Localization of m-Iodo(^{131}I)benzylguanidine in Neuroblastoma

R. S. Hattner,[1] J. P. Huberty,[1] B. L. Engelstad,[1] C. A. Gooding,[2] and A. R. Ablin[3]

Patient survival and the therapeutic strategy for treatment of neuroblastoma are highly dependent on the stage of the tumor at presentation. For routine staging, the Children's Cancer Study Group currently recommends a chest radiograph, abdominal CT scan, radionuclide bone scan, bone marrow biopsy, catecholamine metabolite estimations, and surgical determination of tumor extent [1, 2]. Preliminary experience with intensive chemotherapy combined with whole-body irradiation, followed by autologous or heterologous bone marrow transplantation, suggest that even stage 4 disease survival can be improved from 10% to about 50% [3]. Thus, accurate staging of neuroblastoma and detection of recurrence or persistence of disease is very important. A noninvasive method for detection of neuroblastoma that avoids surgery and bone marrow biopsy would be a most welcome addition to the armamentarium of the pediatric oncologist. We report a case of neuroblastoma demonstrated with m-iodo(^{131}I)benzylguanidine (MIBG) scintigraphy.

Case Report

A 2-year-old boy was found to have an abdominal tumor and anemia. A chest film was normal. Excretory urography and computed tomography revealed a large retrohepatic mass displacing the right kidney inferiorly, invading the right kidney and liver, and encasing the aorta and vena cava (figs. 1A and 1B). Urinal vanillylmandelic acid levels were undetectable. Bone marrow biopsy demonstrated classic features of neuroblastoma (small cell neoplasm with Beckwith-Wright rosette formation and neurofibrillary elements). After informed consent of parents was obtained, an ^{131}I-MIBG study (fig. 1C) was performed. At 48 hr after the administration of 200 μCi (7 MBq) of MIBG and 1 mCi (37 MBq) of ^{99m}Tc sulfur colloid, images were obtained in registration, taking advantage of the photopeak differences of ^{99m}Tc (140 keV) and ^{131}I (364 keV), using a high-energy collimator and a 40-cm field of view scintillation camera (Siemens Gammasonics 7500 ZLC). These images demonstrated marked concentration of ^{13}I-MIBG in the right abdominal mass. The tumor was considered unresectable and debulking dangerous because of the patient's general medical status and proximity of the neoplasm to major vessels. At present, the patient is satisfactorily responding to chemotherapy including cisplatin, Adriamycin, and epipodophyllotoxin.

Discussion

MIGB was first described for localization of adrenergic receptors in the adrenal medulla and has subsequently been found to be extremely useful for the detection of pheochromocytomas [4–7]. Since subcellular fractionation studies of canine adrenal medulla have shown that MIBG is associated with the cytoplasmic fraction that contains neurosecretory granules [4], it seemed reasonable that MIGB imaging of neoplasms of neuroectodermal derivation other than pheochromocytoma and containing neurosecretory granules might be possible. Therefore, we tried to image a well documented neuroblastoma with MIBG.

Our experience with this case suggests that MIBG should be further investigated as a diagnostic agent in neuroblastoma. The intense specific localization of MIBG in this lesion suggests a potential therapeutic role of MIBG in neuroblastoma, as recently has been shown in malignant pheochromocytoma [8].

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[1] Department of Radiology, Nuclear Medicine Section, University of California, San Francisco, CA 94143. Address reprint requests to R. S. Hattner.
[2] Department of Radiology, Pediatric Radiology Section, University of California, San Francisco, CA 94143.
[3] Department of Pediatrics, Oncology Division, University of California, San Francisco, CA 94143.

