

Liver scans in cystic fibrosis

Progressive biliary cirrhosis is a common and well-described feature of cystic fibrosis (CF) (Bodian 1952; di Sant'Agnesse and Blanc, 1956). Serological liver function tests often remain within normal limits until considerable cirrhosis has occurred (di Sant'Agnesse and Blanc, 1956), though some tests are more discriminating than others (Kattwinkel *et al.*, 1973). Feigelson, Pecau, and Perez (1972) considered hepatic scintiscanning to be a useful investigation to show liver involvement in CF, and suggested that it might give prognostic information.

The present study records another assessment of liver scans in CF, and attempts to compare the value of scans with that of certain liver function tests.

Patients and methods

Subjects investigated were 16 CF patients, 9 males and 7 females, aged 7–18 years (Table I). Informed parental consent was obtained. A Shwachman score (Shwachman and Kulczycki 1958), which gives a measure of degree of illness in CF taking into account general activity, physical findings, nutritional status, and chest x-ray appearances (maximum score 100), was calculated for each child. Hepatic and splenic enlargement was recorded.

Anterior and right lateral scintiscans were produced on photographic film and on a colour dot print-out. Scanning was done with a rectilinear scanner, 30 minutes after the intravenous injection of 1 mCi ^{113m}In in colloidal form (slightly modified form of the preparation of Colombetti, Goodwin, and Hermanson, 1969). Simultaneous blood samples were taken for estimation of liver function (Table I).

Liver scans were assessed initially by A.J.B., but as the interpretation of a scan is to some extent a per-

TABLE I

Clinical data, results of liver function tests (LFT), and overall assessment of liver scans in 16 CF patients

Case no.	Age (yr)	Shwachman score (see text)	Clinical exam for hepatic/splenic enlargement	Abnormal LFT results (see below)	Liver scan	
					Opinion of observer B	Collective opinions of observers A, C, and D
1	7	51	—	Alkaline phosphatase 35 K-A units	N	2/3 N
2	7	90	—	—	A	3/3 A
3	7	88	—	—	A	2/3 A
4	8	52	—	—	A	3/3 A
5	8	90	—	—	A	3/3 A
6	9	79	Firm palpable liver	Alkaline phosphatase 38 K-A units	A	2/3 A
7	9	80	—	—	A	2/3 A
8	9	83	Firm palpable liver	—	A	3/3 A
9	10	74	—	—	A	2/3 A
10	11	86	—	—	A	2/3 A
11	12	72	—	—	N	2/3 N
12	12	79	—	—	A (i.e. 2N, 2A)	2/3 N
13	13	67	Firm palpable liver & spleen	Alkaline phosphatase 54 K-A units; prothrombin index 19/145; platelets 129 000/mm ³	A: splenic up- take > 40%	3/3 A (spleno- megaly)
14	13	45	—	—	A	2/3 A
15	13	73	—	—	A	3/3 A
16	18	49	Firm palpable liver	SGPT 51 IU	A	2/3 A

Liver function tests performed (normal values in parentheses): serum total proteins and albumin (6–8 g/dl; 3–5.5 g/dl), SGOT and SGPT (<50IU), serum alkaline phosphatase (<30K-A units), prothrombin index (<4 s difference between actual and control values), Hb (>10 g/dl), total white cell count (>5000/mm³), and platelet count (>150 000/mm³).

—, no abnormality found.

N, normal; A, abnormal.

sonal opinion, each scan was coded and examined by 4 independent observers (2 radiotherapists, 1 radiologist, 1 consultant in nuclear medicine) who recorded liver size, distribution of radioactivity, and overall assessment. The only information given was the chronological age of the patient and his 50th centile age-for-weight.

Results

In the opinion of A. J. B. (radiotherapist, observer 'B') scintiscan appearances were normal in only 2 of the CF children (Cases 1 and 11, Table I), which agreed with the majority view of the other 3 observers (Table I), though the same observers did not agree with A. J. B. on each case. No conclusion was reached for Case 12, 2 observers considering her scan to be normal, and 2 abnormal. 9 of the 13 CF subjects judged to have abnormal scans had no convincing evidence of liver function disturbance on the basis of clinical examination or serological tests (Table I).

Taking a mean value for the 4 opinions on each scan (Table II), 86% of patients were thought to have liver either normal or small in size, 72% of scans showed patchy distribution of radioactivity, and in the final assessment 78% of scans were considered to be abnormal. No correlation was noted between the degree of abnormality as shown by the scans, and the ages of the patients, or their Schwachman scores.

Discussion

There was considerable individual variation in the interpretation of these scans. Nevertheless, the consensus of opinion indicated two points: (1) that the majority of scans were abnormal, and (2) that the majority of patients with abnormal scans had no hepatic abnormality as assessed by clinical examination or serological tests. The abnormalities were a change in liver size and irregularity of

isotope distribution. Colloidal indium injected intravenously into the healthy subject is taken up primarily by the reticuloendothelial cells of the liver; some lodges also in similar cells in the spleen and bone marrow (Colombetti *et al.*, 1969). Distortion of hepatic architecture by fibrosis leads to impairment of hepatic uptake, and with progression of liver disease with portal hypertension and splenic enlargement, there is an increased uptake by the spleen and bone marrow.

