LIVER SCANNING: ANALYSIS OF 2,500 CASES OF AMEBIC HEPATIC ABSCESSES

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Since the first report in 1953 by Stirret *et al* (*1*), liver scanning has become an important method for the diagnosis and localization of intrahepatic lesions such as tumors (*2–4*), cysts (*5,6*) and abscesses (*7–11*). It has proven to be a simple procedure without danger or discomfort to the patient and it is a more accurate method than enzyme studies, other liver function studies (*4*), blind hepatic punch biopsy (*12*) or splenoportography (*13*).

Due to the high incidence of amebic disease in the suburban population of our country and to the fact that our hospital is in charge of a large fraction of this population, we have already collected an unprecedented number of liver scanning studies on hepatic amebiasis. This paper was designed to analyze our experience with liver scanning obtained through the study of 2,500 patients with amebic liver abscesses.

MATERIALS AND METHODS

A total of 3,379 liver scans were performed on 2,500 patients with amebic abscesses of the liver. The patients were obtained from the clinics and hospitals of the Instituto Mexicano del Seguro Social which are located throughout the country. The diagnosis was confirmed in every case by diagnostic puncture, laparotomy, peritoneoscopy or needle biopsy. In fatal cases the scan findings were confirmed by necropsy. These cases were collected over a period of 6 years and consequently were studied with different radiopharmaceuticals and diverse scanning instruments (Table 1).

TABLE 1. CASES STUDIED

Radiopharmaceutical	Scanner and imaging device	Number of cases
^{131}I-rose bengal	Teledeltos and photoscan	225
^{131}I-rose bengal	Photoscan and colorscan	446
^{198}Au-colloidal gold	Photoscan and colorscan	1,051
^{198}Au-colloidal gold	10-channel scanner	642
^{99m}Tc-sulfur colloid	Photoscan and colorscan	80
^{99m}Tc-sulfur colloid	10-channel scanner	243
^{113m}In-coprecipitates	Photoscan and colorscan	42
^{113m}In-coprecipitates	10-channel scanner	650
TOTAL		3,379

Radiopharmaceuticals. Six hundred and seventy one cases were studied with ^{131}I-rose bengal (100–160 μCi). In 1,963 cases ^{198}Au-colloidal gold (120–230 μCi) was used. The scanning agent in 323 studies was ^{99m}Tc-sulfur colloid (2–3 mCi) and iron coprecipitates with ^{113m}In (2–3 mCi) in 692 cases (Table 1).

Scanning instrument and imaging devices. A commercial rectilinear scanner was used in the study of 1,844 cases. A Teledeltos paper printing system and a photographic printing device were used in 225 studies, while the same photographic device and a color printout system were used in 1,619 scans. A 10-channel rectilinear scanner with memory oscilloscope and a Polaroid camera were used for the study of 1,535 cases (Table 1).

Anterior and right lateral projections of the liver were obtained in 3,379 cases. These were supplemented with a posterior projection in 1,535 patients.

To analyze the distribution of the amebic abscesses in the liver and the efficiency of liver scanning on its detection, the right hepatic lobe was empirically divided into eight different regions: upper external posterior, upper external anterior, upper internal posterior, upper internal anterior, lower external posterior, lower external anterior, lower internal posterior and lower internal anterior.

The number of the abscesses in each region was tabulated according to the clinical, pathological, surgical and scanning findings. The number of abscesses located by liver scanning alone was used to measure the efficiency of liver scanning in each separate region (Fig. 1).

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RESULTS

A total of 3,379 liver scans was performed in 2,500 patients with proven hepatic amebic abscesses This includes the repeated studies performed periodically to follow up the evolution of the disease, and those repeated because the first scan was negative or inconclusive due to technical factors or because the lesion was too small to be seen in the scan.

Most of the patients suffered from a single abscess (83.0%) while 17% presented more than one lesion (Table 1). Cases with more than five abscesses were excluded from our statistics because of the difficulty in determining the exact location of each individual lesion.

