Original Research Article

Role of ultrasonography in diagnosis of urological lesions: hospital based study

Ameet C. Panchmahalkar[1]*, Shoeb Khan[2], Wajahat Salim[1]

[1]Department of Radiology, Dr. Shankar Rao Chavan Government Medical College and Hospital, Nanded, Maharashtra, India
[2]Department of Medicine, Government Medical College and Hospital, Aurangabad, Maharashtra, India

*Correspondence:
Dr. Ameet C. Panchmahalkar,
E-mail: dr_ameet_21@yahoo.com

ABSTRACT

Background: Ultrasound examination is considered to be a very useful imaging modality for the diagnosis of renal colic as well as other renal or extra-renal diseases. One of the major advantages of ultrasound examination is the avoidance of radiation exposure. However, it is reported to be operator dependent and less accurate when compared with Computed Tomography. Present study describes role of ultrasonography in assessment of suspected urological disease in patients referred to radiodiagnosis department of Nair Hospital, Mumbai during the study period.
Methods: This observational descriptive study was conducted during June 2006 to June 2008 at Department of Radiology, BYL Nair Hospital, Mumbai, India. 84 patients with clinical features suggestive of urological disease and referred to the department for ultrasound examination were enrolled. Ultrasonography was done on a TOSHIBA ECCOCEE duplex Doppler ultrasound machine with 3.5-5 MHz curvilinear transducer. USG findings were correlated with the final diagnosis and USG examination findings were considered diagnostic if they resulted in correct histopathological diagnosis or correct identification of malignant tumours along with organ site. They were considered contributory when either the organ site was correctly identified without histology diagnosis or when malignancy was identified but without proper organ site. If the lesion was not detected, USG findings were marked as false negative and they were marked as false positive when the predicted disease was found to be incorrect on confirmatory diagnosis.
Results: Age of the patients ranged from 0 to 76 years. Out of 84 patients studied, 49 were males and 35 were females. Overall ultrasound examination findings were found to be diagnostic in 48 cases (57.14%), contributory in 26 cases (30.95%), false negative in 10 cases (11.9%) whereas there were no false positive reports. There were 56 cases in which there were kidney lesions. Ultrasound examination findings were found to be diagnostic in 35 cases (62.5%), contributory in 17 cases (30.35%) and false negative in 4 cases (7.14%) whereas there were no false positive reports. There were 10 cases in which there were lesions involving both kidney and ureters. Ultrasound examination findings were found to be contributory in 8 cases (80%) and false negative in 2 cases (20%).There were 4 cases in which there were lesions involving ureters. Ultrasound examination findings were found to be false negative in all 4 cases (100%). There were 14 cases in which there were lesions involving urinary bladder. Ultrasound examination findings were found to be diagnostic in 4 cases (28.57%), contributory in 9 cases (64.28%) and false negative in 1 case (7.14%).
Conclusions: Ultrasound examination was found to be diagnostic or contributory in diagnosis in most of the cases (88.1%). However there were a sizeable proportion of cases (11.9%) with false negative results on ultrasonography.

Keywords: Diagnostic ultrasound, Kidney, Medical radiation, Ureters, Urinary bladder

INTRODUCTION

Ultrasound examination is considered to be a very useful and accurate imaging modality for the diagnosis of renal colic as well as other renal or extra-renal diseases.[1-5] It is a versatile imaging modality which is easily accessible, inexpensive and helpful for decision making in the patients with urology lesions. One of the major advantages of ultrasound examination over other modalities like Computed Tomography is the avoidance of radiation exposure.

The significance of this advantage is highlighted by the increased reports and concerns regarding the potential harmful effects of exposure to medical radiation. However, on the other side ultrasound examination is reported to be operator dependent and has less accuracy when compared with Computed Tomography.[6-10] Present study describes role of Ultrasonography (USG) in assessment of suspected urological disease in patients referred to Radiodiagnosis department of Nair Hospital, Mumbai during the study period.

METHODS

This observational descriptive study was conducted during June 2006 - June 2008 at Department of Radiology, BYL Nair Hospital, Mumbai, India. 84 patients with clinical features suggestive of urological disease and referred to the department for ultrasound examination were enrolled. Detailed history was taken and physical examination of the patients was done. Institutional ethics committee approval was taken and subjects gave informed consent for the enrolment. Ultrasonography was done on a TOSHIBA ECCOCEE duplex Doppler Ultrasound machine with 3.5 – 5 MHz curvilinear transducer.

