The Liver in Amoebic Disease

A REPORT ON CLINICAL AND SCINTIGRAPHIC OBSERVATIONS IN 247 PATIENTS

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SUMMARY

During the past 8 years, 305 cases of amoebic disease have been examined at the Department of Diagnostic Radio-isotopes of the H. F. Verwoerd Hospital, Pretoria. Analysis of the data obtained by means of scintigraphy in 247 of these patients indicates that *in vivo* scintigraphy of the liver is a valuable method for the investigation of many aspects of the disease. Our observations on the localisation of the abscesses, the relationship between localisation and the frequency of complications, the macroscopical changes in the liver during the disease, the presence of a generalised reaction of the liver parenchyma to amoebae in some cases, and the healing rate of abscesses under different types of treatment, are reported in this article.

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It is a basic fact of hepatology that a single noxious agent may produce variable responses in the liver. This, however, appears to be at variance with the changes produced by amoebic invasion of the liver, since focal hepatic suppuration is the sole response of the liver parenchyma to amoebae. Accordingly, there is a striking resemblance among the vast majority of these patients where this disease is concerned. The history before admission to hospital, the clinical appearance, and the regression of abscesses under treatment, are typical in the well-known clinical picture of amoebic liver disease. This is the impression obtained from reviews, and reports on individual cases, from various parts of the world.[1-3]

Unlike conditions such as carcinoma of the liver, hepatic abscesses are seldom explored at autopsy because recovery is usually uneventful with adequate treatment. Consequently, investigation of the macroscopical changes in the liver during hepatic amoebiasis, correlation between localisation of the lesion, symptomatology and prognosis of the disease, recurrence of the abscess, residua after treatment, and the presence of generalised parenchymal disturbances, are of interest.

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PATIENTS AND METHODS

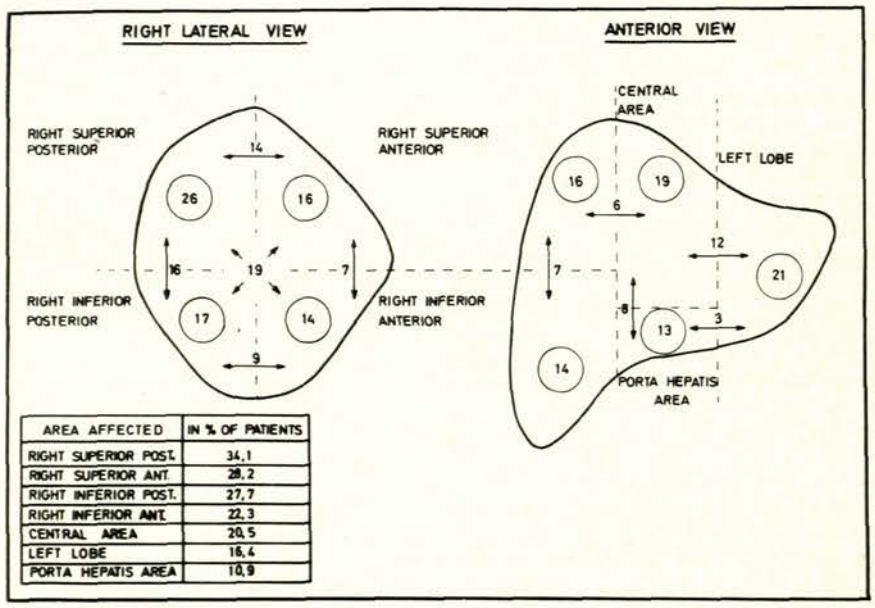
The destructive behaviour of amoebae results in an irregular distribution of isotopes in the liver and makes *in vivo* anatomical examination by scintigraphy possible. This permits valuable conclusions regarding pathological changes in the liver resulting from the disease. Altogether, 305 patients with amoebic liver abscesses were examined in the Department of Diagnostic Radio-isotopes of the H. F. Verwoerd Hospital in Pretoria, between October 1963 and January 1973. Only 247 of these cases, 223 non-White and 24 White, are included in the present study, the remaining cases are excluded because suitable hospital records were not available. According to Lamont and Pooler[3] and Kean,[4] the diagnosis of amoebic liver abscess was accepted only when a patient showed a sufficient number of diagnostic criteria, such as the response to specific therapy, positive serological findings, or the presence of typical pus.

Liver Scanning

In our department the routine procedure employed in scintigraphy of the liver included the intravenous administration of 2 - 4 μCi ^{131}I-rose bengal per kg body mass, followed by anterior and right lateral photoscanning. If necessary—as is sometimes the case in abscesses of the left lobe—a left lateral scan was also done. Delayed scans were done in cases where biliary obstruction was suspected. If inspection of the scan left some doubt as to whether the liver was enlarged or not, the size of the organ was established planimetrically.

Clinical Observations

Of the 247 patients, 202 were male and 45 female. The ratio of male to female patients was about 5:1 for non-Whites and 2:1 for Whites. The age of the patients ranged from 2½ to 80 years, 48,5% being 30 - 45 years old. No significant seasonal distribution was observed (Fig. 1). Pain in the right upper abdomen or the right shoulder, was present in all the patients. In some cases, this started as early as 1 year before admission (3 patients) and in a few



AREA AFFECTED	IN % OF PATIENTS
RIGHT SUPERIOR POST.	34,1
RIGHT SUPERIOR ANT.	28,2
RIGHT INFERIOR POST.	27,7
RIGHT INFERIOR ANT.	22,3
CENTRAL AREA	20,5
LEFT LOBE	16,4
PORTA HEPATIS AREA	10,9

Fig. 2. The distribution of 220 solitary abscesses of the liver. The numbers in circles indicate the number of cases where the abscess was restricted to this region. The numbers next to the arrows indicate the number of cases where abscesses affected more than one region.

that the blood from the mesenteric veins is incompletely mixed within the short common portal trunk, and so there is a difference in the blood going to the right and to the left lobes of the liver. According to Clark[9] the parts of the intestine maximally involved in amoebic ulceration are the caecum and ascending colon. Since these parts are drained by the vena mesenterica superior, the peculiarity of the portal blood distribution explains the preponderant involvement of the right lobe in amoebic embolisation.

A correlation exists between the localisation of the abscesses and the duration of hospitalisation. Hospitalisation is significantly longer ($P<0,01$) in patients with lesions in the superior part of the right lobe (mean = 29,6 days, N = 104), than it is in patients with lesions in the inferior part of the right lobe, in the left, or the central parts of the liver (19,9 days, N = 92). The average period of hospitalisation was 26,3 days (N = 24) in cases where the porta hepatis was affected. However, this was not significantly different from the two other groups.

It seems reasonable to assume that abscesses in the superior part of the right lobe more often tend to produce pleuropulmonary complications, prolonging the duration of the illness, than do abscesses in the inferior part of the right lobe, or in the left lobe. Fig. 3 demonstrates the relation between pleuropulmonary complications (massive pleural effusion, pleural empyema, lung abscesses) and the localisation of abscesses in 35 patients. The number of dots in one area is equal to the number of patients in whom the abscesses affected this special area. Since in 18 of these patients the abscesses affected more than one area, the number of dots in Fig. 3 is greater than the total number of abscesses. The figure illustrates that pulmonary complications usually occur in cases with superior right lobe affected. Actually, of the 35 patients who developed pleuropulmonary complications, only 6 (with massive pleural effusions) did not have lesions in the right upper region of the liver. Consequently, the effusion could not have been caused by a sympathetic reaction to the inflammatory process (circled dots in Fig. 3).