A total of 4,286 abscesses were found in 3,379 liver scans from 2,500 patients (Table 2). The distribution of these lesions is shown in Fig. 1. The regions most affected were those of the external half of the right hepatic lobe (65.0%), those of the posterior portion of the same lobe (56.5%) and those of the upper part of the right lobe (41.6%). In contrast, the left lobe contained only 21.4% of the lesions.

Table 3 shows the efficiency of each scanning projection in the visualization of lesions in each hepatic region. The highest overall efficiency was found with the posterior projection where 94.6% of the lesions were visualized. The anterior projection showed 92.8% of the abscesses while the right lateral scan demonstrated only 72.2%.

The efficiency of both the anterior and posterior scans were similarly high in the localization of abscesses of the left hepatic lobe. However, the right lateral image was completely inadequate for this purpose.

The posterior scan showed 93.1% of the abscesses of the right hepatic lobe. Right lateral and anterior projections demonstrated a somewhat smaller efficiency.

The anterior projection had its best efficiency in locating lesions of the left hepatic lobe (98.4%) and abscesses sited in the anterior region of the right lobe.

The posterior view showed its greatest efficiency in locating the abscesses sited at the left hepatic lobe (99.2%) and at the posterior regions of the right lobe (95.3%).

The right lateral image was useful in studying the lesions located in the external regions of the right hepatic lobe.

Table 4 shows the efficiency of liver scanning when the different projections are combined. As was expected, any combination showed an increase in the ability to visualize the hepatic lesions compared with the results obtained with an isolated projection.

The usual combination of anterior and right lateral scans showed an overall efficiency of 95.5%. Slightly better results were obtained with the combination of the posterior and right lateral scans (96.4%), while the highest percent of positive results was obtained with the combination of anterior and posterior images (97.1%). Logically, the combination of the three projections resulted with the highest efficiency (98.6%), depicting 99.6% of the lesions located in the left hepatic lobe and 98.3% of all the abscesses sited in the right lobe.

TABLE 2. CLASSIFICATION OF PATIENTS ACCORDING TO NUMBER OF LIVER ABSCESSES

	No. cases	Percent	No. abscesses
With one abscess	2,826	83.0	2,826
With two abscesses	327	9.6	654
With three abscesses	130	3.8	390
With four abscesses	74	2.1	296
With five abscesses	24	0.7	120
More than five abscesses*	25	0.8	?
TOTAL	3,379	100.0	4,286

* Cases with more than five lesions were excluded from statistics in following tables.

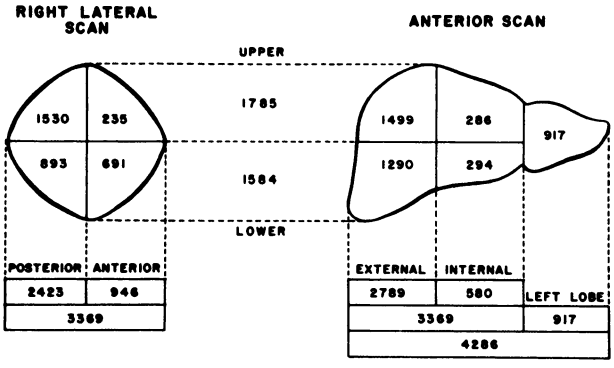

FIG. 1. Distribution of 4,286 amebic abscesses of liver found in 3,379 hepatic scans from 2,500 patients.

DISCUSSION

A major problem in the diagnosis, treatment and prognosis of the amebic liver abscess is the difficulty usually found in the clinical exploration of this organ, particularly in its posterior regions.

The knowledge of the size and location of the lesion(s) is of prime importance in deciding the type of therapy to be instituted. Medical treatment with anti-amebic drugs and antibiotics will suffice if the lesion is small and there is no danger of rupture. But, if the lesion is big and its location is near the surface of the liver, its surgical drainage is compulsory to avoid its eventual rupture. A big abscess or a

