

Scintigraphic detection of peptic lesions with the method of radiolabelled sucralfate

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Background. Sucralfate is an antiulcer agent that after peroral application strongly adheres to mucosal defects and in that way provides a protective barrier to further damage from acid and pepsin. If radiolabelled with a gamma isotope, it could be detected under a gamma camera pointing lesions to which it adhered. With the aim to confirm a suitable noninvasive method for investigation of caustic lesions of the upper gastrointestinal tract we evaluated in a preliminary study the validity of the radiolabelled Sucralfate scintigraphy in detection of peptic disease.

Patients and methods. With that purpose, 35 patients after an endoscopic examination underwent scintigraphy with Tc-99m-DTPA sucralfate. Patients were divided in two groups: a group of 20 patients with endoscopic confirmed peptic disease and a control group of 15 persons who had not any disease of the upper gastrointestinal tract.

Results. Using the test for clinical evaluation of a new method, the scan showed sensitivity of 75 %, specificity of 100 % and accuracy of 85.7 %.

Conclusions. Scintigraphy with Tc-99m-DTPA Sucralfate promoting it as an additional method, complementary to routine investigations in detecting mucosal lesions.

Key words: peptic ulcer-radionuclide imaging; sucralfate; isotope labelling

Introduction

Sucralfate, a complex polyaluminium hydroxide salt of polysulphated sucrose, is used in medical treatment of peptic disease as a coating agent that provides a protective barrier to further damage from acid and pepsin. Its actions are principally local and at acid pH becomes highly polar and binds by way of strong electrostatic interaction to ulcer tissue for up to 12 hours, while relatively little binds to intact gastric or duodenal mucosa.¹

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Utilizing its selective binding characteristics, Vasquez et al. first radiolabelled it with a gamma emitting isotope, developing a new method for detection of gastrointestinal ulcerations.² Since its original publication, this method has been used in different modifications to detect and to evaluate other diseases in addition to peptic ulcers, such as oral microlesions, oesophagitis, oesophageal transit time, gastric carcinoma, inflammatory bowel diseases and many other that have underlying mucosal defects.³⁻⁶

The presence of mucosal and submucosal lesions at peroral caustic ingestion allows the idea that the detection of these injuries is possible with this method. With aim to evaluate the efficacy of the method of radiolabelled sucralfate and gain primary experience about its technique and interpretation of results, a preliminary study was undertaken on a group of patients with and without peptic disease.

Patients and methods

Subjects

After a fiber-endoscopic investigation of the upper gastrointestinal tract, 35 patients (18 male, 17 female; medium age 38.5, range 15 - 72 years) were divided in two groups: an index group, consisting of 20 patients, with endoscopic verified peptic disease and a control group, consisting of 15 patients, who underwent endoscopy because of the suspicion of a peptic disease and the same excluded.

Preparation of radiolabelled sucralfate

After suspending 500 mg sucralfate (1/2 a tablet of Venter, Krka, Slovenia) in 5 ml of normal physiological saline in a test tube, 1 ml DTPA was added and incubated for 2 minutes. 2 mCi of TcO₄ was added, rotated and centrifuged for 10 minutes. After decanting the supernatant, pellet is resuspended in 20 ml water and applicated *per os* (modification of the method of Scopinaro et al.).⁷ The paper

chromatography of the supernatant showed a consistently labeling efficiency of 87-91%.

Patient imaging

Isotope scan was carried out in the morning after an overnight fasting within 48 hours of endoscopy. Images of the upper gastrointestinal tract were obtained using a large field of view gamma camera with the patient in the supine position. Images were initially obtained in the anterior position and, if necessary, additional images were made in the left and right decubitus. Serial analog images on 30 minutes were taken for 2 hours and if gastric emptying was slow, we continued. To hurry up the gastric emptying we gave 100 ml of water by mouth and a intra- muscular injection of metoclopropamid.

Positive images appeared as areas of accumulation of radiopharmaceutical and remained so with no changes of position, time and after drinking 100 ml of water. Negative results were interpreted if the first seen accumulation changed position with time or vanished after drinking water.