The high percentage of abnormal scans confirmed the findings of Feigelson *et al.* (1972), who reported 22 abnormal scans among 25 patients. A difference did occur in the assessment of liver size, which was thought to be normal or small in most of the patients in this study, and large in most of those examined by Feigelson *et al.* (1972). Bodian (1952), in an account of post-mortem findings in CF, reported that the weight of the liver 'if increased was only slightly or moderately so'.

Serological abnormalities were infrequent, suggesting that scintiscans can detect an abnormality at a stage when hepatic cell function is still apparently undisturbed. This supports the findings of Liewendahl and Schauman (1972), who evaluated statistically liver scanning in combination with liver function tests performed on adult patients with a variety of diseases including biliary cirrhosis. They concluded that scanning was superior to liver function tests both in localized and in diffuse disease.

Observing error in reporting liver scans for space-occupying lesions has been documented by Ludbrook, Slavotinek, and Ronai (1972). Since the recognition of diffuse disease on a liver scan is a more difficult matter (Liewendahl and Schauman, 1972), perhaps it is not surprising that there was some variation in interpretation.

The widespread nature of liver disease in CF

TABLE II
Analysis of 16 CF liver scans : independent assessment of coded scans by 4 observers

Observer	Liver size			Distribution of radioactivity		Overall assessment	
	Normal	Small	Enlarged	Uniform	Patchy	Normal	Abnormal
A	7	5	4	1	15	0	16
B	7	8	1	3	13	2	14
C	11	5	0	6	10	6	10
D	9	3	4	8	8	6	10
Collective opinion (% of total opinions)	53	33	14	28	72	22	78

was emphasized by Bodian (1952). Necropsy examination of the liver in 46 patients, ranging in age from 2 days to 7 years, showed biliary ductule hyperplasia or focal biliary fibrosis or both, in 35 patients, 8 of whom were 2 weeks old or younger. Consequently, it seems probable that liver scans show a situation which is present in most CF patients.

We agree with Feigelson *et al.* (1972) that scintiscanning is an easy means of showing liver involvement, and the very small dose of radioactive material and short half-life of 99.5 minutes suggest that long-term complications from the radioisotope would be unlikely to occur. However, in our study scans did not show liver disease of an unsuspected severity, and they did not enable us to offer any modification of treatment. Since we did not find a correlation between scan appearances and the ages of the patients or their Shwachman scores, we do not think that the procedure would contribute substantially to assessment of prognosis in CF.

Summary

Liver scans were performed on 16 cystic fibrosis patients. Most scans were considered abnormal. In most patients, the results of serological liver function tests were normal. Liver scanning in cystic fibrosis is unlikely to make a significant contribution to an assessment of prognosis.

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Cholelithiasis in a neonate

It is well known that gallstones can occur in neonates and infants with haemolytic disease or congenital abnormality of the biliary tree; but their occurrence in an otherwise normal neonate has not previously been recorded in published reports in English. The lack of precedence leads to problems of diagnosis and treatment and these will be discussed.

Case report

A Caucasian male, weighing 3.15 kg, was born at Nottingham Women's Hospital on 23 November 1973 to a 25-year-old para 1 mother. Labour was induced by membrane rupture, after 42 weeks' otherwise normal gestation, and delivery occurred uneventfully 1½ hours later.

The day after delivery the child began to vomit all feeds and was noticed to be slightly dehydrated. No organic cause was detected and he was kept under observation. The vomiting persisted, however, and the child was transferred to the Neonatal Medical and Surgical Unit, City Hospital, Nottingham. 4 days after birth the vomiting had become projectile in nature and did not contain bile. Abdominal examination at that time showed a mobile mass under the right costal margin about 1.5 cm in diameter. It was apparently separate from the liver and was lying anteriorly. X-rays at this time showed no significant abnormality. Blood cultures were sterile and there was no evidence of meningitis. Since the child continued to vomit it was decided to perform a laparotomy with a tentative diagnosis of congenital extrinsic duodenal obstruction.

At operation at the age of 6 days the only abnormality found was a very small inflamed gallbladder with a minute inferior perforation leaking yellow bile. During gentle examination of the perforation three small black concretions were extruded. A diagnosis of inspissated bile cholelithiasis was made and a cholecystostomy was performed. An operative cholangiogram was attempted but was unsuccessful because of leakage from the site of the perforation. The perforation was closed with two interrupted sutures and a fine tube was left sutured into the cholecystostomy.

Postoperatively the child was managed by intravenous infusion and nasogastric drainage, together with gentamicin and cloxacillin. Initially the cholecystostomy