TABLE 3. EFFICIENCY OF DIFFERENT SCANNING PROJECTIONS IN EACH HEPATIC REGION

Image	Upper Regions of Right Lobe N	n	%	P	Lower Regions of Right Lobe N	n	%	P
Ant.	1785	1596	89.41	—	1584	1478	93.30	—
RL	1785	1630	91.31	0.05	1584	1465	92.48	>0.10
Post.	824	774	94.06	<0.001	698	643	92.12	>0.10
Ant. & RL	1785	1679	94.06	<0.001	1584	1514	95.58	0.005
	External Regions of Right Lobe				Internal Regions of Right Lobe			
Ant.	2789	2563	91.89	—	580	511	88.10	—
RL	2789	2610	93.58	0.01	580	485	83.62	0.03
Post.	1284	1209	94.15	0.01	238	208	87.39	>0.10
Ant. & RL	2789	2668	95.66	<0.001	580	525	90.51	>0.10
	Anterior Regions of Right Lobe				Posterior Regions of Right Lobe			
Ant.	946	884	93.44	—	2423	2190	90.38	—
RL	946	865	91.43	0.10	2423	2230	92.03	0.04
Post.	445	391	87.86	<0.001	1077	1026	95.26	<0.001
Ant. & RL	946	906	95.77	0.025	2423	2287	94.38	<0.001
	Right Hepatic Lobe				Left Hepatic Lobe			
Ant.	3369	3074	91.24	—	917	902	98.36	—
RL	3369	3095	91.86	>0.10	917	0	0.00	<0.001
Post.	1522	1417	93.10	0.03	490	486	99.18	>0.10
Ant. & RL	3369	3193	94.77	<0.001	917	902	98.36	>0.10

TOTAL

Image	N	n	%	P
Ant.	4286	3976	92.76	—
RL	4286	3095	72.21	<0.001
Post.	2012	1903	94.58	0.007
Ant. & RL	4286	4095	95.54	<0.001

Ant. = anterior; RL = right lateral; Post. = posterior; N = actual number of abscesses; n = number of abscesses visualized; % = percent efficiency; P = statistical significance of differences with anterior projection (0.10 = no significance; 0.05 = significant).

multiplicity of small abscesses eroding an important segment of the liver may indicate a major surgical procedure such as partial hepatectomy (*14*).

In 1963, when our program of liver scanning started, we obtained only the anterior image of the liver. It was soon found that due to the interposition of a thick layer of normally functioning hepatic tissue between the abscess and the detector, this procedure was unsuitable for the localization of the amebic lesions situated at the posterior regions of the right hepatic lobe. This defect in liver scanning increased inversely to the size of the lesion. Consequently, it was decided to supplement the anterior scan with a right lateral image.

An analysis of the results with liver scanning in 106 cases of amebic abscesses (*9*) showed that the anterior projection failed to detect 17% of the lesions located at the right hepatic lobe, while with the right lateral scan the number of false negatives decreased to 6.8%. The combination of both projections had only 1.1% failures in the detection of abscesses of the right lobe.

Analysis of the distribution of these lesions showed that the most affected regions of the liver were the posterior, external and upper thirds of the right lobe (*9*). This was confirmed by further analysis of the distribution of 722 amebic abscesses demonstrated by liver scanning in 671 patients (*15*). It seems that this peculiar distribution of the amebic lesions has some relation to the anatomical characteristics of the portal branches leading to those regions (*15*).

These studies demonstrated the necessity of a new procedure for the exploration of the posterior region of the right hepatic lobe. Because the low efficiency of the anterior scan alone in the detection of abscesses located in this region is closely related to the thickness of the normal liver tissue interposed between the lesion and the scanning probe, it was assumed that obtaining a posterior view would render an improvement on liver scanning efficiency.

Our results confirmed this hypothesis. The highest efficiency was found with the posterior scan, which showed 95.3% of the right posterior liver abscesses studied, while the anterior image and the right lateral scan demonstrated only 90.4% and 92% of these lesions.

The usual combination of anterior and right lateral images demonstrated 95.5% of all abscesses, but the combination of the posterior and right lateral scans

showed a slightly higher efficiency (96.4%). Since right lateral scans showed the lesions located near the profile of this image or near the external region of the right lobe, the combination of the posterior and the anterior projections gave the best results for two views (97.1%). However, further improvement was obtained when the three projections were combined (98.6%).

