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Evaluation of Renal Pathology by Conventional Ultrasonography & Ct Scanning Modalities

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ABSTRACT

Background and Aim: Patients undergoing long-term dialysis are subject to cyst formation, hemorrhage, and neoplasia in their native kidneys. Present study was performed with aim to evaluate renal pathology by conventional ultrasonography and CT scan modalities at Bhuj, Kutch, Gujarat, India.

Methods: Present study was performed at department of radiology, Gujarat Adani institute of medical science, Bhuj, Kutch. Detection of these complications with incremental dynamic CT and detection with sonography were compared prospectively in 41 patlents (79 kidneys) who had been undergoing dialysis intermittently for 2 or more years. Acquired cystic kidney disease (five or more cysts per kidney) was identified in 59% of kidneys by use of CT and in 18% by use of sonography.

Results: CT showed a complete renal contour definition in all cases, sonography did so in only 57%. Three solid renal tumors (2- to 4-cm diameter) were identified with both techniques with no false-negative evaluations. Four benign hemorrhagic cysts were identified with combined CT (hyperdense mass) and sonography (benign cysts). CT provided the best anatomic image quality and was more accurate for detection of acquired cystic kidney disease. CT and sonography were equivalent for detection of solid tumors.

Conclusion: Our results suggest that dynamic contrast-enhanced CT scanning with the supplemental use of sonography is the best imaging regimen for the evaluation of suspected acquired cystic kidney disease and its potential complications.

KEYWORDS CT scan, Kidney disease renal pathology, Sonography

Introduction

Gained cystic kidney disease refers to the development of cysts in the deteriorating kidney. Although Simon first described the association of cysts with end-stage renal disease in 1847 [1], it was not until 1977 that the concept of acquired cystic kidney disease was formalized by Dunnill et al. [2]. Acquired cystic kidney disease, with its potential complications of hemorrhage and neoplasia, is of growing concern in the expanding population of patients undergoing dialysis. Imaging has become a valuable, although inexact tool for initial evaluation and sequential studies of native kidneys in this population. Other authors have described the CT and sonographic conclusion in acquired cystic kidney disease [3-7]. In some cases, the author has attempted to evaluate the diagnostic accuracies of these two imaging techniques [8]. Present study was done with aim to evaluate renal pathology by conventional ultrasonography and CT scan modalities at Bhuj, Kutch, Gujarat, India.

Subjects and Methods

Present study was performed at department of radiology, Gujarat Adani institute of medical science, Bhuj, Kutch, Gujarat. Ethical clearance was taken from the institutional ethics board and informed consent was obtained from all the participants. Forty-one patients with end-stage renal disease of various causes were included in the present study. Forty patients had been treated with maintenance hemodialysis or peritoneal dialysis for 2 years or more; one patient, previously treated with dialysis for more than 2 years, had a functioning renal transplant. These 41 patients had a total of 79 native kidneys. CT and sonography generally were performed on the same day or within 1 week of each other. CT scans were made with 1-cm sections at 1-cm intervals, both before and after contrast administration. An incremental dynamic scanning technique was used after bolus administration of 100 ml of 60% ionic contrast material. Five-millimeter sections were used at the discretion of the radiologist monitoring the examination. In five patients, only unenhanced CT studies were performed. A GE CT 9800 was used for 36 examinations and a GE CT 8800 for five examinations. Sonography was performed with a GE R/T 3600 or an Acuson 1 28 with both 3.5- and 5.0-MHz transducers. Images were acquired in the coronal, sagittal, and axial planes. Both the CT and sonographic studies were evaluated independently radiologists.. Each study was evaluated for presence and degree of acquired cystic kidney disease, definition of renal contour, and presence of a solid renal mass. Renal cystic changes, when present, were graded as follows: grade 0 = no cysts, grade 1 = fewer than five cysts, grade 2 = five to 10 cysts, grade 3 = 1 1-1 5 cysts, grade 4 = more than 15 cysts/kidney. This grading scale is modified

from that originally proposed by Thomson et al. [9]. Acquired cystic kidney disease was defined as five or more cysts per kidney. Definition of renal contour was characterized as follows: grade 0 = complete renal contour shown, grade 1 = partial loss of renal contour, grade 2 = complete loss of renal contour.

CT scans made before and after contrast administration were compared for anatomic definition and lesion conspicuity.

