Laxative-free CT colonography

This article describes the design and results of a study carried out to determine if the introduction of fecal tagging to CT colonography (CTC) makes the examination easier to tolerate or reduces the number of false-positives. The study analyzed the results obtained when the method of preparation of patients for CTC was changed from a laxative-only procedure to one using a radio-opaque contrast medium without laxative. This latter regimen was well tolerated, producing less diarrhoea than conventional laxative-based techniques. However we did not show that the use of fecal tagging reduced false positives.

CT Colonography (CTC) was initially introduced using bowel preparation regimens originally used for barium enema. By necessity, barium enema required a very clean colon, but the superior imaging of CT enables different techniques to be used; the dose of laxatives can be reduced, and patients can have a low residue diet if it is combined with oral iodinated or barium contrast agents that ‘tag’ the faeces in the colon. Over the years since the introduction of CTC, many different regimens have evolved. The ESGAR consensus statement was only able to reach a conclusion that ‘use of tagging agents is acceptable’ and stated that both full laxative and reduced laxative regimens were acceptable [1].

The UK NHS National Patient Safety Agency (NPSA) has recently issued guidelines about how laxative bowel preparations commonly used for CT colonography (CTC) can be prescribed to patients [2]. The guidelines were drawn up after reported incidents of harm from use of these drugs, including one death. It is no longer acceptable for radiology departments to send patients laxative bowel preparation in the post simply based upon the very limited clinical information usually available on a radiology request card.

In our department, the result of this has been to make the process of organising CT colonography more cumbersome. Several authors have described using faecal tagging, usually with Gastrografin in addition to laxatives, and a few have used Gastrografin on its own without any laxatives. We therefore undertook to change our preparation for CT colonography from Picolax without fecal tagging, to oral Gastrografin only with no laxatives. [Picolax contains two active ingredients, sodium picosulfate and magnesium citrate, which are both laxatives. Gastrografin — Diatrizoate Meglumine and Diatrizoate Sodium Solution — is a watersoluble iodinated radiopaque contrast medium for oral or rectal administration only.]

We compared patient acceptance before and after this change using a questionnaire. We do not have a reference test for all patients to give the true incidence of colonic neoplasia, so are unable to calculate sensitivity and specificity, but can calculate true and false positive rates based upon the results of further investigations, principally carried out by optical colonoscopy and triggered by CTC reports.

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Consecutive patients were identified from before and after the change in bowel preparation. Patients in the Picolax group were asked to take two sachets of Picolax without fecal tagging, to oral Gastrografin only with no laxatives. [Picolax contains two active ingredients, sodium picosulfate and magnesium citrate, which are both laxatives. Gastrografin — Diatrizoate Meglumine and Diatrizoate Sodium Solution — is a watersoluble iodinated radiopaque contrast medium for oral or rectal administration only.]

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the day before the examination, and diet was also modified according to these instructions. For the Gastrografin preparation group, patients took 35mL of Diatrizoate dimeglumine (Gastrografin) mixed with a glass of water at 8pm two days before the CT, and another 35mL at 8pm one day before. Diet was modified to avoid high fibre foods. Forty minutes before the CT, patients were asked to drink our department’s standard oral contrast; 15mL Urografin 370 in 750 mL tap water. The CT examination was performed identically for the two groups, and a mechanical insufflator was used to introduce carbon dioxide after intravenous injection of Buscopan 20mg iv.

Questionnaires were given to patients attending for CT colonography as they arrived in the radiology department for their examination. Patients completed the questionnaires whilst they waited for their CT examination. The results were compared between the two groups.

CTC reports were classified as either normal, or abnormal warranting endoscopic evaluation of a potential colonic abnormality over 10mm. Correlation with subsequent endoscopic and pathological reports was made, and reported abnormalities were classified as ‘true positive’, ‘false positive’ or ‘insufficient information for evaluation’. The latter were excluded from further analysis.

RESULTS
Sixty two patients in each group were given questionnaires.