With regard to the 2 cases with abscesses penetrating into the pericardium, in one the abscess originated in the posterior upper part of the right lobe, and in the other in the superior central part of the liver.

A relationship similar to that described with regard to pulmonary complications and localisation existed between localisation of the abscesses and the presence of hyperbilirubinaemia. Of the 13 patients who had a bilirubin level of more than 1,3 mg/100 ml, 8 had an abscess arising in the porta hepatis, and 3 had multiple lesions; in 2 of the latter cases portal manifestations were also visible. The remaining 2 patients had extraordinarily large abscesses involving the whole right lobe of the liver. Altogether, portal manifestations of the abscesses were noticed in 24 patients, 10 of whom had increased bilirubin levels, i.e. in 41,5% with portal abscesses a hyperbilirubinaemia was present. One may therefore assume that biliary retention in hepatic amoebic disease arises more often from mechanical factors than from insufficiency of the liver parenchyma.

Dimensions of the Abscesses and Anatomical Distortion of the Liver

Periods varying from one day to one year passed between the onset of symptoms and admission to hospital, and the size of the abscesses on admission varied considerably. However, there was no significant correlation

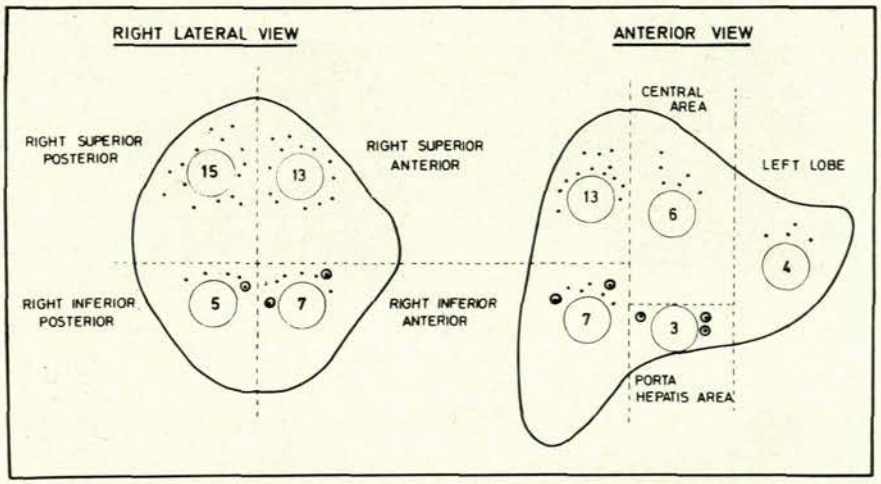


Fig. 3. Localisation of abscesses in 35 patients who developed pleuropulmonary complications. The predominant involvement of the right superior regions in these cases, is clear. However, in 6 cases (circled dots) **abscesses restricted to the inferior part of the right lobe or the porta hepatis were revealed.**

between length of history and size of abscess. The smallest abscess observed was 3,5 cm in diameter, and the largest abscess in this series was 16 × 24 × 10 cm. The approximate volume of this abscess was estimated to be about 2 100 - 2 300 ml. This is somewhat smaller than the largest abscess encountered by Paul[3] in his series of 400 patients. He evacuated 2 700 ml of pus at a single sitting from one patient. The common range of abscess volume in Paul's series was between 280 and 1 100 ml. This agrees very well with our observations. In the older literature[10] extraordinarily large abscesses were reported, ranging in volume from 5 - 18 litres. This is almost incredible when it is recalled that the dimensions of a normal liver are about 16 × 20 × 13 cm.[11]

A group of 42 patients with abscesses of extraordinary size was compared with patients in our series who had abscesses of medium or small size. All the very large abscesses had at least one diameter of more than 14 cm. Surprisingly, the duration of hospitalisation of these patients was not significantly longer (30,4 days) compared with the rest of the patients (25,3 days), when tested with Student's *t*-test. Also, the incidence of liver malfunction, as reflected by liver function tests, was not higher in these patients than it was in patients with smaller lesions. Finally, the incidence of complications was not significantly higher in these patients (21,5%) than it was in the other patients (18,5%). This indicates that the size of an abscess is not necessarily a decisive factor in the outcome of the disease. It seems that an abscess, even if it is of enormous size, rarely interferes seriously with the function of the liver parenchyma. This contrasts sharply with our observations in 100 patients suffering from primary liver cancer. In the latter instance a definite relationship existed between the size of the lesion and the frequency of malfunction.[12] This difference may be of diagnostic importance.

Abscesses having a diameter of less than 8 cm were usually spherical and rarely deformed the shape of the liver (Fig. 4). In the case of larger abscesses, the shape was seldom spherical (only in 3 out of 42 cases). This is probably due to the fact that growth is modified when the abscess reaches the surface of the organ. In some cases, however, expansion of the abscess seemed to be governed by other factors. This was so in 8 of our cases who had irregular, elongated abscesses which penetrated the right lobe completely (Fig. 5c). Two cases had 'button-hole' abscesses, i.e. 2 spherical lesions were present and connected by a ductus which penetrated the right lobe. In 1 case a single abscess, arising from the right lobe of the liver, penetrated the parenchyma in different directions, producing no less than 7 'blank' areas on the scan (Figs 5a and 5b). Incidentally, this patient had normal bilirubin and enzyme values and recovered uneventfully within 11 days on chemotherapy.

Frequently, large abscesses caused massive deformation of the liver. As the majority of the abscesses originated in the right lobe, deformation was generally brought about by enlargement of the left lobe, the right lobe being partly or totally displaced by the abscess. In these cases it is usually not possible to decide whether enlargement of the left lobe is due to compensatory hypertrophy or to displacement of the liver parenchyma by expansion of the abscess to the left side. A genuine hypertrophy of the left lobe is often noticed in benign lesions of the right lobe, such as echinococcus cysts or amoebic abscesses.[13] In our experience, based on scintigraphic evidence, an enlargement of the left lobe can almost always be demonstrated in cystic disease of the liver, in primary or secondary carcinoma localised in the right lobe and exceeding a certain size (Fig. 6). Enlargement of the left lobe in amoebic liver abscess is presumably due to hypertrophy and mechanical factors. Fig. 7 illustrates the importance of mechanical displacement in altering the shape of the left lobe. The figure shows a series of scans obtained from a patient with an amoebic abscess (Fig. 7, top row). The initial scan (Fig. 7a) shows a huge area without radio-isotope uptake in the right and central part of the liver. This

