SUCCESSFUL MODIFICATIONS FOR PANCREATIC IMAGING

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An experience with pancreatic imaging in 24 patients is described using some modifications for the patient/detector position. No single position is infallible and it is suggested that more than one position be attempted in the same patient for better results.

There is no doubt that a great problem in the interpretation of pancreatic images is due to overlap of the liver image. Some centers do not even venture doing pancreatic images in the presence of hepatomegaly. In addition, unless hepatomegaly is gross, it is not always possible to predict prior to imaging whether the liver accumulation will interfere with the pancreatic image. Accepting the challenge of the superimposed liver problem, we attempted an interplay of patient positioning with the detector head to obtain the following encouraging results. Possibly the maximum number of modifications advocated for a single nuclear medicine procedure so far may be attributed to pancreatic imaging, yet we are not aware of a report that may have dealt simply with appropriate positioning of the patient and the detector for results that we feel bring consistency to the procedure.

MATERIALS AND METHODS

Twenty-four patients have been studied who were referred for pancreatic imaging. No preparation of the patient was undertaken. Routine liver imaging on a gamma camera was obtained on all using ^{99m}Tc-sulfur colloid before the pancreatic imaging. Each patient received i.v., 250 μCi of ^{75}Se-selenomethionine. Soon after injection the sequential pancreatic images were performed on the Picker Dynacamera using a high-energy parallel-hole collimator. A cumulative image every 10 min was routinely performed up to 50 min postinjection. The last of the images was performed in the conventional supine position (anterior) with a 10-deg cephalad tilt of the detector. The first four images were performed in the following modified position.

POSITION

The patient lies on his right side with a grooved wedge under the waist. Retaining the hips and lower limbs more or less in this position, the trunk is then turned halfway supine (the movement predominantly occurring at the spine) till the back rests on another angled wedge lying parallel to the patient's long axis (Fig. 1); the dorsolumbar spine is thus hyperextended with apparent transient scoliosis as if to the left. We call this position left anterior oblique (LAO). The detector is then turned cephalad, inclined as well at the other axis, sufficient enough so as to obtain the inferomedial aspect of the liver along

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FIG. 1. Patient's position, LAO. Note wedge under waist.

the left upper quadrant of the monitor scope. This in general leads to a 10-deg cephalad tilt and a 10-deg transverse tilt. The net effective patient/detector position obtained is depicted in Fig. 2 and achieves a reasonable, sometimes excellent, separation between the inferior aspect of the liver and the pancreas as illustrated subsequently.

RESULTS

The results were categorized as follows (see Table 1): Category I (excellent) pancreas not identifiable in supine view but very well visualized in the modified position, Category II (very good) pancreas only partly identifiable in supine view but very well visualized in the modified position, Category III (good) pancreas fully identifiable in supine view but still clearly demarcated in the modified position, Category IV (poor) pancreas better seen in the supine view, and Category V (? failure) pancreas not visualized in either position.

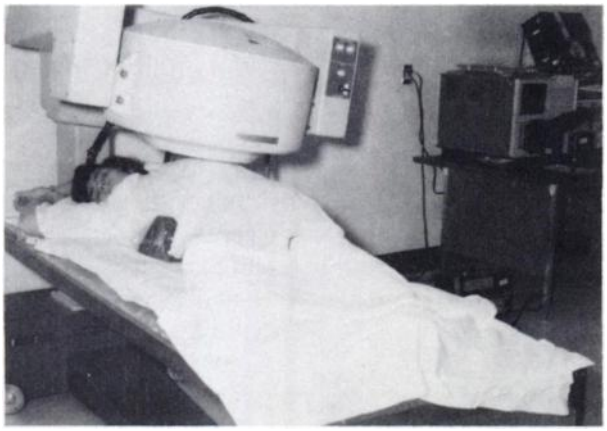

FIG. 2. Patient and detector positioned as described in text.

TABLE 1. CATEGORY OF RESULTS OBTAINED UTILIZING MODIFIED PATIENT/DETECTOR POSITIONING (LAO)

Category	No.	Name	Enlarged liver	Normal liver
I Excellent results	1	KG	X	—
	2	MB	X	—
	3	JK	X	—
	4	MS	X	—
	5	MM	X	—
II Very good results	1	KS	—	X
	2	MF	—	X
	3	MH	—	X
III Good results	1	ME	X	—
	2	AD	X	—
	3	SV	X	—
	4	ML	—	X
	5	MD	X	—
	6	PC	—	X
	7	EK	—	X
	8	AM	X	—
IV Supine view better	1	NY	—	X
	2	JP	X	—
	3	BK	—	X
	4	FW	—	X
	5	WB	X	—
	6	MC	—	X
	7	MF	—	X
V Not visualized	1	EJ	X	—