Results

The number of detected peptic lesions visualized with both investigations, fiber-endoscopy and radiolabelled sucralfate scintigraphy, are given in Table 1.

After comparing the results obtained from the radiolabelled sucralfate scans with the endoscopic findings, they were estimated as

Table 1. Number of detected peptic lesions with both methods

peptic lesion	FE	Sc
reflux esophagit	4	3
gastric ulcer	7	5
duodenal ulcer	9	7
control group*	0	0
total	20	15

FE=fiber-endoscopy; Sc =scans; * no lesions

true positive (TP), true negative (TN), false positive (FP) and false negative (FN). This study gave 15 TP, 15 TN, no FP and 5 FN results.

Using the methods of clinical estimation (Bayesian analysis), the sensitivity ($S_n = TP / (TP + FN)$), the specificity ($S_p = TN / (TN + FP)$), positive predictive value ($PPV = TP / (TP + FP)$), negative predictive value ($NPV = TN / (TN + FN)$) and the accuracy ($Ac = (TP + TN) / (TP + TN + FP + FN)$) were calculated as $S_n = 75\%$, $S_p = 100\%$, $PPV = 100\%$, $NPV = 75\%$ and $Ac = 85.7\%$.

Discussion and conclusion

Many authors found this method sensitive for detecting various mucosal defects in the upper and lower gastrointestinal tract. With variable successes in visualizing lesions, reported sensitivity was in the range from 67-75 % in the cases of gastroduodenal ulcers and up to 95% in the cases of detecting inflammatory bowel disease.^{5,6,8} In all these studies the S_p was constantly high 97- 100 %. Lesions as small as 0.5-2 mm were detected after biopsy of gastric mucosa.⁹ Although of many optimistic reports, some authors reported unsatisfactory results and discontinued studies in the assessment of localization and extent of inflammatory bowel disease mostly because of the need of purgation in severely ill patients.¹⁰ Our preparing of the patient was only an overnight fasting. Only severe oesophagitis was detected in other studies explaining unfavorable conditions while drinking the radiopharmaceutical in erect position and giving short time of contact to the not enough proteinaceous exudate overlying lesser degrees of esophageal inflammation.^{4,11}

In our study we got similar results as the previously reported in the literature. The false negative results may be due to the »inactivity« of the peptic disease that means reepithelisation of the visualized ulcer craters. The pep-

tic lesions in this study were not histologically verified and mostly depended on morphological judgment and experience of the endoscopist. However, acute and »active« peptic lesion with mucosal denudation seems to be detectable and not chronic »inactive« structural ulcers. How the aim of this study was to get experience with this method and later on to apply it in the investigation of caustic ingestion that is acute and sometimes deeper than the mucosal and submucosal layer, these preliminary results give an opportunity to try.

Most authors conclude that this method is insufficient in comparison with endoscopy, with equal reliability to contrast x-rays, but admits its advantage to be noninvasive, easy to perform, not needing active collaboration from the patients and gives an opportunity to evaluate any seriously ill patient not in condition for endoscopy or barium meal.^{5,12}

Although the group is small, the results suggest that this method could be useful as noninvasive help in the clinical follow up and the detection of mucosal lesions. It seems to be a preferable option for patients after the ingestion of a caustic that would be an aim of a further clinical trial.

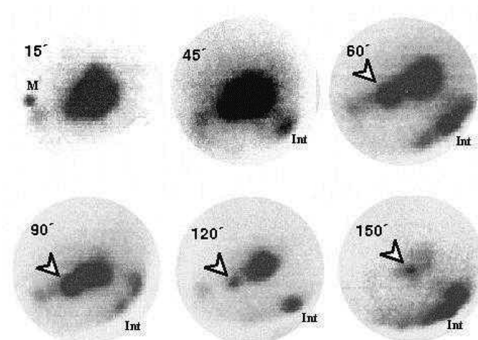


Figure 1. Scintigraphy visualization of gastric region on 30 minute intervals after drinking a portion with radio labeled Sucralfate in a patient with previously endoscopic verified antral ulcer.

(Arrow pointing to the radiotracer accumulation, matching endoscopic location of peptic ulcer; M-Marker , Int - Intestinal loops)

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