We may conclude that, contrary to the usual practice, the best single scan in the localization of amebic abscesses is the posterior image which can be supplemented with anterior and right lateral scans. The latter should always be obtained to get a tridimensional idea of the location of the lesion. However, a conventional linear scanner is very slow, even when used with higher doses of short-lived radionuclides (^{99m}Tc or ^{113m}In), and to obtain three different projections of the liver is difficult and time consuming. In this case, the posterior projection perhaps supplemented with an anterior or a right lateral scan may suffice in the study of liver abscesses. The choice between the anterior and the right lateral scan should be decided on a clinical basis.

This problem is solved when a multichannel linear scanner is used. This instrument is faster than the conventional one and can be used to obtain three different liver projections in a lapse of time no longer than 20 min and without special discomfort to the patient.

Because the data reported here were obtained using different scanning instruments and diverse radiopharmaceuticals, it may be worthwhile to analyze these data further to assess the actual importance of each instrument and each radiopharmaceutical in the development of liver scanning. This will be the subject of a later report.

SUMMARY

A total of 3,379 liver scans were performed in 2,500 patients with proven hepatic amebic abscesses. Most of the patients suffered from only one abscess (83.0%) while 17% presented more than one lesion. A total of 4,286 abscesses were found. The most affected regions were those of the external half of the right hepatic lobe (65.0%), of the posterior portion of the right lobe (54.5%) and of the upper part of the same lobe (41.6%). The left lobe implanted only 21.4% of the lesions. Right lateral scans showed 72.2% of the lesions, while the anterior image demonstrated 92.8% and the posterior

TABLE 4. EFFICIENCY OF LIVER SCANNING WHEN DIFFERENT PROJECTIONS ARE COMBINED

	Upper Regions of Right Lobe				Lower Regions of Right Lobe			
Image	N	n	%	P	N	n	%	P
A-RL	1785	1579	94.06	—	1584	1514	95.58	—
P-RL	824	791	95.99	0.04	698	662	94.84	>0.10
A-P	824	790	95.87	>0.05	698	675	96.70	>0.10
A-P-RL	824	814	98.78	<0.001	698	687	98.42	0.001
	External Regions of Right Lobe				Internal Regions of Right Lobe			
A-RL	2789	2668	95.66	—	580	525	90.51	—
P-RL	1284	1236	96.26	>0.10	238	217	91.17	>0.10
A-P	1284	1237	96.33	>0.10	238	228	95.79	0.02
A-P-RL	1284	1270	98.90	<0.001	238	231	97.05	0.005
	Anterior Regions of Right Lobe				Posterior Regions of Right Lobe			
A-RL	946	906	95.77	—	2423	2287	94.38	—
P-RL	445	414	93.03	0.03	1077	1039	96.47	0.03
A-P	445	430	96.62	>0.10	1077	1035	96.10	>0.10
A-P-RL	445	439	98.65	0.005	1077	1058	98.23	0.006
	Right Hepatic Lobe				Left Hepatic Lobe			
A-RL	3369	3194	94.77	—	917	902	98.36	—
P-RL	1522	1453	95.46	>0.10	490	486	99.18	>0.10
A-P	1522	1465	96.15	0.02	490	488	99.59	0.04
A-P-RL	1522	1497	98.35	<0.001	490	488	99.59	0.04

TOTAL

Image	N	n	%	P
A-RL	4286	4095	95.54	—
P-RL	2012	1939	96.37	>0.10
A-P	2012	1953	97.06	0.004
A-P-RL	2012	1985	98.65	<0.001

A-RL = anterior & right lateral; P-RL = posterior & right lateral; A-P = anterior & posterior; A-P-RL = anterior, posterior & right lateral; N = actual number of abscesses; n = number of abscesses visualized; % = percent efficiency; P = statistical significance of differences with combination of anterior and right lateral projections (0.10 = no significance; 0.05 = significant).

one depicted 94.6% of the abscesses. The combination of anterior and right lateral scans showed 95.5% of the abscesses. The posterior and right lateral scans showed 96.4% of the lesions and the anterior and posterior combination showed 97.1%. The combination of the three images demonstrated 98.6% of the abscesses.

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