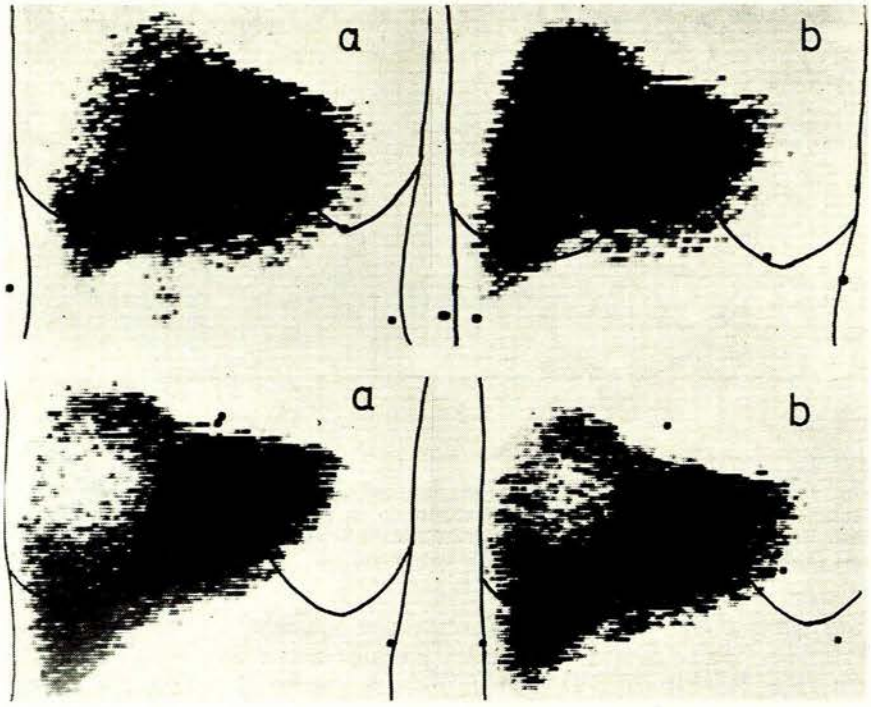


Fig. 4. Follow-up examinations of amoebic abscesses of small size after 36 days (top row) **and after 5 days** (bottom row), **respectively.**

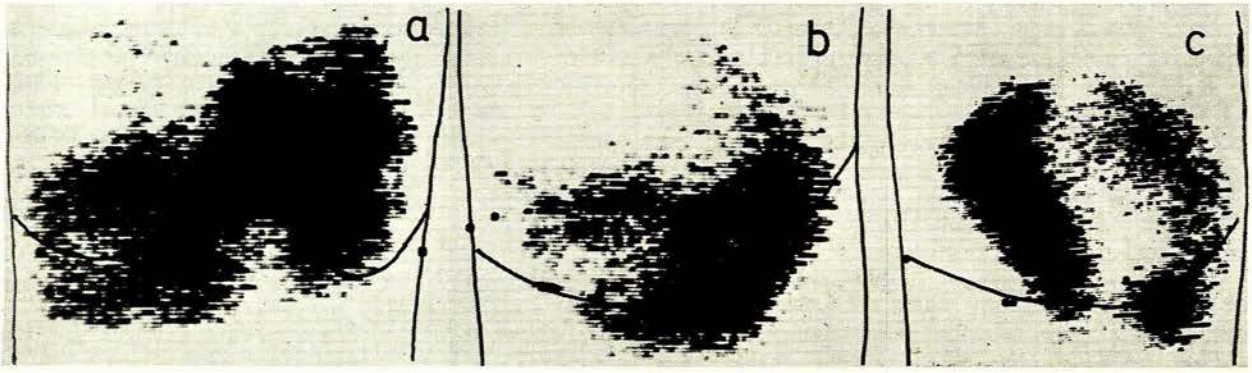


Fig. 5. Irregular development of abscesses, which suggests a penetrating rather than a displacing enlargement: (a) **anterior, and** (b) **lateral view of a liver with multiple 'blank' areas caused by a single abscess;** (c) **lateral view of an abscess penetrating the whole right lobe of the liver.**

abscess was the largest encountered in our series. From the scan it is clear that only the left lobe accumulated some isotope. Scanning was repeated immediately after the aspiration of 800 ml of pus (Fig. 7b). It is apparent that the size of the functioning area increased immediately after the pressure exerted by the abscess was reduced. The third scan (Fig. 7c) shows the shape of the liver 6 months later; the liver was still severely deformed. The bottom row of scans in Fig. 7 demonstrates the enlargement of the right lobe produced by an amoebic abscess and the changes which occurred after 19 days of chemotherapy.

Some authors claim that healing of amoebic abscesses is usually not associated with scar formation or distortion of the shape of the liver.[3,14] This is usually true only in the case of smaller abscesses. In Fig. 8 the initial changes in livers with large abscesses and scans obtained some months after discharge from hospital are shown. Significant malformation was still present despite complete clinical recovery. This pattern was noticed in 10 of the 12 patients with large abscesses, who were followed-up for more than 5 months; these 10 patients had very large abscesses on admission. Nevertheless, it is our impression that neither

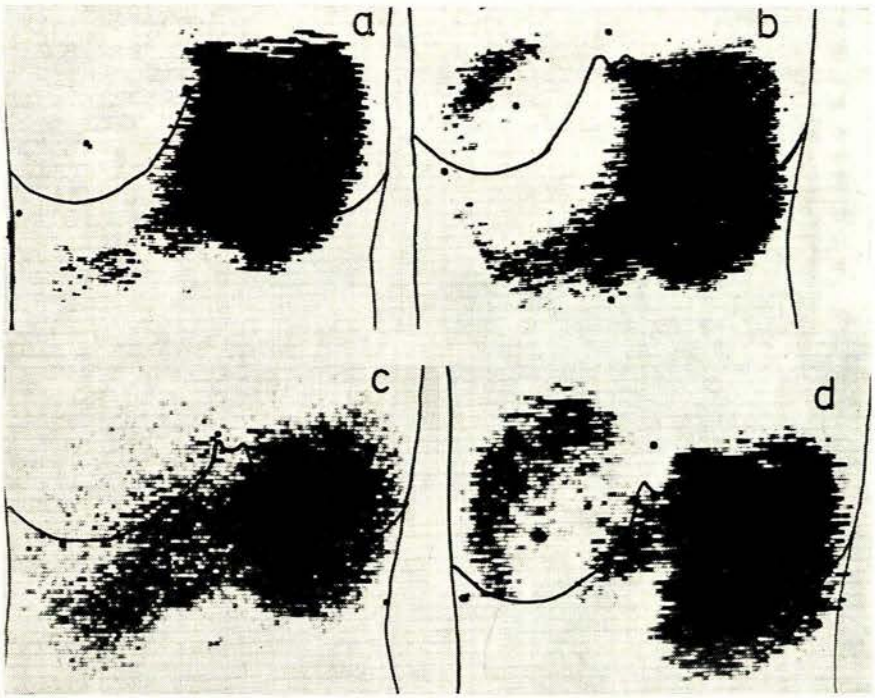


Fig. 6: Comparison of 3 conditions where an enlargement of the left lobe can usually be observed: (a) **amoebic abscess of the right lobe;** (b) **and** (c) **primary liver cancers in the right lobe;** (d) **cystic disease of the liver.**