The main differences between the two groups were found to be in the frequency of bowel movements, with Picolax causing 77% of the patients to have five or more bowel motions in the previous day and night, compared to 34% for Gastrografin (P<0.001). This was reflected in perianal soreness, which was experienced in 63% of patients receiving Picolax against 26% for Gastrografin (P<0.001).

Patients preferred the experience of drinking Picolax compared to Gastrografin (reported as ‘easy’ for 85% of patients taking Picolax vs 61% for Gastrografin, P<0.002). This may be due to the strong aniseed flavour of Gastrografin. 112 patients were identified in the Gastrografin preparation group. Of these, nine were correctly reported as having colon cancer (true positive). A benign 2cm polyp was correctly reported. There was one false positive diagnosis of malignancy. Endoscopy showed this to be a diverticular stricture. There was one false positive diagnosis of a 10mm polyp. No examinations were considered non-diagnostic. 397 patients were identified in the Picolax preparation group. There were 14 false positive lesions reported as being 10mm or greater. There were 12 true positive cancers, and 16 true positive large polyps. Eight were reported as non-diagnostic due to excessive amounts of retained fecal residue. The positive predictive values for lesions greater than 10mm for Picolax and Gastrografin groups were 67% and 83% respectively. Although the results are not statistically different from each other, the false positive rate was almost twice as large in the Picolax group. A typical image obtained from the Gastrografin regimen is shown in Figure 1.

DISCUSSION
Fecal tagging combined with laxatives has been well described, most notably by Pickhardt et al [3]. However, hard evidence of benefit in sensitivity or specificity is lacking. It has been previously suggested that use of fecal tagging would reduce the number of false positives since small amounts of residual fecal material would be more easily distinguished from true pathology. However previous studies have not shown this. Lefere et al [4] found a non-significant increase in specificity when a polyethylene glycol regimen was compared to a single dose of magnesium citrate combined with barium tagging. The first report of the use of iodinated contrast alone without laxatives was by Iannacconne et al [5]. They described use of Gastrografin taken with a low fibre diet at a dose of 100mL per day for two days before CT. This resulted in excellent tagging with good sensitivity for pathology compared to subsequent colonoscopy. The reference colonoscopy used standard laxative preparation and patients reported preferring the Gastrografin technique. Liedenbaum et al [6] report use of CTC without laxatives with iodine tagging only. They used Meglumine-ioxithalamate
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Modified preparation CT is an alternative method of investigating the colon that is very easy to tolerate. Several studies have shown that standard CT performed without bowel purgation has reasonable sensitivity for colorectal cancer [7]. Patients are required to drink oral contrast medium (usually Gastrografin) with meals for two days before the scan in order to label feces. No laxatives are administered and the protocol is thus especially suited to frail patients who may be intolerant of full bowel purgation. A supine scan without gas insufflation is performed and high attenuation tagged feces can be differentiated from the relatively low attenuation bowel wall and related pathology [Figure 2].

There are several limitations with this study. Clearly randomizing patients to a tagging regimen or a standard regimen would have been preferable. In retrospect it is clear that our sample size is too small to demonstrate a reduction in false positives, but the necessary sample number needed of 1200 per method would be difficult to achieve in practice. An alternative strategy would be to use a polyp-enriched population. We did not formally grade the quality of tagging achieved, but none of the tagged dataset were considered non-diagnostic.

**CONCLUSION**

We have described a simple bowel preparation technique that does not use laxatives, thus bypassing NPSA regulations. This regimen is well tolerated, producing less diarrhea than conventional laxative-based techniques. We have not shown that use of fecal tagging reduces false positives. Use of mild laxatives not covered by NPSA guidelines may improve the quality of tagging, but at the expense of increased complexity of the regimen. As software develops that can remove tagged feces from a dataset producing ‘virtual cleansing’, the quality of tagging may become more important. Until now such software has been unreliable and prone to producing artefacts. Historically many papers have described the frequent use of Gastrografin, presumably due to the theoretical benefit of its high osmolarity, but it is likely that other iodinated contrast agents will be able to provide equally good results. Agents that do not have the strong aniseed flavour of Gastrografin are likely to be better tolerated by patients.

**REFERENCES**


