Public Health Briefs

The Role of the Cranial CT Scan in Municipal Hospitals

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Abstract: House officer predictions of lesions and CT scan diagnosis were compared for accuracy in a municipal and community hospital setting. The input of the CT scan into initial patient care was also evaluated. In the municipal hospital, house officers made fewer most-correct diagnoses, and the CT scan more often established the correct diagnosis ($P < .03$) and altered therapy ($P < .02$). Results suggest that municipal hospital patients could benefit from accessible CT scanners. (*Am J Public Health* 70:268-270, 1980.)

Introduction

Several retrospective studies, reviews, and editorials have demonstrated increased diagnostic accuracy and favorable cost effectiveness of cranial computer-assisted tomography (CT) compared with brain scan, cerebral angiogram, and pneumoencephalogram[1-3]. In a prospective study involving a general hospital population, the CT scan decreased the perceived need for other neuroradiologic procedures, and altered therapy in 19 per cent of patients.[4] However, despite this initial acclaim,[1-3] several authors have raised the possibility of abuse of the CT scan in patient care, and the potential for its misuse during the training of neurology house officers and medical students.[5,6]

Future CT resource allocations by health planning agencies are likely to consider overall diagnostic accuracy, general clinical efficacy, and cost-effectivness. CT resources should serve the medical community in settings where patients will be most benefited. The purpose of this study is to test the hypotheses that: 1) initially establishing the correct diagnosis is more difficult in a municipal hospital setting than in a private hospital setting, and 2) the CT is more often able to establish the correct diagnosis and alter therapy in the municipal setting. Clarification of these factors may contribute to future rational distribution of CT scanning units.

The neurology residency training program at the Albert Einstein affiliated hospitals offers an opportunity to study these issues, since the same house officers rotate through prototype private (community) and municipal hospitals during their training.

Methods

During February and May, 1978, the same group of neurology house officers in the Albert Einstein Neurology Training Program predicted intracranial lesion location and pathology at Montefiore Hospital (February) and at the Bronx Municipal Hospital Center (BMHC) (May). Montefiore Hospital is a university-affiliated medical center which primarily serves a local community; BMHC is a university-affiliated municipal hospital providing principally emergency care to the central-south Bronx region.

In each setting, all consecutive patients on one of two "teams" (approximately one-half of the Neurology service admissions), with undiagnosed intracranial neurological disease were evaluated.*

Immediately upon admission, after obtaining a history and performing physical and neurological examinations, but before any diagnostic studies (except routine blood tests), house officers were required to indicate the proposed location and the pathology for each patient's intracranial disease. A complete written description of localization was generally supplemented by drawing the proposed lesion site on a xeroxed copy of a horizontal section from a brain atlas. The written description followed a specific format; for every

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*This series does not include patients with acute (within 24 hours) head trauma or obvious metabolic encephalopathy who are admitted to the neurosurgical and medical services, respectively.

TABLE 1—Number of Patients in Each General Disease Category

Type of Disease	BMHC (Municipal Hospital Setting)	Montefiore (Community Hospital Setting)
Vascular (including aneurysm, but excluding AVM)	8	11
Degenerative Disease (including MS)	3	5
Seizure Disorder	3	3
Neoplasm and Vascular Malformation	1	3
Subdural	1	0
Infection-Abscess	1	0
Trauma	2	0
Functional Disease	1	3
Undiagnosed Disease	0	1

symptom and sign the house officer indicated the particular part of the brain implicated, then synthesized the information to predict the CT findings, or to predict a normal CT scan.

At the time of discharge or autopsy a consensus was reached regarding what constituted the best or most-correct diagnosis for each patient. The most-correct diagnosis was determined by further neuroradiological procedures, surgical pathology, other laboratory tests, or the patient's course. CT scan and house-staff diagnostic accuracy were objectively determined by comparing the CT scan report and the house staff's primary admission diagnosis with the most-correct diagnosis.

Results

During the time periods sampled, 26 patients at Montefiore Hospital, and 20 patients at the BMHC qualified for study. The general categories of diseases encountered are shown in Table 1. The number of patients in each major disease category did not differ in the two hospitals.

