT) inserted once the splenic flexure had been traversed as previously described[6,7].

Pain recording

Having obtained prior ethical approval, patients were informed that they would almost certainly experience a) a sensation in the rectum due to the endoscope itself and b) abdominal bloating due to air insufflation. It was explained that in addition to this they might get some discomfort due to looping/stretching of the colonic mesentery. We requested that, in this event, the patient let the staff know so that a) the event could be recorded and b) action could be taken to relieve the discomfort.

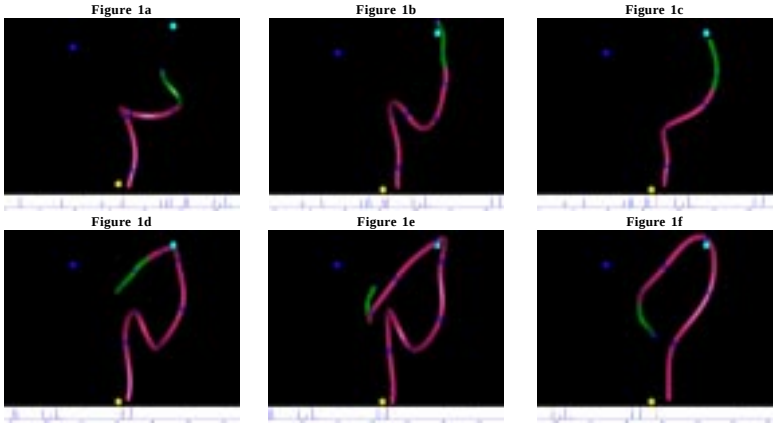

Figure 1 - Bladen Endoscope Imaging System with RMR software to analyse discomfort/pain events during colonoscopy. These 6 computer-generated images show that the episodes of discomfort/pain tended to occur when the sigmoid colon became stretched/looped (Figures 1a, 1b, 1d, 1e). Pain was rapidly relieved when the sigmoid colon was straightened (Figures 1c, 1f). The distal 11.5cm bending segment is shown in green while the position of the individual magnetic sensors in the biopsy channel of the colonoscope are shown in blue. The spherical markers correspond to the anus, splenic flexure and hepatic flexure. The horizontal axis at the bottom of each image is the time in minutes since the start of the procedure and the blue vertical spikes record episodes of discomfort/pain when the "painometer is squeezed

Pain analysis

The Bladen endoscope imaging files[4] with the pain data were stored on the instrument's hard drive at one second intervals for later analysis using a modification of the RMR software previously described[5-7]. In each patient we noted :-

1) the total number of discomfort/pain "events"
2) the number of these events occurring before the splenic flexure was reached and the endoscope shortened and straightened (first half)
3) number of episodes occurring during movement from the splenic flexure to the caecal pole (second half)
4) loop formation during both 2) and 3)

Statistics

We analysed separately the pain data for male and female patients colonoscoped with a) an adult colonoscope and b) the MS230I scope. We also looked at the effect of a stiffening sigmoid overtube on pain experienced during the second half of the examination. In the 77 patients in whom an overtube was used, a judgement was made by all 4 colonoscopists as to whether the overtube was adequately splinting the left side of the colon. The number of pain episodes occurring during the second half of the colonoscopy in those patients in whom the sigmoid overtube worked efficiently were compared with those in whom the overtube failed to do so. The pain data was not normally distributed so non-parametric statistics were employed using Arcus QuickStat software.

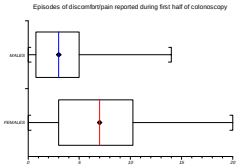

Figure 2 - Box and whisker plot showing number of episodes of discomfort/pain experienced from the anus to the splenic flexure

Results

A total colonoscopy was carried out in 144 of the 145 patients. Some examples taken from one session are shown in Figure 1. It can be seen that the vast majority of the pain experienced before reaching the splenic flexure coincided exactly with periods of stretching or looping of the sigmoid colon. Furthermore most of the pain that occurred during passage of the colonoscope from the splenic flexure to caecum occurred at times of sigmoid re-looping/stretching. In 27 of the 145 patients no sigmoid looping occurred prior to reaching the splenic flexure. In this group 25/27 experienced no pain whatsoever as the colonoscope passed easily and smoothly up to the splenic flexure.

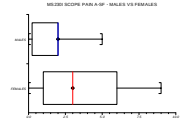

Figure 3a - Number of episodes of discomfort/pain experienced during the passage of the MS230I from the anus to the splenic flexure. Females experienced a median of 3 episodes compared with only 2 for male patients (p=0.186 NS)

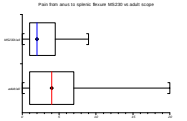

Figure 3b - Number of episodes of discomfort/pain during the passage of an adult colonoscope (N=104) or the MS230I scope (N=37) from the anus to the splenic flexure

Female patients experienced significantly more pain than males during the passage of the adult endoscope to the splenic flexure (Figure 2). In both male and female patients there was a dramatic reduction in pain during the first half of the examination when the Olympus MS230I scope was used (Figures 3a and 3b).

In general, once the splenic flexure had been passed, the examination tended to be relatively painless provided recurrent sigmoid looping was prevented. None of the 4 patients who had undergone previous colonic surgery had any pain during their colonoscopy. The use of a sigmoid stiffening overtube with either scope significantly reduced pain in the second half of the examination (Figure 4). There were differences between the number of reported pain events in the second half of the examination in the 14 patients in whom the overtube failed compared with the 63 patients in whom adequate splinting was achieved (Figure 5).

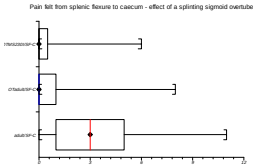

Figure 4 - Use of a stiffening sigmoid overtube significantly reduced discomfort/pain episodes in the second half of the examination

Conclusions

Women experience significantly more discomfort than men during both FS and colonoscopy[7]. We have shown that discomfort/pain during the first half of a FS/ colonoscopy can be greatly reduced by using a thinner and "floppier" instrument but the examination takes longer to perform[8]. A stiffening sigmoid overtube [6] significantly reduces the pain experienced during the second half of the examination providing adequate splinting of the left side of the colon is achieved. Variable stiffness colonoscopes should reduce pain in the first half of the examination but (as currently designed) will not prevent sigmoid re-looping and thus pain during the second half of the examination. The use of an endoscope imaging system[4] with suitable software[5-7] and a painometer in combination with pressure sensor data [8] should aid improved instrument design in the future.

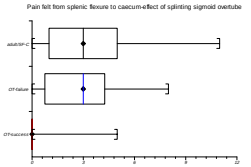

Figure 5 - The stiffening overtube only prevented pain during the passage of the colonoscope from the splenic flexure to the caecum

Acknowledgements

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