Detection of Gastroduodenal Ulcers Using Technetium-99m-Labeled Sucralfate

Nicole Puttemans, Michele Lambert, Pierre P. Andre, Serge Jamsin, Daniel Balikdjian, and François Lustman

Hôpital de Saint-Gilles; and Institut Jules Bordet, Brussels, Belgium

Sucralfate is an effective medication for treatment of gastroduodenal ulcers, and ^{99m}Tc-labeled sucralfate has been found to adhere to ulcers. In this study, we examined the reliability of confirming the diagnosis of gastroduodenal ulcers—previously detected by endoscopy and histology—by means of sucralfate labeled with ^{99m}Tc, imaging 1 and 2 hr after oral administration. Eighteen out of 23 patients were positive by scintigraphy with this method (sensitivity = 78%). In five patients with gastroduodenal bleeding, the study was positive. The procedure was well tolerated and offered a noninvasive procedure that can be performed at the bedside in critically ill patients, and in follow-up of fragile patients.

J Nucl Med 28:521–523, 1987

Sucralfate is a substance characterized by its affinity with ulcerated gastroduodenal tissue, and has the advantageous effect of anti-ulceration protection (*1*).

A preliminary gastroduodenal labeling study using technetium-99m- (^{99m}Tc) labeled sucralfate was published in 1983 (*2*). Vasquez analyzed the reliability of this method, principally on normal rabbits and rabbits having induced ulceration (after administration of acetylsalicilic acid). Only four patients were observed.

We have carried out the same experiment in a larger number of patients presenting gastroduodenal ulcers to verify the accuracy of the examination.

MATERIAL AND METHODS

Sucralfate Labeling

The preparation of the labeled compound was as follows. Two to three grams of sucralfate were diluted in a solution of HCl (pH 4.3) in the presence of stannous tartrate (0.05 to 0.07 mg). The suspension was labeled with 3 to 5 mCi of [^{99m}Tc] human serum albumin (HSA) (3 mg of HSA).

After centrifugation, the supernatant which contained the labeled [^{99m}Tc]HSA (which does not fix to the sucralfate) was discarded. The pellet was redissolved in tap water for the first ten cases and distilled water for the 13 other cases.

The efficiency of the labeling varied between 95% and 97% and remained stable for at least 5 hr.

Received Nov. 6, 1985; revision accepted Aug. 12, 1986.

For reprints contact: F. Lustman, MD, Hôpital de Saint-Gilles, Rue Marconi 142, B 1180 Bruxelles, Belgium.

Patients

The study concerned 23 patients. Thirteen out of the 23 patients observed were male and ten female. Their age varied between 22 and 90 yr old (mean 60 yr old). All the patients presented either gastric or duodenal ulcers at gastroscopy, confirmed by histology thereafter. X-rays confirming the localization of the ulcer were available in 17 out of 23 patients. Regarding the six other patients, the x-rays either did not provide proof of ulceration or were not carried out. Out of the 23 patients, five hemorrhaged during the examination.

Imaging Procedure

The scintigraphy was always carried out 24 to 48 hr after the endoscopic diagnosis of the ulcer. The patients had not received any kind of ulcer treatment for at least 24 hr and received nothing orally for 15 hr. The [^{99m}Tc]sucralfate was diluted in 20 ml of water and administered per os. The patients were asked to drink 100 ml of water to wash away residual [^{99m}Tc]HSA not fixed to gastric mucosa.

The images were taken every half hour for a period of 2½ hr after the administration of the tracer in the first five patients. It was noticed that the best images were taken between 1 and 2 hr after administration. Thereafter, serial images of the stomach and duodenum were obtained by means of a gamma-camera* in upright and supine positions, 1 and 2 hr after administration of the tracer.