Statistical analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 15 (SPSS Inc. Chicago, IL, USA) Windows software program. Descriptive statistics included computation of percentages. For all tests, confidence level and level of significance were set at 95% and 5% respectively.

Results

Each technique showed an equal grade of cystic change in 27 of 79 kidneys. CT showed a higher grade in 52 of 79 kidneys. In assessment for acquired cystic kidney disease, sonography showed only 29% of cases shown by CT. There were no false-positive sonographic diagnoses of acquired cystic kidney disease. The prevalence of acquired cystic kidney disease was 59% as determined by CT, and was 18% as determined by sonography.

All CT studies were classified as grade 0. The scores assigned to sonographic examinations were 57% grade 0 (complete renal contour definition 32% grade 1 (incomplete renal contour definition); and 1 1% grade 2 (total loss of renal contour definition).

Evidence of a renal mass lesion was seen with one or both techniques in nine patients. In three patients, solid renal masses that varied in size from 2.0 x 2.5 cm to 3.0 x 4.0 cm were shown by both imaging techniques. All three lesions were later confirmed to be primary malignant tumors by biopsy or nephrectomy. In a fourth patient, two contiguous hyperdense masses, each less than 1 cm in diameter, were seen on precontrast CT scans and had appearances typical for benign renal cysts on sonograms. At subsequent nephrectomy, these lesions were described as retention cysts. In three other patients, small hyperdense masses were shown on precontrast CT scans, whereas sonograms showed typical benign renal cysts. These cases are considered typical hyperdense hemorrhagic renal cysts. In one patient, a 1 .5-cm mass was questioned on sonography because of a poorly defined back wall. CT findings were consistent with a simple renal cyst. No cyst puncture or biopsy was performed. In one patient, sonography suggested a solid renal mass, whereas CT findings were consistent with focal hypertrophy in a zone of kidney tissue that enhanced homogeneously after administration of contrast material. Of 36 patients who had precontrast and postcontrast CT studies, the postcontrast examination was judged superior in 28.

Discussion

While the article by Dunnill et al. in 1977 [2], many radiographic imaging surveys for acquired cystic kidney disease and its complications have been reported [10-12]. Various authors have suggested sonography alone [13], sonography and CT [14], or CT alone [15] as the suitable technique for monitoring patients. Other authors have suggested that either imaging technique is suitable [16]. In this study, state-of-the-art sonographic and CT equipment and technique were used to determine the strengths and weaknesses of each for evaluating patients at risk for acquired cystic kidney disease and its complications. Contrast-enhanced CT produced the better resolution of renal contour and grading of acquired cystic kidney disease changes in patients with end-stage renal disease. The fibrotic, shrunken kidney seen in patients with end-stage renal disease is difficult to image sonographically. The kidney itself, as well as the fat and bowel that could fill in the renal bed, adds to the difficulty in imaging. These topographic changes do not affect CT imaging.

Contrast-enhanced CT, with a thin-section technique, shows greater resolution than sonography; it can resolve cysts as small as 0.3 cm [6]. Cysts less than 1 cm are difficult to resolve sonographically. The difference in resolution is important, considering that most cysts in acquired cystic kidney disease are 5 mm or less. This difference is reflected in the prevalence of acquired cystic kidney disease shown by CT at 59% compared with a prevalence of only 1 8% shown by sonography. CT also was able to show a higher grade of cystic change in two thirds of the cases.

Although use of CT as the gold standard creates an inherent bias, the differences in these results are substantial. The definition of cystic change is not only of academic interest. The complications of neoplasia and hemorrhage are associated with acquired cystic kidney disease and, therefore cyst development is an important clinical marker[16-18]. We believe that IV contrast enhancement is an integral part of the CT scanning technique. Contrast enhancement was judged useful in 80% of the CT examinations in which it was used. The incremental dynamic scanning technique uses contrast material circulating in renal capillaries to provide a tissue "signature." This enhancement helps define small cysts, is useful in defining solid masses, and helps to distinguish focal hypertrophy from solid masses.

Patients with end-stage renal disease with normal cardiovascular function can undergo this bolus-enhanced dynamic scanning technique without risk offluid overload. In our series, bolus injections of contrast material were given without regard to the subsequent timing of dialysis treatments. Sonography was clearly inferior to CT for evaluating contour definition and grading acquired cystic kidney disease. However, it is useful for evaluating focal hyperdense masses seen on precontrast CT scans. In our series, four hyperdense masses were characterized as hemorrhagic simple cysts on the basis of sonographic and CT correlation.

