《原　著》

Reappraisal of Radionuclide Liver Scans for Preoperative Gastric Cancer Patients

Makoto KONDO*, Yoshio YONAHARA, Shoji YAMASHITA*, Yutaka ANDO*, Makoto MOHRI, Shigeru KOSUDA, Hidekazu MASAKI** and Tatsuo YOSHIOKA

The Departments of Nuclear Medicine and Radiology, National Tokyo Second Hospital, Tokyo, Japan

Abstract Radionuclide liver scans were obtained in 89 preoperative patients with gastric cancer. Eight showed definite defects on liver scans. At laparotomy, 14 patients were found to have liver involvement secondary to gastric cancer. The sensitivity of liver scans to predict liver involvement is 57% (8/14), and the specificity is 100% (75/75). The patients with definite defects on liver scans had a lower rate of palliative resection of the primary tumors (2/8) than the patients with liver involvement and no scan abnormality (4/6). The patients with advanced lesions but without liver involvement had the highest probability of resecting the primary tumors (57/63: 47 radical, and 10 palliative). Normal serum levels of liver chemistries did not preclude the presence of defects on liver scans. Additional three patients were found to have cirrhosis of the liver solely based on liver scans, which was confirmed at laparotomy. Radionuclide liver scans can predict liver involvement with very few false positives, and may discriminate patients unsuitable for laparotomy even with palliative intent.

Introduction

Accuracy of radionuclide liver scans to predict the presence or absence of liver involvement in preoperative gastric cancer patients has been studied (1–3). However, they used a rectilinear scintiscanner, which has become obsolete in modern nuclear medicine. Moreover, considerable numbers of false positives made it impossible to use liver scans as a sole method to discriminate patients with liver involvement. On the other hand, there are surgeons believing that an only palliative means for far advanced gastric cancer is resection of the primary tumors. The presence of liver involvement is not necessarily equated with unresectability of the primary tumors. Therefore, patients with apparent liver involvement may be operated on. We reevaluated the role of liver scans for preoperative gastric cancer patients in these clinical settings. The main issues are whether it is possible to decrease the number of false positives; then, what is contribution of liver scans to decision making for treatment of choice.

Materials and Methods

1980 through 1981, consecutive 89 patients with gastric cancer underwent both radionuclide liver scans and laparotomy with or without resection of the primary tumor. Radionuclide liver scans were obtained approximately 30 minutes following the administration of 5 mCi (185 MBq) of Tc-99m phytate. Gamma-camera images were obtained in

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慶応義塾大学医学部放射線医学教室
近　藤　　誠

Present Address:
* Department of Radiology. Keio University School of Medicine.
** Department of Radiology, National Children's Hospital.
For Reprint:
Makoto Kondo, M.D.
Department of Radiology
Keio University School of Medicine
35 Shinanomachi
Shinjuku-ku
Tokyo 160, Japan

the standard four projections. The hospital record and the official report of liver scans were reviewed for each patient. Scans were not reinterpreted retrospectively, except for equivocal readings, which were assigned for either normal or abnormal by reinterpretation. Only large definite focal defect(s) were considered a sign for liver involvement.

The serum levels of the alkaline phosphatase, bilirubin, lactate dehydrogenase (LDH), and serum glutamate-oxaloacetate transaminase (SGOT) before surgery were recorded from hospital records. Values more than a mean+2 s.d. were considered abnormal.

Results

Of the 89 patients, liver involvement was found in 14 patients (16%). Of the 14 patients with liver involvement, eight showed large definite defect(s) on radionuclide liver scans (Table 1). No patients without liver involvement had positive readings of liver scans. As for detecting liver involvement, liver scans had a sensitivity (true positive rate) of 57% (8/14) and a specificity (true negative rate) of 100% (75/75). Other three patients' scans suggested the presence of cirrhosis of the liver by splenomegaly with marked bone marrow uptake; cirrhosis of the liver was confirmed at laparotomy in these three cases.

Twelve primary lesions were confined in the mucosa or submucosa of the gastric wall (Tl lesions of the UICC TNM classification) (4). All 12 patients with Tl lesions had normal liver scans and normal serum levels of liver chemistries. Laparotomy in these patients revealed no liver involvement; only one patient had lymph node metastasis.

The other 77 patients had more advanced primary tumors (T2–T4 lesions). All abnormal liver scans were found in this group. No patients had increased serum levels of the bilirubin. Ten patients had abnormal levels of either alkaline phosphatase, SGOT or LDH. The results of liver scans are shown in Table 2 according to the results of the liver chemistry study. In 67 patients with normal liver chemistry levels, liver involvement was found in seven, of which two were predicted by liver scans. All three patients with cirrhosis of the liver and one patient with hepatomegaly had normal liver chemistry levels. In the ten patients with abnormal serum levels of liver chemistries, seven had liver involvement. Of these seven patients, six were correctly diagnosed as having liver involvement by liver scans. One patient with an increase of serum alkaline phosphatase and without liver involvement had overt bone metastases.

Table 1 Radionuclide liver scans vs. laparotomy findings in 89 patients with gastric cancer

Defects on liver scans	Liver Involvement	
	Present	Absent
+	8	0
−	6	75*

* Three patients had scintigraphic patterns of cirrhosis of the liver.