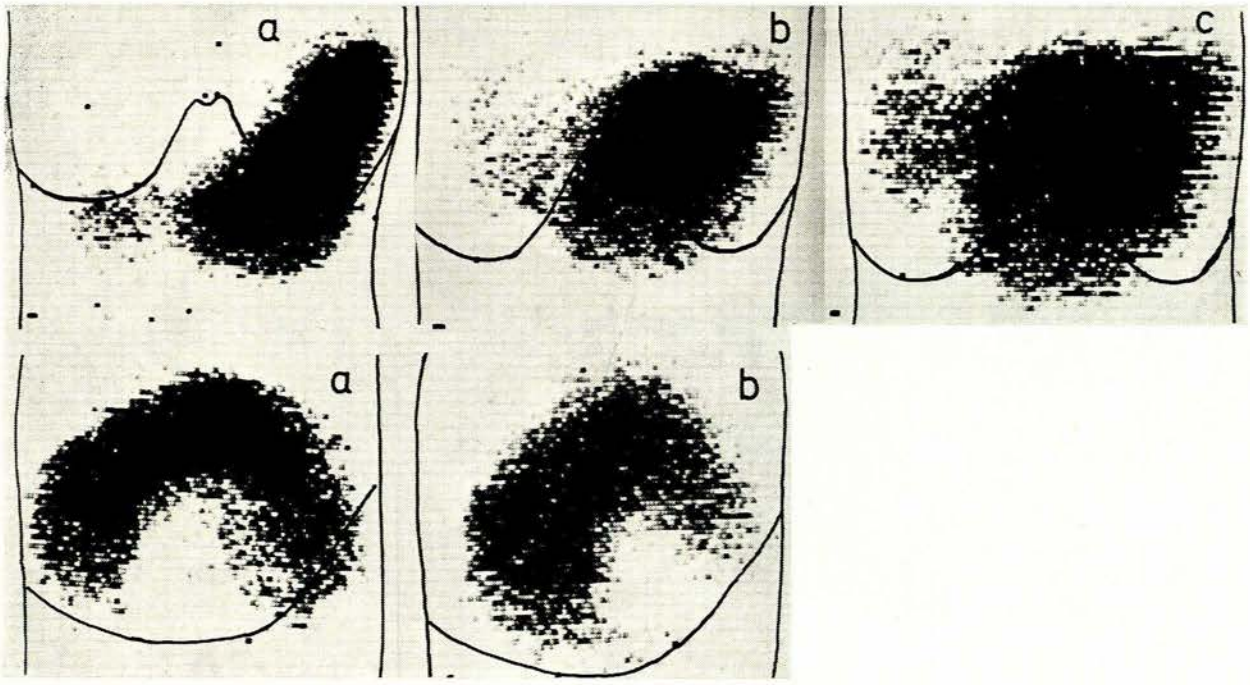


Fig. 7. Mechanical displacement of liver parenchyma by the abscess: Top row: (a) **large abscess in the right and central part of the liver;** (b) **scan after evacuation of 830 ml of pus;** (c) **control after 6 months (anterior views).** Bottom row: (a) **enlargement of the right lobe of the liver by an amoebic abscess;** (b) **condition after 19 days of chemotherapy (lateral scans).**

the initial size of the lesion nor the type of treatment determines whether the liver will heal without severe deformation, since some extremely large abscesses disappeared completely after a short period of treatment. One such case in whom a huge abscess resolved completely after only 18 days of treatment, is demonstrated in Fig. 9. We have no explanation for this. Apparently distortion of the liver is not a factor that influences the function of the parenchyma. Follow-up liver function tests proved to be normal even in cases where the liver was still severely

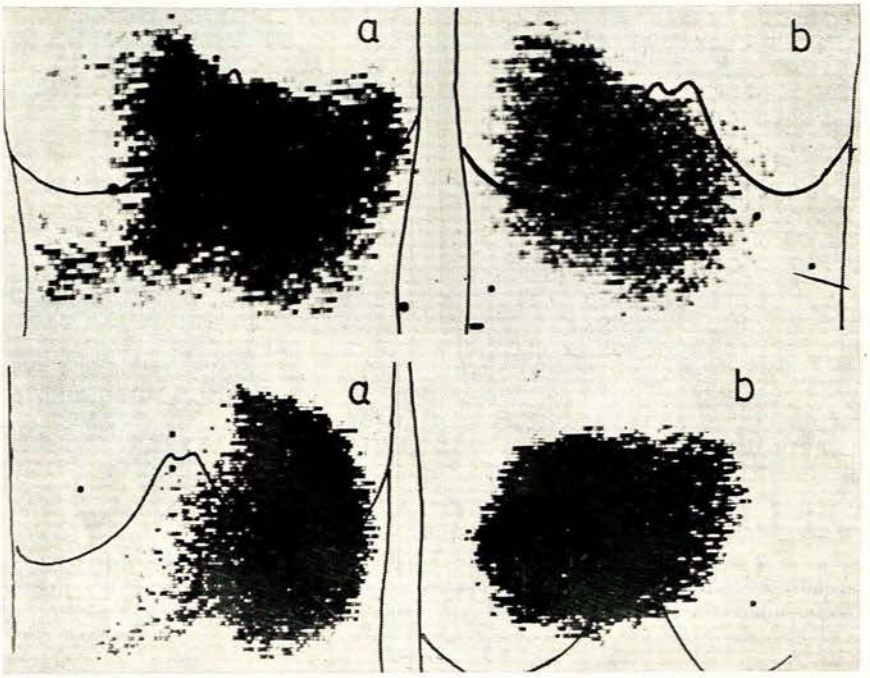


Fig. 8. Initial scans and controls several months after discharge from hospital, of 2 patients with initially large abscesses (anterior views). Top row: (a) **initial scan;** (b) **$6\frac{1}{2}$ months after discharge from hospital.** Bottom row: (a) **initial scan;** (b) **6 months after discharge from hospital.**

