GAMMA CAMERA IMAGING OF HEPATOBILIARY SYSTEM USING $99m_{Tc}$ DIETHYLE-ACETANILIDO IMINODIACETATE (DIETHYLE IDA)

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Abstract

$99m_{Tc}$-diethyle-IDA was used for serial imaging of the hepatobiliary system using gamma camera. Limited number of patients suspected of disorders of hepatobiliary system were investigated. Diagnoses were confirmed by operation and correctly predicted preoperatively.

Introduction

The advantages of radionuclide investigations are their noninvasiveness and their ability to give both functional as well as morphological information. A number of radiopharmaceuticals have been proposed in the past to study the hepatobiliary system, but none have been developed into clinically useful reagent. In 1976 Loberg et al. (1976) made comparative studies on a number of compounds based on N-substitution of aminodiacetic acid and reported the radiochemical and biological characteristics. The present study is the use of this agent in patients. All patients were admitted into surgical wards (5 patients were under the care of R.G. and one under the care of SJR). Except one, all the patients were operated upon, one had two studies and was operated twice.

Material and Methods

Diethyle IDA was used for this study. It is sterile, pyrogen free lypholized, stabilised and is commercially available in the form of a kit. In all the patients, a dose of 4mci $99m_{Tc}$ was administered intravenously and sequential polaroid images were obtained at one, two, five, ten, fifteen, twenty, thirty, fortyfive minutes and at one hour intervals. Gamma camera (Toshiba) with a large crystal was used. The clinical features of the patients are given in Table I.

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Table I: Clinical Features of Patients

No.	*Patients*	*Age*	*Sex*	*Clinical Features*
1.	R.D.K.	35	M	Fever, acute pain in the right hypochondrium; tenderness and guarding in the right hypochondrium.
2.	A.K.	45	F	Pain right hypochondrium and R. shoulder, Diabetic; not jaundiced; liver not enlarged.
3.	A.K.	45	F	Developed jaundice two months after operation; liver enlarged, uniform.
4.	G.R.	50	F	Pain R. hypochondrium; Jaundiced, liver enlarged
5.	Z	45	F	Fever, pain R. hypochondrium; Jaundiced, liver enlarged, rounded mass palpable in the right hypochondrium.
6.	L	50	F	Pain R. hypochondrium, pruritis, Jaundiced, liver enlarged.
7.	G.A.	17	F	Recurrent pain R. hypochondrium; tenderness and guarding right hypochondrium; not jaundiced.

Results

The size shape and distribution of radioactivity in the liver of patient number I was normal. Gall bladder and bile passages were delineated and the reagent was excreted into the intestine (Fig. I). This patient did not come to operation and the cause of his pain in the right hypochondrium turned out to be extrahepatobiliary stystem (pleuritis.) The results of the radionuclide studies and the operative findings in the rest of the patients are given in table II.

Discussion

Diethyle IDA has been shown to be superior to all the commercially available hepatobiliary agents (Ronai, 1977; Wistow et al., 1977). There have been no reported side effects and there are no contraindications. In the present study

Table II: Results of Radionuclide Studies and Operative Findings in Rest of the Patients

No.	*Patient*	*Hepatobiliary Radiotracer Study*	*Operative Findings*
1.	R.D.K.	Normal appearance (Fig. I)	Was not operated.
2.	A.K.	No concentration in gallbladder area. Bile ducts delineated and tracer excreted into intestine.	Gallbladder full of stones.
3.	A.K.	No concentration in gallbladder, no excretion into intestine.	Bileduct was thickened and fibrosed. Head of the pancrease was hard and enlarged.
4.	G.R.	No concentration in gallbladder, Bile ducts delineated and tracer excreted into intestine.	Gallbladder full of stones.
5.	Z	Liver enlarged, no concentration in gallbladder area. No excretion into intestine.	Gallbladder full of stones.
6.	L	Liver enlarged, no concentration in gallbladder, no excretion into intestine.	Big solitary stone in common bile duct. Duct distended.
7.	G.A.	No concentration in gallbladder. Bile ducts delineated and tracer excreted into intestine.	Gallbladder full of stones.

there were no side effects. The advantages of radiotracer techniques are its noninvasiness and their ability to give information on structure as well as on function. The procedure may be used in jaundiced patients in whom radiological contrast methods cannot be used.

In $99m_{Tc}$ diethyle IDA study, three phases can be recognised and diagnostically evaluated. The first phase shows the distribution of the radiotracer in the large vessels. The second phase shows accumulation in the liver and the third phase shows the dynamics of the bile excretion (Fig. 1).