All patients were examined after an overnight fast with an empty bladder and later on full bladder. Follow up of patients was done with respect to surgical interventions, laparoscopic examinations, histopathology reports for the confirmation of diagnosis. USG findings were correlated with the final diagnosis and USG examination findings were considered diagnostic if they resulted in correct Histopathological diagnosis or correct identification of malignant tumours along with organ site. They were considered contributory when either the organ site was correctly identified without histology diagnosis or when malignancy was identified but without proper organ site. If the lesion was not detected, USG findings were marked as false negative and they were marked as false positive when the predicted disease was found to be incorrect on confirmatory diagnosis.

RESULTS

Age of the patients ranged from 0 to 76 years. Out of 84 patients studied, 49 were males and 35 were females. Overall ultrasound examination findings (Table 1) were found to be diagnostic in 48 cases (57.14%), contributory in 26 cases (30.95%), false negative in 10 cases (11.9%) whereas there were no false positive reports. Lesions were classified as per involvement of the organ. There were 56 cases in which there were kidney lesions (Table 2).

Table 1: Overall diagnostic accuracy of ultrasonography.

Results	Percentage
Diagnostic	48 (57.14%)
Contributory	26 (30.95%)
False positive	0
False negative	10 (11.9%)
Total	84 (100%)

Ultrasound examination findings were found to be diagnostic in 35 cases (62.5%), contributory in 17 cases (30.35%) and false negative in 4 cases (7.14%) whereas there were no false positive reports. There were 10 cases in which there were lesions involving both kidney and ureters (Table 3).

Table 2: Diagnostic accuracy of ultrasonography in evaluation of kidney lesions.

Results	Percentage
Diagnostic	35 (62.5%)
Contributory	17 (30.35%)
False positive	0
False negative	04 (7.14%)
Total	56 (100%)

Table 3: Diagnostic accuracy of ultrasonography in evaluation of lesions involving both kidney and ureter.

Results	Percentage
Diagnostic	0 (0 %)
Contributory	8 (80%)
False positive	0
False negative	2 (20%)
Total	10 (100%)

Table 4: Diagnostic accuracy of ultrasonography in evaluation of ureteral lesions.

Results	Percentage
Diagnostic	0 (0%)
Contributory	0 (0%)
False positive	0 (0%)
False negative	04 (100%)
Total	04 (100%)

Ultrasound examination findings were found to be diagnostic in 0 cases (0%), contributory in 8 cases (80%) and false negative in 2 cases (20%) whereas there were no false positive reports. There were 4 cases in which

there were lesions involving ureters (Table 4). Ultrasound examination findings were found to be diagnostic in 0 cases (0%), contributory in 0 cases (0%) and false negative in 4 cases (100%) whereas there were no false positive reports. There were 14 cases in which there were lesions involving urinary bladder (Table 5). Ultrasound examination findings were found to be diagnostic in 4 cases (28.57%), contributory in 9 cases (64.28%) and false negative in 1 case (7.14%) whereas there were no false positive reports.

Table 5: Diagnostic accuracy of ultrasonography in evaluation of urinary bladder lesions.

Results	Percentage
Diagnostic	4 (28.57%)
Contributory	9 (64.28%)
False positive	0 (0%)
False negative	01 (7.14%)
Total	14 (100%)

DISCUSSION

In 84 patients studied, overall ultrasound examination findings were found to be diagnostic in 48 cases (57.14%), contributory in 26 cases (30.95%), false negative in 10 cases (11.9%) whereas there were no false positive reports. Out of 84 cases, there were 56 cases with kidney lesions. Of these 58 cases, ultrasound examination findings were found to be diagnostic in 35 cases (62.5%), contributory in 17 cases (30.35%) and false negative in 4 cases (7.14%) whereas there were no false positive reports. There were 10 cases in which there were lesions involving both kidney and ureters. Ultrasound examination findings were found to be contributory in 8 cases (80%) and false negative in 2 cases (20%).

