

# GALLBLADDER VISUALIZATION IN ADRENAL SCANNING: CASE REPORT

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***A patient suspected of having adrenal hyperfunction was scanned with <sup>131</sup>I-iodocholesterol. Intense gallbladder activity persisted for several days and was eliminated by a fatty meal. The possibility of confusion with unilateral adrenal localization is discussed.***

may be found in adrenal adenoma or in the contralateral adrenal after surgical excision of the tumor. We have recently studied a patient with intense localization of <sup>131</sup>I-19-iodocholesterol in the gallbladder, which may cause confusion in the interpretation of these scans.

### CASE HISTORY

The technique of scintillation scanning of the adrenal glands using <sup>131</sup>I-19-iodocholesterol has been well established (1-6). Tissue distribution studies in dogs show substantial uptake of this tracer in both liver and kidneys (7). However, the adrenal-to-liver and adrenal-to-kidney activity ratios at 48 hr may be 25:1 and may exceed 100:1 at 3-6 days after administration. Because of these high ratios, successful scans of the adrenals can be obtained. In patients without manifest disease, both adrenals are usually visualized by scanning (2). Unilateral localization

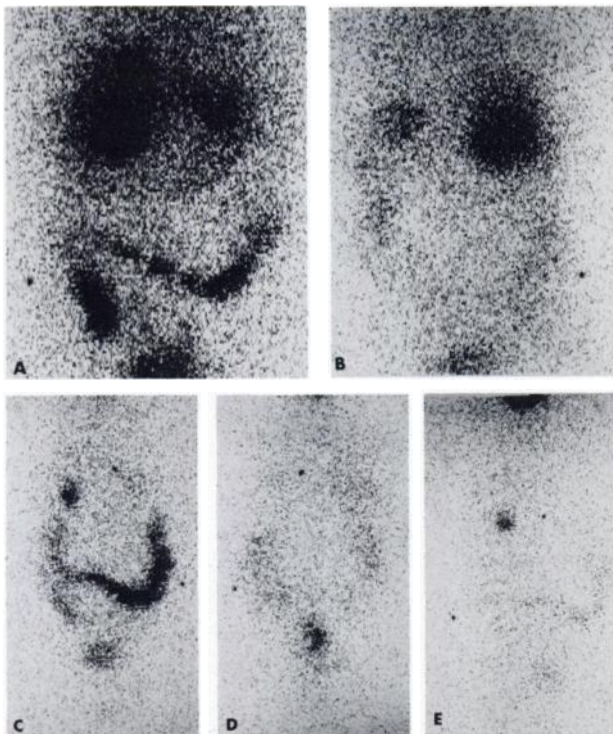
A 47-year-old white female nurse with obesity since adolescence, irregular menstrual periods, and some facial and upper chest hirsutism was admitted for endocrinologic evaluation. One month prior to admission a cholecystogram had revealed a normal gallbladder.

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**TABLE 1. RESULTS OF ADRENAL STIMULATION AND SUPPRESSION**

Results* (normal values)	Day									
	1	2	3	4	5	6	7	8	9	10
Creatinine (1,000-1,500 mg/24 hr)	1,630	1,295	1,283	1,248	1,069	1,318	1,165	949	1,453	1,432
17-Ketogenic steroids (7-22 mg/24 hr)	16.3	14.9	36.7	17.7	6.1	3.3	3.8	4.2	4.6	13.0
17-Ketosteroids (4-14 mg/24 hr)	4.5	4.6	7.5	—	2.5	2.3	2.1	—	—	4.0
Pregnanetriol (0.2-1.8 mg/24 hr)	0.7	0.5	1.5	1.9	0.3	—	0.3	—	—	1.0
Pregnanediol (0-8 mg/24 hr)	1.1	1.2	3.0	—	0.5	—	0.3	—	—	1.0
Plasma cortisol (8 am: 12-24 µg%) (3 pm: 8-14 µg%)	8.2	16.5 12.0	10.8			2.9		2.4		
Plasma testosterone (8 am: 0.5-1.0 ng/ml)		1.0				0.5				

\* Treatment consisted in administration of 2 gm methopyrapone at 12:01 am (Day 3), followed by 0.5 mg dexamethasone every 6 hr (Days 4 and 5), and 2.0 mg dexamethasone every 6 hr (Days 6 and 7).