In order to be able to differentiate between the images of the ulcers and those of the residual marker, the patient was asked to drink a supplementary glass of water between the 1-hr and 2-hr images, and was also asked to walk a little in order to change the position of the stomach whenever possible. If the hyperfixation remained unchanged on the second image, we concluded that it was an ulcerated image. However, it was difficult to wash away any kind of residual sucralfate located in the gastric fundus, regardless of the position of the patient

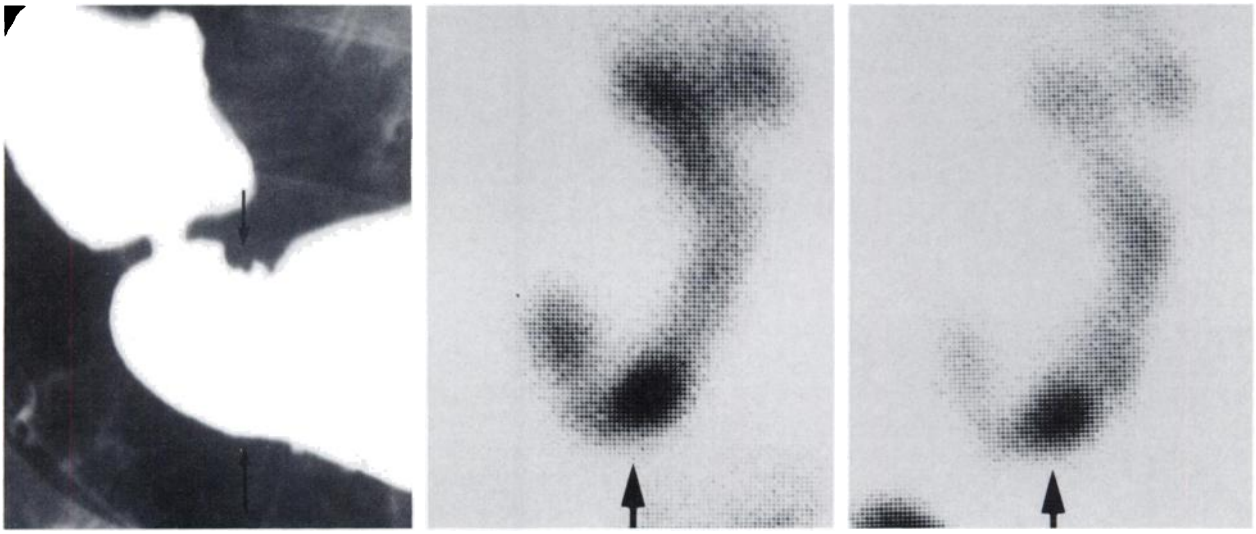

FIGURE 1
Ulcer of the gastric antrum (arrows) demonstrated by x-ray (left) and scintigraphy (middle and right). Note retention in area of the ulcer on both 1-hr and 2-hr images. Uptake in fundus of stomach is also persistent although no pathology existed in this area.