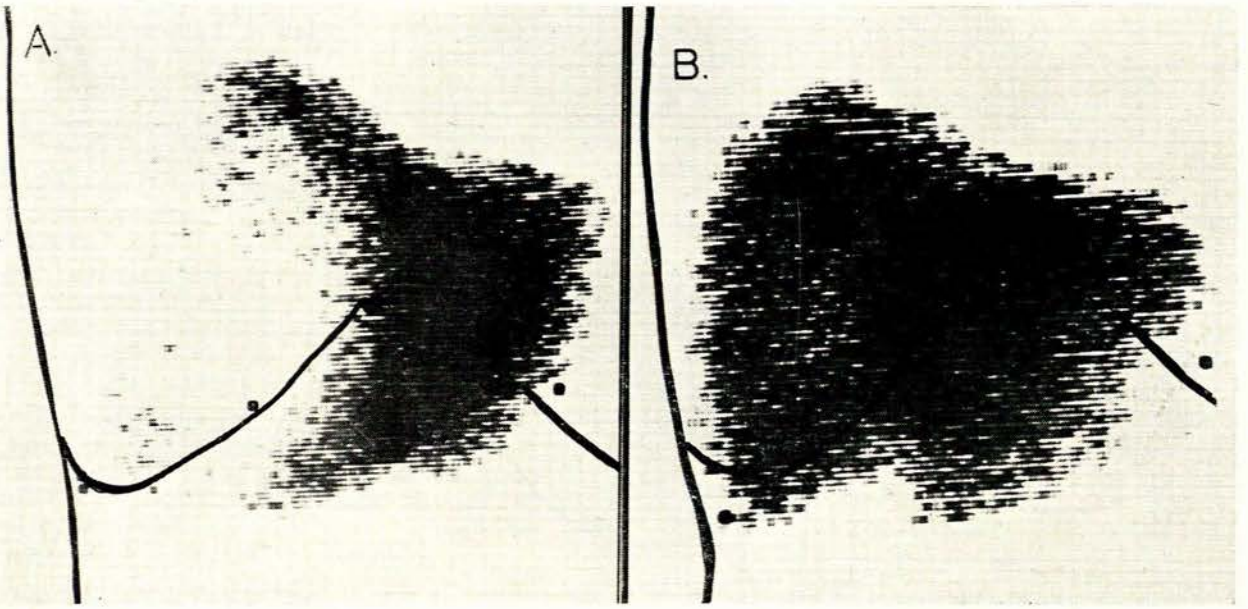


Fig. 9. Resolution of a very large abscess in 18 days of chemotherapy, without distortion of the shape of the liver.

deformed. This differs widely from other benign conditions of the liver such as schistosomiasis japonica. In the latter about 50% of patients with positive skin tests show characteristic, irreversible liver deformation. Marked atrophy of the right lobe is usually found in these cases and the liver is markedly decreased in size. Biochemical derangements are present in more than 25% of these patients.[15]

The scintigraphic appearance of the liver parenchyma adjacent to the abscess was normal in the majority of cases. However, a marked uneven uptake of radio-isotope was revealed by the initial scans of 7 patients, compared with later scans obtained after treatment. This characteristic 'mottled' appearance of the parenchyma occurs in diffuse parenchymatous disease of the liver. There are 3 factors which produce a diffuse uneven uptake of ^{131}I-rose bengal: (*i*) reduced hepatic blood flow; (*ii*) a disturbed function of the hepatic parenchyma; and (*iii*) fibrosis of the liver. Four of our 7 cases were especially interesting as they also showed significant changes of liver function. When these patients were re-examined some weeks later after treatment, the ^{131}I-rose bengal uptake by the liver had increased considerably and the scan showed an even distribution of the radio-isotope (Figs 10 and 11). Furthermore, the liver function as reflected by liver function tests was normal, or had improved greatly. Two illustrative cases are presented in Fig. 10. Scanning and biochemical findings at the time of admission and after a few weeks of treatment, are demonstrated. The levels of the transaminases on admission suggest considerable liver cell necrosis. A significant increase in SGPT, or SGOT, is not frequently found in amoebic liver disease (see below). This observation suggests that hepatic amoebiasis is not always a localised event, but may be accompanied by diffuse

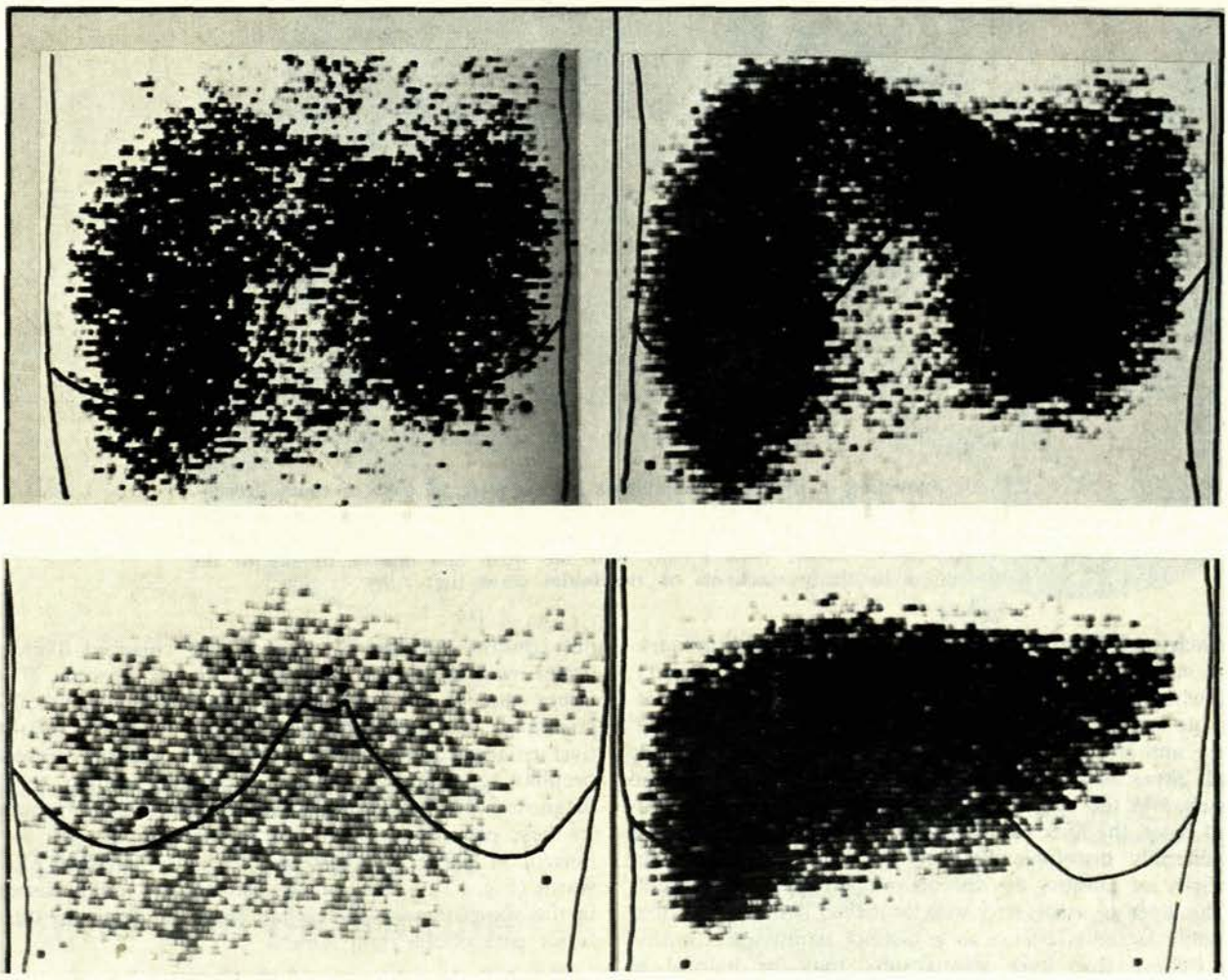


Fig. 10. Two cases of amoebic abscesses where the initial scans and biochemical findings suggested a generalised parenchymal disturbance, which normalised or improved under specific treatment. Top: **Biochemical findings on 25 March 1971 in a patient aged 25 years: SGOT-106 IU; alkaline phosphatase-72 IU; bilirubin—normal. Biochemical findings on 14 April 1971; SGOT—53 IU; alkaline phosphatase—17 IU; bilirubin—normal.** Bottom: **Biochemical findings on 5 April 1970 in a patient aged 36 years: SGPT—68 IU; SGOT-76 IU; alkaline phosphatase—42 IU; bilirubin—normal. Biochemical findings on 20 April 1970: SGPT—32 IU; SGOT—38 IU; alkaline phosphatase—25 IU; bilirubin—normal.**

