Value of Bowel Preparation in Adrenocortical Scintigraphy with NP-59

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The use of radiolabeled cholesterol derivatives for functional imaging of the adrenal cortex may be rendered inaccurate or impossible because of the excretion of activity by the liver and its subsequent appearance in the colon. A simple bowel preparation (bisacodyl 5 or 10 mg nightly) significantly reduced bowel background activity during 6β-[I-131]iodomethyl-19-norcholesterol (NP-59) adrenal cortical scintigraphy. Activity interfering with image interpretability was present less frequently in patients taking bisacodyl: three days after injection 22% compared with 59%; five days after injection 23% compared with 35%. As bisacodyl acts only on the colon and does not disturb the enterohepatic circulation of cholesterol or bile acids, it is ideal for use with a tracer of cholesterol metabolism.

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The radiolabeled cholesterol derivatives have been used for over a decade in the functional and structural characterization of adrenal cortical disease (*1*,*2*). Adrenal uptake of the radiopharmaceutical is not usually greater than 1.0%, even in the face of the most active disease (*1*,*2*). The remaining activity is mainly excreted in the urine or accumulated by the liver and probably excreted via the bile into the gastrointestinal tract (*3*,*4*). Activity within the colon may overlap the suprarenal areas and can pose significant difficulty in the interpretation of adrenal cortical scintigrams (*1*,*2*). Although pretreatment with laxatives for adrenal imaging has been reported (*5*), no comparative study of the image quality has been performed with and without bowel preparation.

MATERIALS AND METHODS

One hundred and three adrenal scintigrams obtained 3 to 7 days after intravenous administration of 1–2 mCi NP-59 (6β-[I-131]iodomethylnorcholesterol) by a previously reported method (*1*), were interpreted blindly by three observers with extensive experience in adrenal scintigraphy (MN, MG, JF) and scored for bowel activity in a semiquantitative fashion similar to that used for gallium imaging (*6*) (see Table 1). The adverse effect on imaging interpretability was also noted. The 103 adrenal scintigrams were divided into 58 without bowel preparation and 45 treated with bisacodyl 5–10 mg nightly from the time of NP-59 administration through the period of imaging (5–7 days). Dexamethasone suppression (1 mg every 6 hr for 7 days preceding and throughout the imaging interval) was given in the case of 28 images with bowel preparation and 35 images without bowel preparation. The final biochemical and pathological diagnosis was confirmed in all cases.

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RESULTS AND DISCUSSION

The bowel preparation caused no adverse reactions other than the anticipated increased frequency of defecation. Table 2 summarizes the results. A significant decrease in colonic radioactivity was observed in the bowel-preparation group. An improvement in interpretability in both baseline and dexamethasone suppression scans was observed. As no significant differences were present between patients treated with and without dexamethasone, these data were pooled. Figure 1 illustrates the effect of bowel preparation on adrenal imaging.

The source and nature of colonic activity in adrenal imaging

TABLE 1. GRADING OF NP-59 ACTIVITY IN GUT

Grade	Description
0	No gut activity seen
1	Minimal gut activity, less intense than the liver
2	Mild gut activity, as intense as the liver
3	Moderate gut activity, exceeds that in the liver
4	Gut activity exceeds that in all other regions

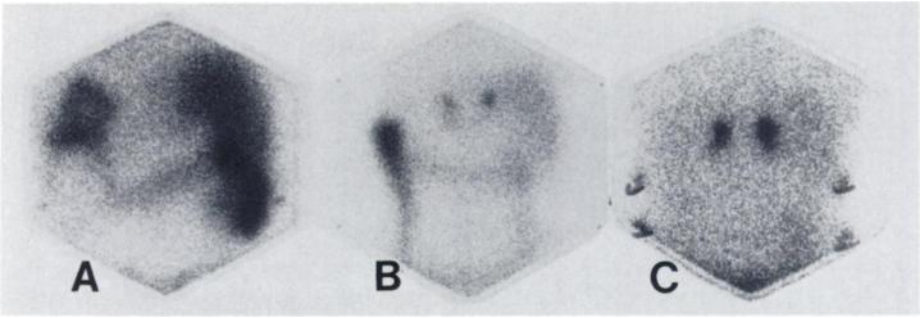

FIG. 1. Examples of posterior NP-59 scintigrams. (a) Image obtained three days after NP-59 administration in patient without bowel preparation; all three observers felt bowel activity interfered with evaluation of adrenal glands. (b) Image obtained three days after NP-59 administration in patient without bowel preparation. Cushing's disease study without dexamethasone. (c) Image obtained three days after NP-59 administration in patient with bowel preparation. Cushing's disease without dexamethasone administration.

TABLE 2. INDICES OF BOWEL ACTIVITY [MEAN ± s.e.(n)] AND IMAGING INTERPRETABILITY

Day of study	Bowel preparation A	B	No bowel preparation A	B
Day 3	1.11 ± 0.28 (9)*	2	2.09 ± 0.27 (17)	10
Day 4	0.66 (3)	0	2.33 ± 0.38 (12)	6
Day 5	0.55 ± 0.18 (26)*	6	2.06 ± 0.35 (17)	6
Day 6	—	—	3.33 (1)	1
Day 7	0.33 ± 0.24 (7)	1	0.72 ± 0.31 (11)	1
Overall	0.62 ± 0.13 (45)	9	1.99 ± 0.17 (58)	24

* = Student's t-test for unpaired variables $p < 0.05$.

A = Mean index of bowel background activity = $\frac{\text{sum of activity scores}}{\text{number of observations}}$.

B = Number of cases in which gut activity was considered by one or more observers to have interfered with interpretation of the adrenal scan.

with radioiodinated cholesterols is probably the secretion of activity with the bile (*1*,*2*,*7*). If an enterohepatic circulation of unaltered radiolabeled cholesterol derivatives occurs early, severe bowel preparation may be detrimental for adrenal visualization. However, the major absorption site of cholesterol recirculation is the jejunum (*8*) and bisacodyl acts entirely upon the colon. (*9*). This suggests that the bowel preparation would have little effect on the enterohepatic circulation, and the adrenals were well visualized despite it. The difference in the effect of bowel preparation observed between gallium and NP-59 imaging is probably due to the difference in sources of colonic activity, the bowel mucosa in the case of gallium (*10*) and probably the bile with NP-59.

In the past, the problem of background activity has been dealt with by means of serial imaging, in the case of 6β-[Se-75]selenomethylnorcholesterol, waiting as long as 14 days (*2*). With dexamethasone-suppressed NP-59 scintigraphy, where timing of adrenal visualization is critical in interpretation (*1*,*11*), oblique and lateral images have been partly successful in distinguishing bowel from adrenal activity.

The counts derived from the bowel activity may contribute a major fraction of the overall counts in the image, and bowel preparation increases the information density in the adrenal region as well as having the more direct effect of removing overlying bowel activity (see Fig. 1).

One of the major limitations of adrenal cortical imaging is the relatively high radiation dose to the target organ and the whole body (*12*). A further benefit arising from bowel preparation is a decrease in unnecessary radiation exposure to the colonic mucosa and the whole body.

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