Because of the potentially life-threatening complications of hemorrhage or neoplasm in acquired cystic kidney disease, nearly all authors suggest screening patients after 3 years of dialysis. Our data suggest that dynamic contrast-enhanced CT scanning with the supplemental use of sonography is the best imaging regimen. Subsequent progress-imaging studies done yearly, or possibly every second year, seem appropriate, but long-term studies are needed to show the efficacy of this approach. The symptomatic patient with hematuria, flank pain, abdominal mass on physical examination, or an unexplained drop in hematocrit warrants immediate study.

REFERENCES

1. Simon J. On sub-acute inflammation of the kidney. Medico-Chirurg Trans Lond 1847;30:141-164.|2. Dunnill MS, Millard PA, Oliver D. Acquired cystic disease of the kidneys: a hazard of long-term intermittent malntenance haemodialysis. J Clin Pathol 1977;30:868-877.|3. Bommer J, Waldherr A, van Kaick G, Strauss L, Ritz E. Acquired renal cysts in uremic patients-in vivo demonstration by computed tomography. Clin Nephrol 1980;14:299-303.|4. Narasimhan N, Golper TA, Wolfson M, Aahatzad M, Bennett WM. Clinical characteristics and diagnostic considerations in acquired renal cystic disease. Kidney Int 1986;30:748-752.|5. Andersen BL, Curry NS, Gobien AP. Sonography of evolving renal cystic transformation associated with hemodialysis. AiR 1983;141 :1003-1004.|6. Levine E, Grantham JJ. The role of computed tomography in the evaluation of adult polycystic kidney disease. Am J Kidney Dis 1981;1 :99-105|7. Cho C, Friedland GW, Swenson AS. Acquired renal cystic disease and renal neoplasms in hemodialysis patients. UrolRadiol 1984;6: 153-1 57|8. Jabour BA, Aalls PW, Tang WW, et al. Acquired cystic disease of the kidneys: computed tomography and ultrasonography appraisal in patients on peritoneal and hemodialysis. Invest Radiol 1987;22:728-732.|9. Thomson BJ, Jenkins DA, Allan PL, Elton AA, Winney AJ. Acquired cystic disease of the kidney in patients with end-stage chronic renal failure: a study of prevalence and aetiology. Nephrol Dial Transplant 1986;1 :38-43.|10. Ishikawa I, Saito Y, Onouchi Z, et al. Development of acquired cystic disease and adenocarcinoma of the kıney in glomerulonephntic chronic hemodialysis patients. Clin Nephrol 1980;14: 1-6.|11. Minar E, Tscholakoff D, Zazgomik J, Schmidt P, Marosi L, Czembirek H. Acquired cystic disease of the kidneys in chronic hemodialyzed and renal transplant patients. Eur Urol 1984;10:245-248.|12. Levine E, Grantham JJ, Slusher SL, Greathouse JL, Krohn BP. CT of acquired cystic kidney disease and renal tumors in long-term dialysis patients. AiR 1984;142:125-131.|13. Weissberg DL, Miller RB. Aenalcell carcinoma and acquired cystic disease of the kidneys in a chronically dialyzed patient. J Ultrasound Med 1983; 2:191-194.|14. Kutcher A, Amodio JB, Aosenblatt A. lkemic renal cystic disease: value of sonographic screening. Radiology 1983;147:833-835|15. Gehrig JJ Jr, Gottheiner TI, Swenson AS. Acquired cystic disease of the end-stage kidney. Am J Med 1985;79:609-620.|16. Smith JW, Sallman AL, Williamson MA, Loft CG. Acquired renal cystic disease: two cases of associated adenocarcinoma and a renal ultrasound survey of a peritoneal dialysis population. Am J Kidney Dis 1987;10: 41-46.|17. Hughson MD, Hennigar GA, McManus JF. Atypical cysts, acquired renal cystic disease, and renal cell tumors in end-stage dialysis kidneys. Lab Invest 1980;42:475-480.|18. Grantham JJ, Levine E. Acquired cystic disease: replacing one kidney disease with another. Kidney Int 1985;28:99-10