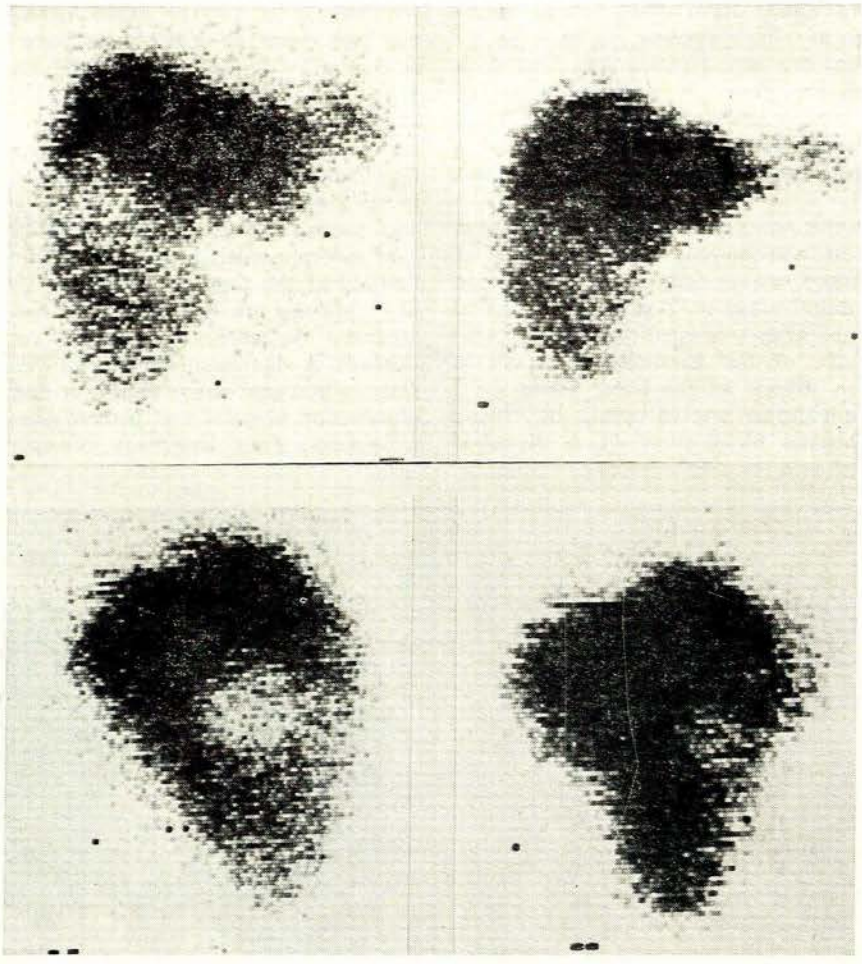


Fig. 11. Reduction of liver size in amoebic abscess after 24 days of chemotherapy. The area of the ^{131}I-rose bengal accumulating parenchyma on the anterior scans (top row) **is initially 410 cm^2** (left scan) **and later 260 cm^2** (right scan). **Lateral scans are shown in the** bottom row. **Note the weak and uneven uptake of the radio-isotope by the parenchyma on the initial scans** (left row).

parenchymal disorders. The patients who showed remarkable changes in their scans and in their biochemistry, and who improved greatly during treatment, may be comparable with the cases of Chatgidakis[16] and Doxiades *et al.*[17] These authors found, on histological examination, multiple small areas of necrosis or inflammatory infiltration and amoebae in the sinusoids. However, apart from these isolated cases, the liver parenchyma surrounding the abscesses is generally histologically normal, and consequently the majority of authors do not believe that amoebic abscess of the liver is associated with amoebic hepatitis, or that amoebic hepatitis occurs as a distinct pathological entity. We believe that liver scintigraphy may be helpful in showing up cases of amoebic hepatitis, if there is such a condition.

A tender, enlarged liver was diagnosed clinically in 87% of our patients. However, liver enlargement could be demonstrated scintigraphically in only 69% of the patients. In the majority of cases where scintigraphy did not confirm the clinical diagnosis of enlarged liver, th organ was displaced downwards by an abscess of th upper part of the right lobe. Usually the degree of en largement was moderate and in only 38 cases was th liver enlarged more than 5 fingers. Six patients showed peculiar type of enlargement, apparently similar to tha diagnosed by Lamont and Pooler on clinical grounds In these patients the liver was enlarged to the left in th horizontal plane and only very slightly enlarged down wards (Fig. 12). Four of these patients had small abscesse in the superior part, and 2 had small abscesses in the in ferior part of the right lobe.

The pathology of the enlarged, tender liver in hepati amoebiasis is not fully understood. The observations o Lamont and Pooler[1] on the mechanism of liver enlarge ment in hepatic amoebiasis favour intrahepatic congestio of neurovascular origin, rather than direct pressure on th larger venous ramifications. However, such a mechanism cannot be effective in every patient, since almost one-thir

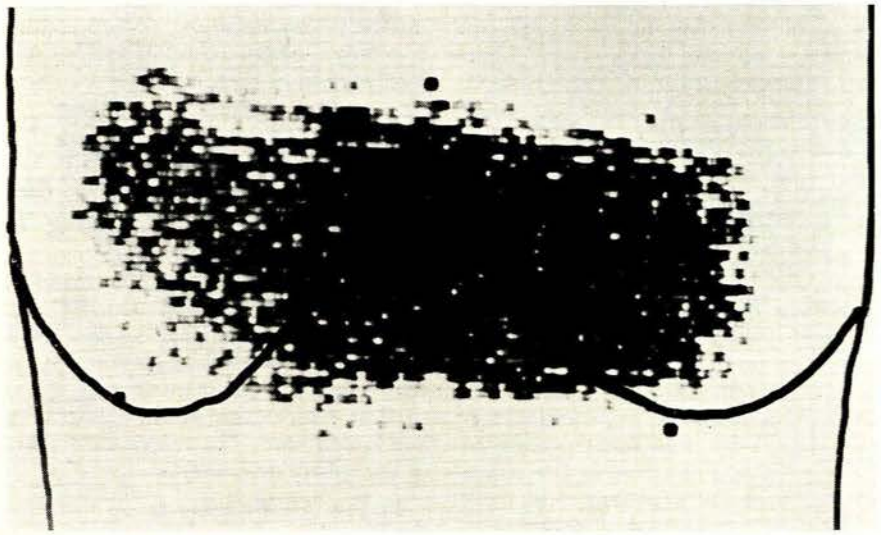


Fig. 12. Horizontal enlargement of the liver in a case of an abscess of the superior region of the right lobe expanding to the left.

f our cases showed no enlargement of the liver. Also, there ppears to be no close relationship between the size of an bscess and the degree of hepatic enlargement, since, lthough 34 of the 76 patients who did not have an en-ırged liver had small abscesses of less than 7 cm in iameter, 21 patients had abscesses of a similar size, but ıowed very significant enlargement of the liver. Thus ıe reaction of the liver parenchyma to abscesses of ap-roximately similar size differed from patient to patient. iochemistry or anatomical localisation of the abscesses id not provide an explanation for this unpredictable be-aviour of the parenchyma. Constitutional factors of the ost or factors inherent in the parasite, may be important. .s is clear from the follow-up scintigrams, liver size re-ırned to normal rapidly during adequate therapy (Fig. 11).