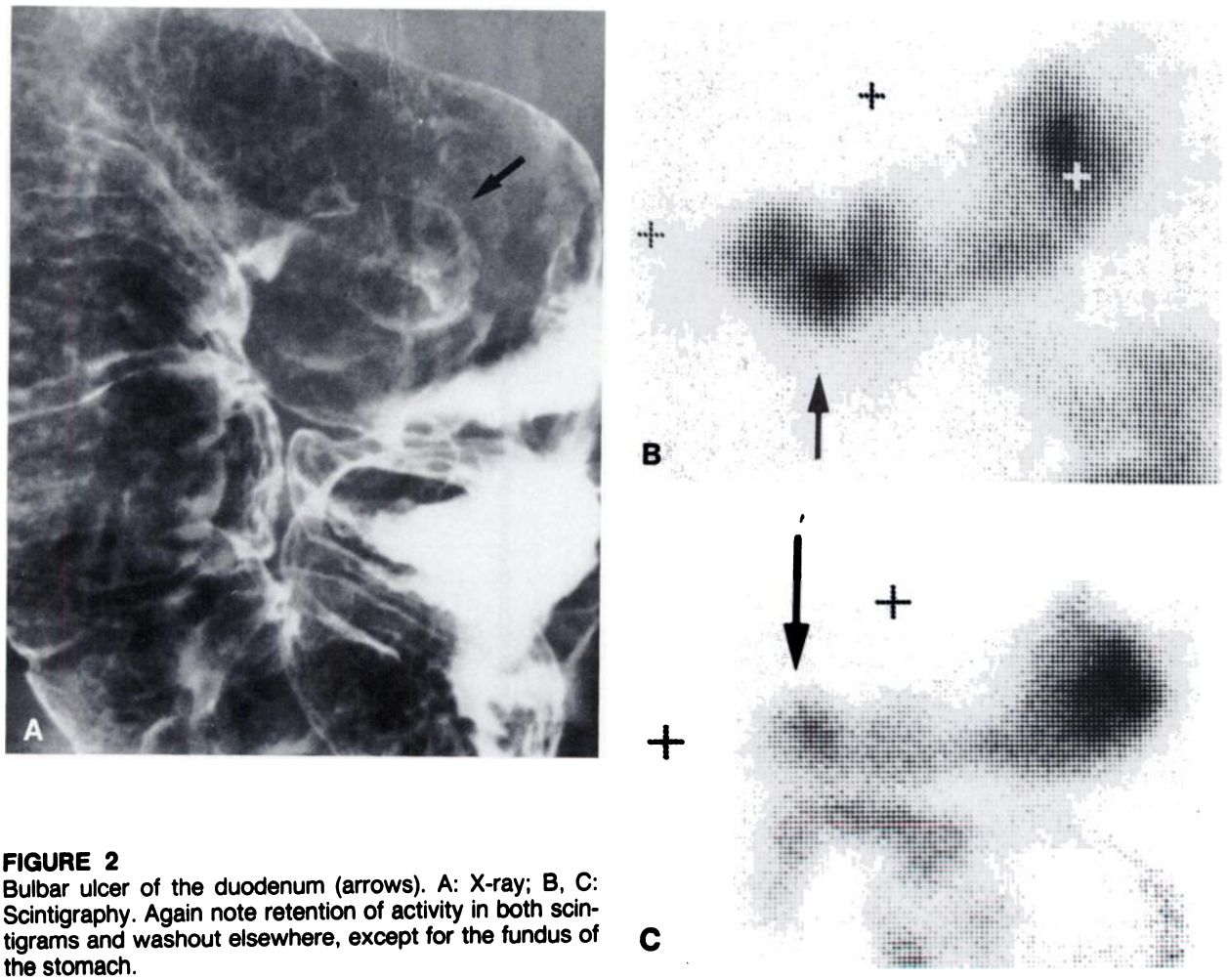

FIGURE 2
Bulbar ulcer of the duodenum (arrows). A: X-ray; B, C: Scintigraphy. Again note retention of activity in both scintigrams and washout elsewhere, except for the fundus of the stomach.

or the amount of the liquid absorbed, making interpretation in this area impractical.

RESULTS

The scintigraphy was positive in 18 out of 23 ulcer patients (radiological confirmation in 14 cases) and negative in the other five cases (radiological confirmation in three cases).

Thus, scintigraphy using sucralfate labeling was positive in 78% of the 23 patients observed.

The five negative scintigraphies were made up of four bulbar ulcers and one prepyloric ulcer. In three of these cases the sucralfate marker was diluted in tap water.

The scintigraphy was positive in the five patients with gastroduodenal hemorrhage during the examination. The examinations were carried out without incident and the labeling substance was well tolerated.

Figure 1 demonstrates a gastric ulceration; Figure 2 demonstrates a duodenal ulcer.

DISCUSSION

The detection of gastroduodenal ulcers with [^{99m}Tc] HSA sucralfate is easy and nontraumatic allowing screening of active mucosal ulcerations. When the labeling agent accumulated significantly in the stomach wall with the exception of the fundus, the examination was always considered to be positive. It is, therefore, possible to avoid further more traumatic examinations such as endoscopy. The latter is of particular importance with regards to intensive care patients.

A gastroduodenal hemorrhage would not appear to interfere with the labeling of an ulcer by means of the tracer, at least as far the five patients observed in our study are concerned.

In the absence of an area of persistant or increased activity and in the evidence of clinical symptoms suggesting gastric or duodenal ulceration, traditional complementary examinations are required.

In this study, it was possible to diagnose gastric or duodenal ulcers by scintigraphy in 78% of the cases. Although not attempted here, this examination method should permit follow-up regarding the evolution of lesions without repetition of disagreeable or risky examinations in fragile patients.

NOTE

*(Siemens Gammasonics ZLC), Searle-Siemens Medical Systems, Inc., Iselin, NJ.

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JNM The Journal of NUCLEAR MEDICINE

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J Nucl Med. 1987;28:521-523.

The Journal of Nuclear Medicine is published monthly.
SNMMI | Society of Nuclear Medicine and Molecular Imaging
1850 Samuel Morse Drive, Reston, VA 20190.
(Print ISSN: 0161-5505, Online ISSN: 2159-662X)

SNMMI SOCIETY OF NUCLEAR MEDICINE AND MOLECULAR IMAGING