**FIG. 1.** (A) Anterior rectilinear scan 24 hr after injection of iodocholesterol shows tracer in liver, gallbladder, bowel, and urinary bladder. (B) Posterior scan at 24 hr shows no localization in expected position of adrenals. (C) Anterior scan on Day 3 shows gallbladder, bowel, and urinary bladder activity. (D) Posterior scan on Day 3. (E) Anterior scan on Day 5 shows gallbladder activity. Markers at right iliac crest and xiphoid.

On examination, the patient was pleasant, obese, and had no significant physical abnormalities. Routine laboratory studies were normal. There was slight asymmetry of the floor of the sella turcica, but the volume of the sella was normal. Methopyrapone stimulation and high- and low-dose dexamethasone suppression showed normal adrenal responsiveness and ruled out adrenal hyperfunction (Table 1).

On the tenth day, the patient received 1.0 mCi of  $^{131}\text{I}$ -iodocholesterol (Nuclear Pharmacy, University of Michigan Hospital, Ann Arbor) intravenously. She was scanned daily during the next 6 days, using a dual 2-in rectilinear scanner. Anterior scans clearly exhibit discrete localization of activity in the right upper quadrant, which persisted throughout the first 5 days (Fig. 1). This localization was thought to represent gallbladder activity. This impression was confirmed when the activity completely disappeared after a fatty meal (Fig. 2). The adrenal glands were never visualized.

#### DISCUSSION

Iodine-131-iodocholesterol scanning has proved highly valuable in the diagnosis of hyperplasia and adenoma of the adrenal glands. These scans provide

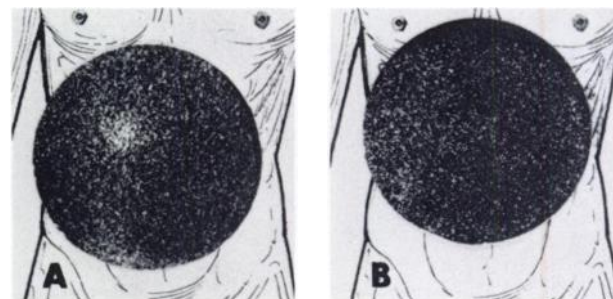
reliable information about adrenal function and location, and they may supplant far more invasive diagnostic procedures. This case presents several features of adrenal scanning of which the physician should be aware.

Biliary excretion is virtually the only mode of cholesterol elimination. Bile normally contains 2–7% cholesterol, 60–90% bile acids (mainly cholic acid), and 8–35% phospholipids (8). Cholesterol secretion is 1–2 gm/day and bile acids 5–10 gm/day (9,10). Therefore,  $^{131}\text{I}$ -19-iodocholesterol should concentrate in a normally functioning gallbladder. Blair, et al (7) recorded concentrations of  $^{125}\text{I}$ -cholesterol in dog bile: bile-to-adrenal-cortex ratios were near unity at the first day but fell to 0.5–0.02 over a period of 2–8 days. In the patient presented here, bile stasis may explain the persistence of radioactivity.

Liver, gallbladder, stomach, bowel, and urinary bladder activity was intense in the 24-hr scans (Fig. 1A, B). The last probably represents *in vivo* deiodination of the radiopharmaceutical in the liver, stomach, and bowel. This iodine moiety may easily be reabsorbed intact through the enterohepatic circulation in which much of the excreted cholesterol is reabsorbed from the gut (11). By the third day, gallbladder, bowel, and urinary bladder were prominent scan features (Fig. 1C, D). By the fifth day a small amount of activity remained in the gallbladder and urinary bladder (Fig. 1E).

Through personal communication with Dr. Beierwaltes it was learned that his group had studied a similar case in which a fatty meal also resulted in marked reduction of gallbladder activity. A fatty meal is a standard technique for stimulating gallbladder contraction. In fact, Englert, et al (12,13) have used this as a means of measuring gallbladder secretory activity after the administration of radioactive cholecystotropic agents.

The failure of  $^{131}\text{I}$ -iodocholesterol to localize in the adrenals of our patient was thought to be due to sufficient residual suppression to inhibit tracer up-



**FIG. 2.** (A) Anterior scintigram on Day 6 shows gallbladder activity. (B) Same area 3 hr later after fatty meal.

take. Scanning need not be delayed, however, since a hyperfunctioning adrenal adenoma would not be suppressible.

## ACKNOWLEDGMENTS

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