The result of each patient was related to size of the liver. For simplicity, an inferiorly displaced liver or a liver with a prominent left lobe has also been categorized under "enlarged liver" (Table 1). Five patients fall in Category I and all of them had an enlarged liver. The pancreas was not identifiable on conventional view and was remarkably well seen in the modified position (Fig. 3). Category II comprises only three patients. None of the patients in this category had hepatomegaly and yet the pancreas was not well seen or was only partly seen on conventional view. Very good separation [Fig. 4 (KS)] of the pancreatic image was obtained in our position. In Category III, which comprises one-third of the total patients, reasonably good visualization of the pancreas was obtained on the conventional view but our modification still distinguished the pancreas more clearly [Fig. 4 (ML)]. Only three out of these eight patients had normal-sized livers. In Category IV, there were seven patients in whom the pancreas was better seen on the conventional supine view [Fig. 4 (FW)] despite the fact that two of them had significant hepatomegaly. Without modification all five patients in Category I would have been routinely grouped in the bothersome category of non-visualized pancreas. Grouping Categories I, II, and III, 16 out of 23 (74%) we may conclude that three out of four patients showed improved pancreatic visualization.

DISCUSSION

In the saga of pancreatic imaging more modifications have been proposed than for any other nuclear medicine procedure (*1–7*). These modifications have had limited success. The incidence of the liver overlap varies from 33–39% in the literature and various positions have been described (*8*). The altered patient/detector relationship also has passed the stage of empiricism but no single position has been successful enough to be adopted with some uniformity in nuclear medicine. Without dispute, by far the most logical and useful approach to get rid of the liver overlap has been the electronic subtraction technique (*9,10*). This technique is sophisticated and the few pancreatic images requested in most routine nuclear medicine laboratories may not ade-

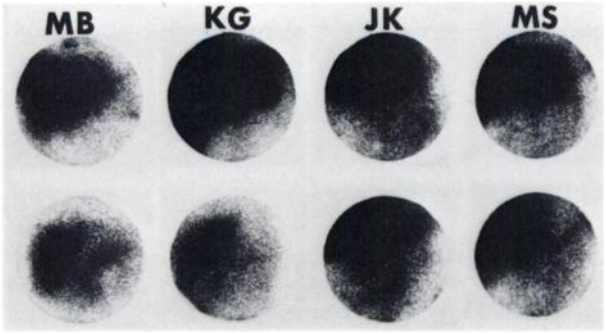

FIG. 3. Category I (excellent), pancreas not identifiable in supine view (ANT, top row) but very well visualized in modified position (LAO, bottom row).

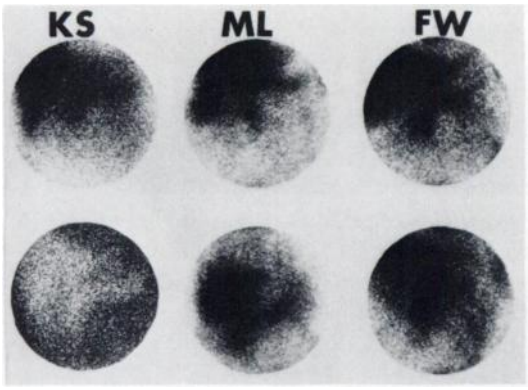

FIG. 4. KS, Category II, (ML) Category III, pancreas visualized on ANT view (top row) but still better seen on LAO (bottom row). (FW) Category IV, pancreas is better seen on ANT view.

quately justify the considerable investment necessary for the subtraction scanning equipment. Even when available its disadvantages (*10*) also need to be kept in mind. Undoubtedly a satisfactory unsubtracted pancreatic scan is technically superior to the subtracted scan.

Overall success in separating the pancreas from the liver in 16 out of 23 (74%) speaks for itself for the modification of positioning and there are no corresponding reports for comparison. But, at the same time we should admit that exact parameters as to when this position shall succeed cannot at this time be set. In Category I (excellent results) where the liver was unequivocally enlarged and no identifiable pancreatic image was obtained in the supine view, we attained a discrete pancreatic image by positioning the patient and the detector. One may conclude that the modification should be applied in all the cases with hepatomegaly. Yet in Category IV (supine view better) in two out of seven who had hepatomegaly, our position did not succeed. On the contrary, in Category II (very good results) none of the patients had an enlarged liver but the pancreas was better seen in the LAO position. Therefore it appears that the chances of separating the liver and pancreatic images do not depend entirely upon presence or absence of hepatomegaly but may depend upon some hitherto unforeseen or uninvestigated factors such as the relationship of the axis of the pancreas to either that of the liver or the vertical axis of the body. This deserves further examination and we are presently investigating this facet. Therefore, at this time when critics ask whether the pancreatic image is worthwhile, and optimism of multiplane tomographic gamma-ray scanning as well as extreme resolution of the Fresnel zone plate is foreseeable, our plea to those who may not enjoy these privileges is to utilize a modified patient/detector positioning for optimal interpretation.

Thus our recommendations are to obtain the pancreatic images in the following sequence: (A) 0–10 min in LAO with the waist and the back wedge both in place; (B) 10–20 min, same as the first 10 min; (C) 20–30 min, same position, except for removal of the waist wedge; (D) 30–40 min, same position of the patient (LAO) but the transverse axis of the detector is made horizontal (0 deg); (E) 40–50 min, the patient is placed in the supine position and the detector head is only tilted 10 deg cephalad (anterior).

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