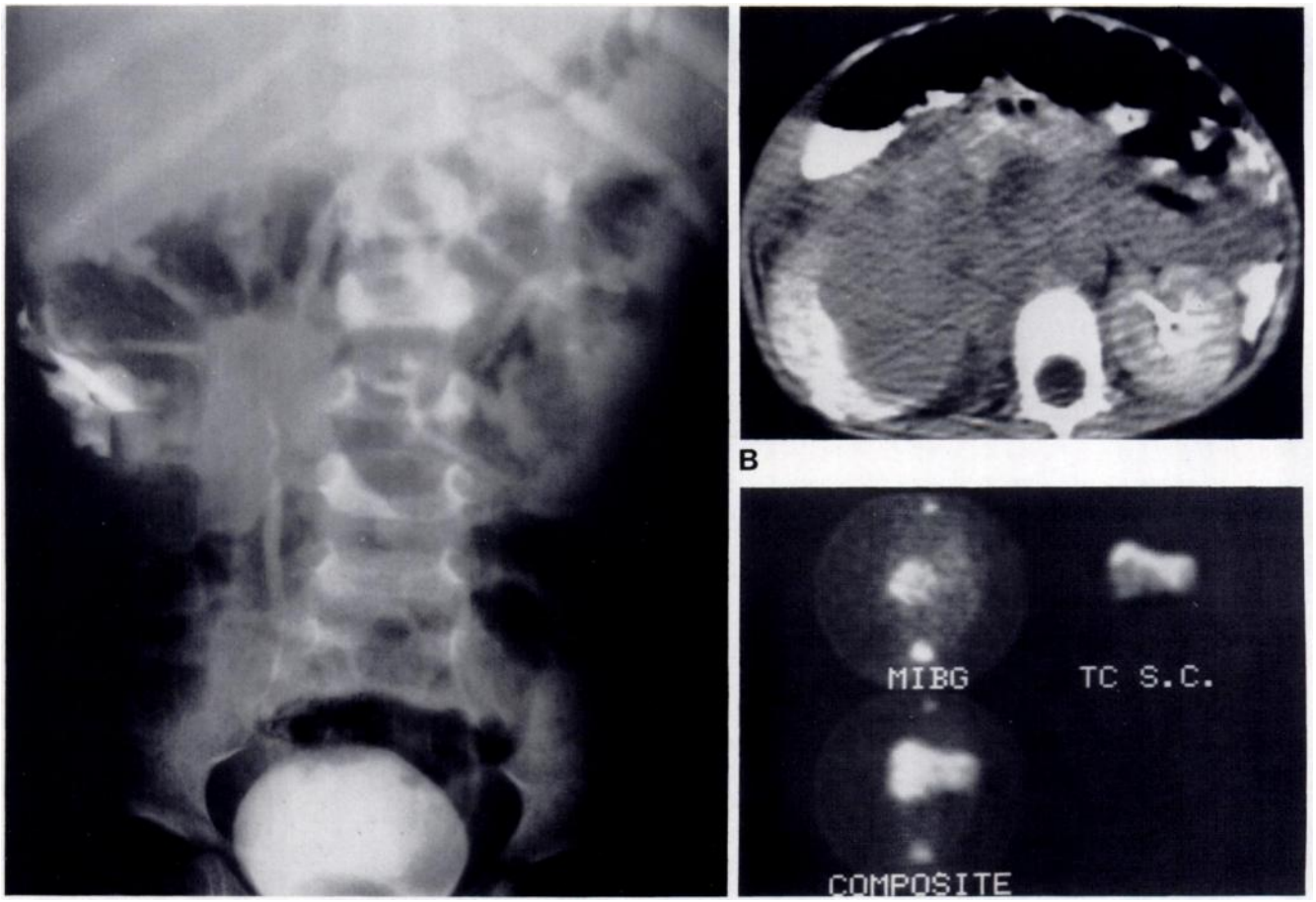

Fig. 1.—**A,** Excretory urogram. Inferolateral displacement of right renal collecting system indicative of suprarenal mass. **B,** Transverse CT scan after oral and intravenous contrast administration. Posterolateral displacement and invasion of right kidney by large soft-tissue mass that obscures normal retroperitoneal anatomy. Encasement of aorta and inferior vena cava is suggested. **C,** Computer acquired and displayed ^{99m}Tc sulfur colloid (S.C.) and MIBG images. Upper left: Anterior MIBG scan (upper and lower structures are ^{131}I external markers on suprasternal notch and pubic symphysis, respectively). Upper right: Anterior ^{99m}Tc sulfur colloid scan. Large irregular defect in inferior right lobe and lateral segment of left lobe. Lower left: Computer composite. Matching of MIBG with sulfur colloid defect.

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