Overall, the residents made the most-correct anatomic and pathologic diagnosis in 80 per cent of cases. The most-correct diagnosis was included in the differential in all cases. However, while at BMHC the same group of house officers made one-fifth fewer most-correct diagnoses (Table 2). As shown in Table 3, diagnostic accuracy of the CT scan was significantly greater in the municipal hospital setting, ($P < .03$), where, in addition, the CT more often functioned to clarify perceived diagnostic problems and alter further diagnostic tests and therapy ($P < .02$). Data were statistically analyzed by the difference in proportions test.

Discussion

This preliminary study indicated the cardinal role of cranial CT scaning in municipal hospitals and hopefully will influence future CT scanning resource allocations. CT scanning is likely to achieve maximum benefit to patients in situations where clinical diagnosis is most difficult; in the municipal hospital such situations frequently arise.

Overall, CT affected therapy in about 15 per cent of patients, comparable to the 19 per cent reported in a Massachusetts General Hospital series.[4] However, when data were considered separately for each hospital, a significant difference emerged. House officers made fewer most-correct localizations and relied on CT data for management decisions more frequently in the city hospital setting where the CT most often helped establish the diagnosis and modified patient care. This phenomenon probably reflects basic differences in hospital patient populations.

The BMHC is a prototype inner-city hospital where essentially all admissions are emergencies; many patients enter the hospital comatose, desperately ill, and without available medical history. The BMHC patients are therefore particularly vulnerable to mis-diagnosis and non-specific treatment (although the general types of disease in both hospital settings are similar). At Montefiore Hospital, many patients are electively admitted, and generally have accurate medical histories.

In this series, patients with acute head trauma were generally initially evaluated by the neurosurgery service. Had these been included, one might anticipate more instances in which CT-altered therapy yielded a rapid, favorable outcome, e.g., identification and treatment of acute epidural hematoma.

This prospective study provides statistically significant data supporting our impression that the city hospital patient population is most likely to benefit from therapy altered by CT data. This phenomenon results in part from the ability of CT scanning to detect intracranial blood and to assess ventricular size and position, both of which may be related to

TABLE 2—Accuracy of House Officer Clinical Examination

	Municipal Hospital	Community Hospital	Both	Statistical Difference
Staff correctly predicted lesion location, or correctly predicted a normal CT scan	70% (14/20)	89% (23/26)	80% (37/46)	Not Significant ($P > .10$)
Staff correctly predicted most-correct pathology	70% (14/20)	89% (23/26)	80% (37/46)	Not Significant ($P > .10$)
Staff included most-correct diagnosis in differential	100% (20/20)	100% (26/26)	100% (46/46)	—

TABLE 3—Accuracy and Effectiveness of CT Scanning

	Municipal Hospital	Community Hospital	Both	Statistical Difference
CT diagnostic accuracy (objectively defined)	95% (19/20)	73% (19/26)	83% (38/46)	$P < .03$
CT altered immediate diagnostic tests or therapy	30% (6/20)	4% (1/26)	15% (7/46)	$P < .02$
CT eliminated diagnostic possibilities considered less likely (making diagnosis more certain)	35% (7/20)	30% (6/20)	28% (13/46)	Not Significant

cerebral herniation. In a stuporous patient without available medical history, many diagnostic and therapeutic decisions center around the possibility of cerebral herniation. The presence of accessible CT scanning at the BMHC has reduced this threat while eliminating the hazards and delays of nocturnal angiography.

Our experience clearly suggests that to yield most benefits to patients from future allocations of CT scanning resources, inner-city municipal institutions should be given high priority. The fact that in New York, and other major US cities, CT scanners appeared in private offices and small clinics long before they were installed municipal hospitals (many still are without them) may represent an egregious error in health resource allocation.

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Epidemiologic/Environmental Policy-Making Symposium Announced

"Epidemiologic Studies as a Scientific Basis for Environmental Policy-Making" is the theme of a three-day symposium to be held April 28-30, 1980 at the Center for Environmental Epidemiology, University of Pittsburgh Graduate School of Public Health. Invited speakers for the symposium will include faculty members from the Center as well as key government agency personnel.

This first annual symposium will be concerned with the discussion of epidemiologic, statistical and genetic methods related to the evaluation of environmental health effects in humans. Topics will include: detection of health effects of exposure to low doses of agents, genetic-environmental interactions in relation to low-dose studies, epidemiologic investigation of special groups at risk, and related subject matter.

Members of government, industry, and the academic community are invited to attend. The registration fee is $20, and the deadline for pre-registration is April 1, 1980. Attendance will be limited. For further information, contact: Center for Environmental Epidemiology, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, PA 15261, (412) 624-1559.