.iver Function Tests and Amoebic Abscesses of ıe Liver

The diagnostic value of liver function tests for hepatic bscesses is a controversial point, and it has been repeated-' emphasised that the diagnosis of amoebic abscesses is rimarily clinical.[3,18] However, laboratory examinations ıay be helpful in differentiating between amoebic abscess nd other common conditions showing similar sympto-ıatology.

Plasma proteins: The results of serum electrophoresis 'ere available for all 247 cases in this series. The non-Vhite patients showed an almost regular decrease in the lbumin/globulin ratio. Incidentally, only 18 (7,7%) had normal albumin level. Various workers pointed out that epatic amoebiasis is not necessarily responsible for this lteration, since this albumin/globulin ratio is common in on-Whites.[18] This view is reinforced by the albumin/ lobulin ratios of the 24 White patients with amoebic bscesses (Table I). According to Table I, only 4 of the latter patients showed a moderate change in the albumin/globulin ratio.

TABLE I. LEVELS OF ALBUMIN AND GAMMA GLOBULIN IN THE SERUM OF 223 NON-WHITE AND 24 WHITE PATIENTS WITH AMOEBIC ABSCESSES OF THE LIVER

	Non-White patients (223)		White patients (24)	
Albumin	No.	%	No.	%
less than 40% of total protein	**205**	**92**	**4**	**16,6**
γ-globulin				
more than 25% of total protein	**202**	**90,6**	**4**	**16,6**

Bilirubin: The bilirubin level was determined in 238 patients, and it was markedly raised (more than 1,3 mg/100 ml) in 13 patients (5,5%). Only 1 of them had a level of 11,0 mg/100 ml and presented clinically as a case of severe obstructive jaundice. ^{131}I-rose bengal excretion into the intestine was not apparent and the isotope was excreted by the kidneys. All patients with hyperbilirubinaemia also showed raised alkaline phosphatase levels, 10 having more than 70 IU. The only deviation these patients had in common was the localisation of the abscesses. In 10 of the 13 patients the abscesses were located in the porta hepatis (see above). In 6 of these patients the abscesses were smaller than 7 cm in diameter, i.e. abscesses of small size, and in 4 the diameter of the abscesses varied from 8 to 12 cm. The other patients had either multiple abscesses or a single, very large abscess more than 14 cm in diameter.

Alkaline phosphatase: Values for this enzyme were available in 235 cases, and were within the normal range in 102 patients (43%). In 119 cases (51%) it ranged from

40 to 60 IU, and in 14 cases (6%) from 60 to 111 IU. Six in this latter group had raised bilirubin levels as well. Eight of them showed uneven concentration of the radio-isotope.

Glutamate oxaloacetate transaminase (SGOT): This enzyme was determined in 155 patients; 112 had normal values (72%), 34 (22%) had moderately elevated levels (40 - 60 IU), and 9 (6%) had significantly elevated levels (65 - 170 IU). In 8 of the latter 9 patients, abscesses involved a considerable part of the liver. All 9 patients had elevated alkaline phosphatase levels, and 5 had elevated bilirubin levels. Two of these patients died. Thus, significantly elevated SGOT levels with amoebic abscesses are associated with very large or multiple abscesses involving much of the liver, and often with bilirubin retention. A distinctly uneven uptake of radio-isotope is invariably demonstrated by scintigraphy. Very significantly elevated SGOT levels were, however, seldom observed in our series. Follow-up examinations of 4 of the 9 patients with very high transaminase levels have been described above (Fig. 10). These patients presented biochemical and scintigraphic findings which fit in best with diffuse necrosis of the liver.

Glutamate pyruvate transaminase (SGPT) levels were determined in 107 patients. Generally, cases with elevated SGOT levels showed similarly high SGPT levels, the SGOT usually more elevated than the SGPT.

Though liver function tests are not of great importance in the diagnosis of hepatic amoebiasis, these tests may be useful in differentiating between amoebic abscess and primary liver cancer. In Fig. 13 the results obtained by scintigraphic and clinical examination and liver function tests in the patients of this series with hepatic amoebiasis, and 100 patients with primary liver cancer, are compared.

Bilirubin, SGOT and SGPT, and clinical signs of portal hypertension such as ascites, splenomegaly and the appearance of abdominothoracic collateral vessels, are useful in differentiating between the two conditions. In this connection only 2 of our amoebic patients developed portal hypertension, and in both instances hepatic amoebiasis was associated with a cirrhotic liver.

Scintigraphic Assessment of the Regression Rate of Amoebic Abscesses During Therapy

In one-third of the patients, scanning was used to follow regression of the lesions during treatment. However, in only 42 of these patients did the almost spherical shape of the abscesses permit calculation of the approximate volume of the lesion. The diameters of the abscesses were measured in 4 directions (at 45° to each other) on the anterior and lateral scan. The values were averaged and the volume of the sphere determined.

In Fig. 14, decrease in size of abscesses in 5 patients treated chemotherapeutically only, is shown; 3 successive scans were done. Change in volume occurs initially at an exponential rate; later the decrease in volume takes place more slowly and deviates from the exponential rate. This implies that the rate of healing of an abscess is closely related to its size, i.e. when therapy is initially instituted, healing is fastest, decreasing with time. The figure also shows the rate at which the size of the lesion decreased in cm^3/day. This phenomenon can be explained only if regeneration ensues from the periphery of the abscess only. (This is, however, not a generally accepted concept.[20]) Under these circumstances, the rate at which the size of the lesion decreases should be a function of the size of the surface of the lesion. This also implies that a spherical configuration of an abscess is the most unfavourable shape for healing, since a sphere has, by comparison with its volume, the smallest possible surface where regeneration could take place.