Table 2 Radionuclide liver scans vs. laparotomy findings in 77 patients with advanced lesions according to the results of the liver chemistry study

Liver chemistries	Defects on liver scans	Liver involvement	
		Present	Absent
Abnormal	+	6	0
	−	1	3*
Normal	+	2	0
	−	5	60**

* One had overt bone metastases

** Three had scintigraphic patterns of cirrhosis of the liver.

Of the eight patients with definite defects on liver scans, six could not receive palliative resection of the primary tumors nor bypass procedures at laparotomy, and the other two had palliative resection of the primary tumors. Of the six patients with liver involvement and normal liver scans, two could not undergo palliative resection of the primary tumors, and the other four received palliative resection of the primary tumors. Of the 63 patients with advanced primary tumors and without liver involvement, six had exploratory laparotomy only, ten had palliative resection of the primary tumors, and the other 47 underwent surgical procedures with curative intent.

Discussion

This study is unique in producing no false positives. Only apparent and definite large defect(s)

on liver scans were considered a sign for liver involvement. Using the same criteria, we believe, physicians experienced in nuclear medicine should not mistake such as the porta hepatis, gall bladder fossa, renal fossa, etc. for liver involvement. In this study, lesions of the liver with false negative liver scans were small in size (less than 2 cm) in 4 of the 6 patients, and an effort to increase the sensitivity should have also yielded an unacceptable number of false positives.

As evident from Bayes theorem, the yield of liver scans is correlated with the incidence of liver involvement in the group studied. In other malignancies such as sarcoma, head and neck cancer as well as localized carcinoma of the cervix and endometrium, liver scans did not play a role in pretreatment evaluation (5, 6), due to the low incidences of liver metastases in those tumors. As in this study, there is almost no existence of liver involvement among patients with early lesions (1). Therefore, patients with early gastric cancer confined to the mucosa or submucosa are not good cancidates for liver scans. In advanced gastric cancer patients, the incidence of liver involvement is considerable, 18% (14/77) in this study and up to 35% in others (3, 7). Although the discrimination of lesions of eary gastric cancer from more advanced lesions is sometimes difficult, liver scans are particulary recommended for patients with advanced primary lesions.

The patients with definite defects on liver scans had a higher rate of unresectability of the primary tumors than the patient with negative liver scans. Usually, liver involvement is a relatively late complication of gastric cancer. Transmural extension to the neighboring structures such as the pancreas, spleen and mesocolon, and lymph node metastases may precede liver involvement. Moreover, it is coceivable that, in the presence of liver involvement, patients with apparent defects on liver scans have more advanced disease than those with negative scans. In this study, while four of the six patients with liver involvement and negative scans could undergo palliative resection of the primary tumors, only two of the eight patients with positive scans could receive resection of the primary tumors.

There are, however, no concrete agreement concerning the treatment for patients with far advanced gastric cancer. Some surgeons as well as ours believe that an only palliative means is resection of the primary tumors, while others argue that palliative surgical procedures may add little, if any, to the quality of patients' life. If laparotomy is to be avoided in the presence of liver involvement, again, it is important to produce no false positives. No patients should be denied laparotomy based on false positive findings.

References

1) Watanabe K, Kawahara K, Matsuura K: Clinical evaluation of preoperative liver scintigraphy in gastric carcinoma patients. AJR **121**: 720–727, 1974
2) Machida K, Watari T, Hayashi S, et al: Clinical significance of preoperative scintigraphy in gastric cancer. Am J Gastroenterol **68**: 294–299, 1977
3) Derimanov SG, Manoilov KP: Hepatoscintigraphy in patients with gastric carcinoma. Klin Med (Mosk) **57**: 65–68, 1979 (Eng Abstr)
4) TNM classification of malignant tumours. International Union Against Cancer (UICC). Geneva. 1978
5) Felix EL, Bagley DH, Sindelar WF, et al: The value of the liver scan in preoperative screening of patients with malignancies. Cancer **38**: 1137–1141, 1976
6) Mettler FAJr, Christie JH, Garcia JF, et al: Radionuclide liver and bone scanning in the evaluation of patients with endometrial carcinoma. Radiology **141**: 777–780, 1981
7) Dockerty MB: Pathologic aspects of primary malignant neoplasms of the stomach. In Cancer of the Stomach. ReMine WH, Priestly JT, Berkson J (Eds). Philadelphia, W. B. Saunders. 1964, pp 173–206

要　旨

術前胃癌患者における肝スキャンの再検討

近藤　誠* 与那原良夫 山下　昌次* 安藤　裕*
毛利　誠 小須田　茂 正木　英一** 吉岡　達夫

国立東京第二病院核医学科・放射線科
* 現　慶応義塾大学医学部放射線医学教室 ** 現　国立小児病院放射線科

胃癌症例における肝スキャンの意義を再検討する目的で，手術予定症例に肝スキャンを行い，その読影結果と手術所見と血清生化学検査結果とを比較した．

89例中8例にはっきりした欠損像を得た．開腹時に14例に胃癌による浸潤・転移を肝に認めた．肝スキャンの sensitivity は 57%(8/14), specificity は 100% (75/75) であった．肝病変のあった14例中では，肝スキャン陽性群の方が姑息的胃切除の施行率が低かった (2/8 vs. 4/6)．進行癌でも肝スキャン陰性例では胃切除の施行率が高かった (57/63; 根治的47例，姑息的10例)．血清肝酵素値が正常であっても，肝スキャン陽性像を得ることがある．他の3例では肝スキャンによって肝硬変が術前に診断できた．肝スキャンの特異性を高くすることは可能で，開腹に適さない胃癌症例を選び出せるかもしれない．

Key words: Radionuclide liver scan, gastric cancer, surgery, liver chemistry.