Most important in the diagnosis of diseases of the biliary tract are direct or indirect radiological methods, oral cholecystogram (OCG), intravenous contras cholangiogram (IVCC), percutaneous transhepatic cholangiogram (PTC) and endoscopic retrograde cholangiopancreatography (ERCP). These procedures have recently been supplemented by ultrasound and computor assisted tomography (CAT). OCG is noninvassive procedure and is effective in diagnosing cholelithiases, but IVCC is associated with a significant incidence of severe reactions: severe reactions requiring treatment in one in 700 examinations, a life threatening reaction one in 1600 examinations and death one in 5000 examinations (Ansell 1970). It is here that radioisotopec tracer using diethyle IDA will prove useful. In the present limited study it has proved useful and its future role overhere will be established when this agent becomes available on a regular basis. Preoperative prediction was made in all the patients (Fig 2 and 3). Intravenous radioisotope cholangiogram (IVRC) has also been reported to be most useful in evaluating the patency of surgically devised drainage pathway of the biliary system after liver transplantation and after the Kasai procedure for biliary atrasia (Ronai 1977).

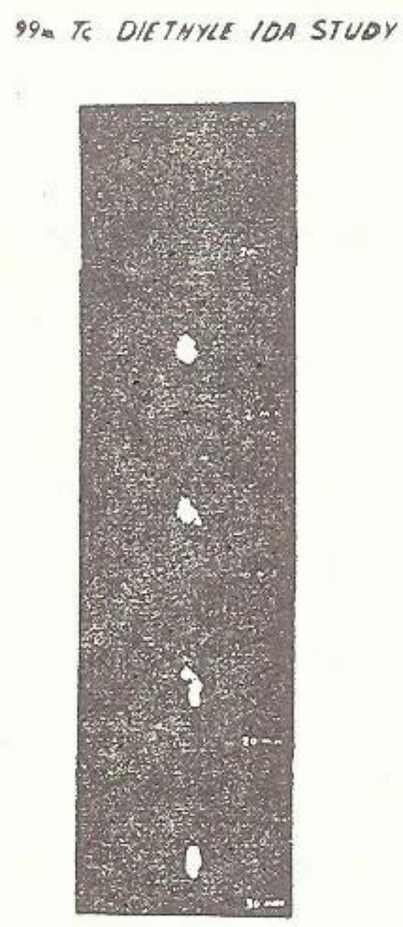

Fig. 1. Normal Hepatobiliary system showing three phases.

Fig. 2. Hepatobiliary study showing gallbladder dysfunction.

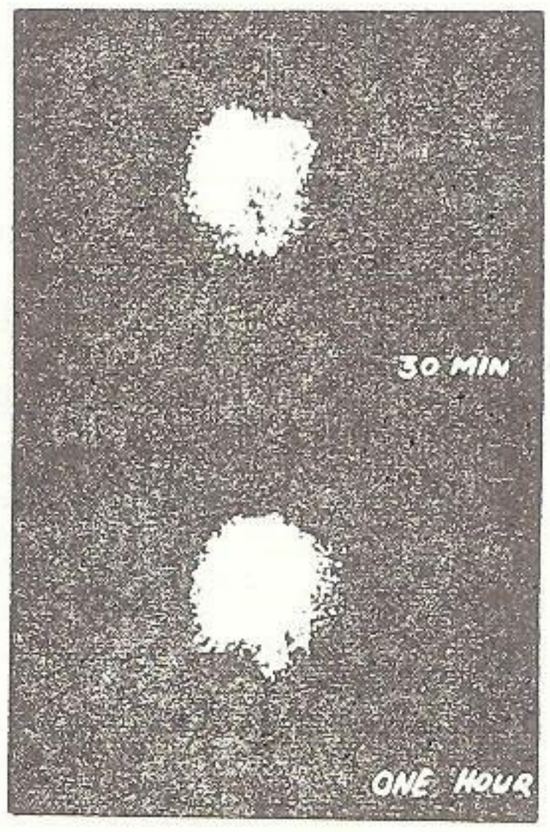

Fig. 3. Hepatobiliary study showing obstruction of the common bile duct.

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References

Ansell, G. (1970) Adverse reaction to contrast agents. Scope of problem. Invest. Radiol., 5:374.

Loberg, M.D., Cooper, M., Harvey, E. et al. (1976) Devement of new radiopharmaceuticals based on N-substitution of iminodiacetic acid. J. Nucl. Med., 17:633.

Ronai, P.M. (1977) Hepatobiliary radiopharmaceuticals; defining their clinical role will be a galling experience (editorial). J. Nucl. Med., 18:488.

Wistow, B.W., Subramanian, G., Heertum, R.L., Henderson, R.W., Gagne, G.M., Hall, R.C. and McAfee, J.G. (1977) An evaluation of ^{99m}Tc-labeled hepatobiliary agents. J. Nucl. Med., 18:455.