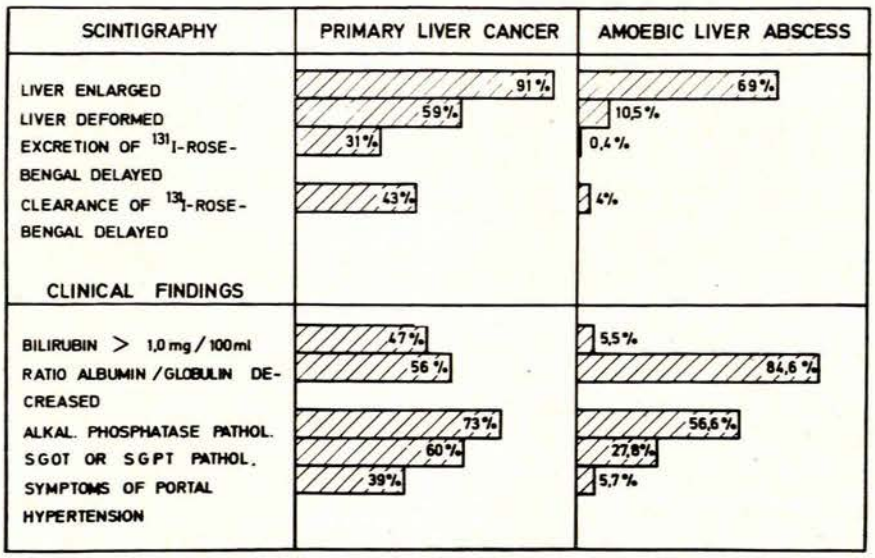


Fig. 13. Comparison of nuclear-medical and clinical findings in 100 patients with primary liver cancer and the cases of amoebic abscess of the present series.

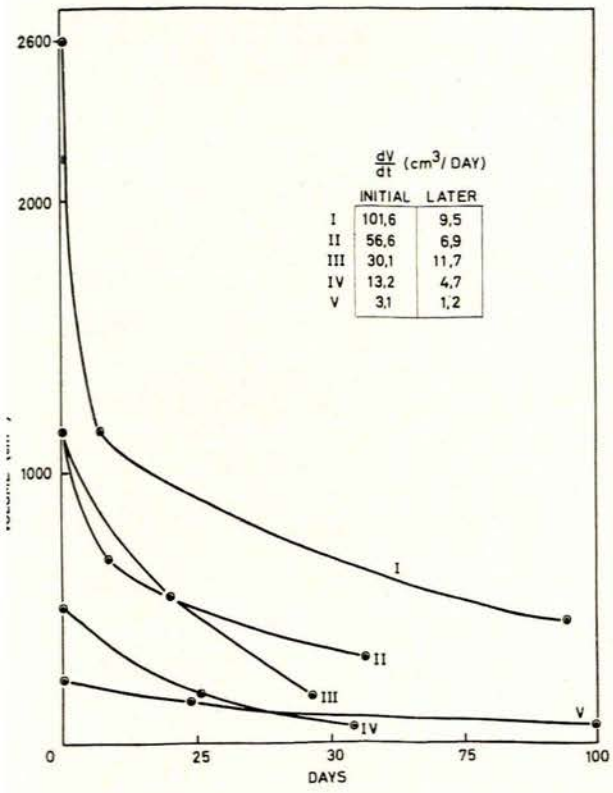


Fig. 14. Diminution of 5 amoebic abscesses of different initial volumes.

Fig. 15 demonstrates the healing rate of lesions in 39 patients who fulfilled the following requirements: (*a*) the abscesses were almost spherical; and (*b*) follow-up scans were done 18 - 22 days after the initial scan. The figure shows the correlation between the initial size of the abscess and the healing rate (expressed as volume decrease in cm^3/day) during the first 18 - 22 days of treatment. There was no significant difference between the healing rates of patients treated with the usual metronidazole-chloroquine-tetracycline regimen alone (unbroken regression line), and patients treated by open surgical drainage or needle aspiration in addition (broken regression line). In 3 cases (circled crosses or dots) resolution of the lesion was unusually slow, and this was unrelated to the considerable size of these abscesses. In the first of these patients the illness was prolonged by a persistent external fistula after drainage; in the second patient, amoebiasis was complicated by cirrhosis; and in the third patient, no explanation could be found for the slow resolution of the abscess. (The effect of cirrhosis on the genesis and healing of an abscess is, to our knowledge, uncertain.[21])

It should be interesting to study the healing rate in cases with multiple abscesses on chemotherapy. Unfortunately, only 1 of our cases with 2 abscesses, complied with the criteria required for this kind of study. In this case the healing rate was about the same for the two abscesses (6,7 and 6,0 cm^3/day) despite considerable differences in the initial volumes of the abscesses (700 and 221 cm^3). We do not wish to indulge in generalisations, but this case reminds one of Breur's observation that different metastases in the same patient may have identical growth

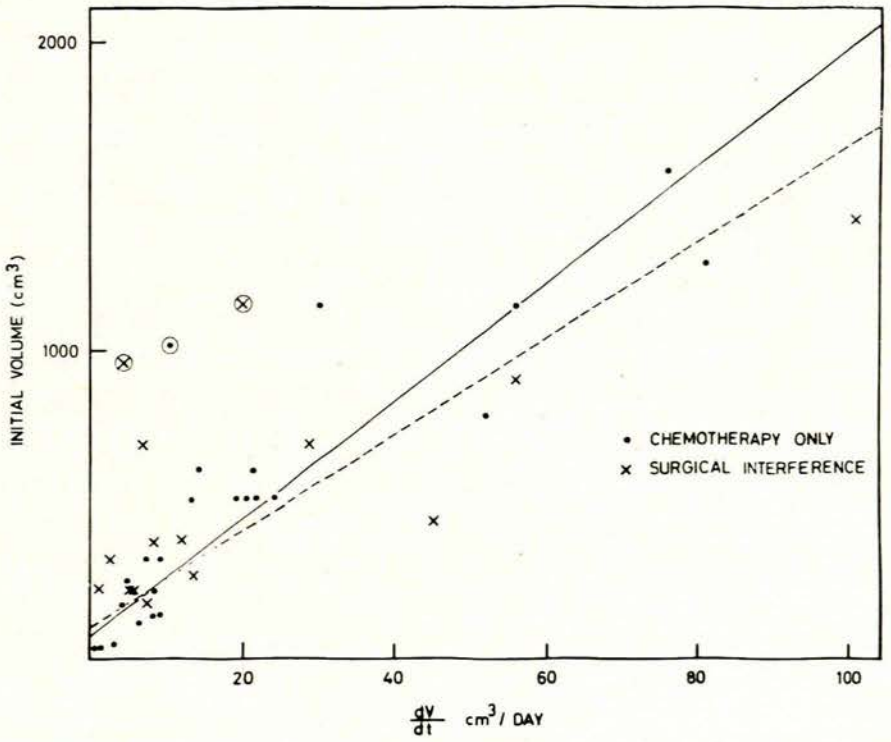


Fig. 15. Diminution of 39 abscesses in 18 - 22 days after the commencement of treatment. The dots indicate patients who were only chemotherapeutically treated (unbroken regression line). The crosses indicate cases who also had surgical treatment (broken regression line).

rates, even when they differ in size.[22] It is just possible that the healing of multiple hepatic abscesses is governed by a similar synchronising mechanism.

CONCLUSIONS

Two hundred and forty-seven cases of amoebic liver abscesses were studied from a predominantly nuclear-medical point of view. Scintigraphy is unequalled in (*i*) the detection of abscesses; (*ii*) localising abscesses and determining their relationship to adjacent structures; (*iii*) determining the dimensions of abscesses; (*iv*) detecting diffuse structural abnormalities of the liver parenchyma accompanying the focal process; and (*v*) in following the healing of an abscess and showing remnants of abscesses in the liver.

A closer association of clinical and nuclear-medical studies would be of considerable value in further research.

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