There were 4 cases in which there were lesions involving ureters. Ultrasound examination findings were found to be false negative in all 4 cases (100%). Thus, kidney lesions were picked in most cases i.e. 92.85% cases whereas diagnostic accuracy was low in cases with involvement of ureters. Similar results were reported by Ather MH et al.[8] They mentioned that ultrasound examination has a high degree of sensitivity and specificity for renal calculi in renal failure patients but it is less sensitive for calculi in the ureters especially middle of the ureters. They concluded that ultrasound examination should be the initial imaging modality for assessment of patients with previously undiagnosed kidney failure. In present study, overall, ultrasound examination was diagnostic or contributory in diagnosis in 88.1% cases. However, 11.9% cases had false negative results on ultrasonography. Our results indicate that ultrasonography has high specificity as there were no false positive cases although sensitivity is low as false negative cases were found. Van Randen et al studied accuracy of computed tomography and ultrasound examination in acute abdominal pain and concluded that

although computed tomography was more sensitive, ultrasound was also reliable in detecting common diagnoses and was not affected by patient characteristics or operator experience.[11]

Westphalen et al found that with tenfold higher rates of use of computed tomography over a decade, there was no associated difference in proportion of urinary calculi diagnosis, alternate significant diagnoses or hospitalization rates.[6] They suggested that radiation exposure should be taken into account prior to recommending computed tomography for patients as the conventional choice of computed tomography over ultrasound examination for assessment of pain in flank or kidney in emergency department lacks evidence that higher use of computed tomography have altered diagnosis, treatment or hospitalization rates.

Carlos Nicolau et al have also recommended ultrasound as first line imaging investigation for renal colic as it is less expensive, reproducible and non-invasive technique with high accuracy in diagnosing most cases while avoiding exposure to radiation.[12] Rippoles T et al concluded that although computed tomography is the best technique in suspected ureteral colic, ultrasound examination in combination with plain radiograph is a practical alternative even with lower sensitivity as it has low radiation dose.[5]

CONCLUSION

Ultrasound examination was found to be diagnostic or contributory in diagnosis in most of the cases (88.1%). However there were a sizeable proportion of cases (11.9%) with false negative results on ultrasonography.

REFERENCES

1. Middleton WD, Dodds WJ, Lawson TL, Foley WD. Renal calculi: sensitivity for detection with US. Radiology. 1988;167:239-44.
2. Dalla Palma L, Stacul F, Mosconi E, Pozzi Mucelli R. Ultrasonography plus direct radiography of the abdomen in the diagnosis of renal colic: still a valid approach? Radiol Med. 2001;102:222-5.
3. Smith-Bindman R, Aubin C, Bailitz J, Bengiamin RN, Camargo CA, Corbo JA, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. N Engl J Med. 2014;371:1100-10.
4. Patlas M, Farkas A, Fisher D, Zaghal I, Hadas-Halpern I. Ultrasound vs CT for the detection of ureteric stones in patients with renal colic. Br J Radiol. 2001;74:901-4
5. Ripollés T, Agramunt M, Errando J, Martínez MJ, Coronel B, Morales M. Suspected ureteral colic:

plain film and sonography vs unenhanced helical CT. A prospective study in 66 patients. Eur Radiol. 2004;14:129-36.

6. Westphalen AC, Hsia RY, Maselli JH, Wang R, Gonzales R. Radiological Imaging of Patients with Suspected Urinary Tract Stones: National Trends, Diagnoses, and Predictors. Academic emergency medicine. Official J Society Aca Emerge Med. 2011;18(7):699-707.

7. Smith-Bindman R, Lipson J, Marcus R, Kim KP, Mahesh M, Gould R, Berrington de González A, Miglioretti DL. Radiation dose associated with common computed tomography examinations and the associated lifetime attributable risk of cancer. Arch Intern Med. 2009;169(22):2078-86.

8. Ather MH, Jafri AH, Sulaiman MN. Diagnostic accuracy of ultrasonography compared to unenhanced CT for stone and obstruction in patients with renal failure. BMC Medical Imaging. 2004;4:2.

9. Ulusan S, Koc Z, Tokmak N. Accuracy of sonography for detecting renal stone: comparison with CT. J Clin Ultrasound. 2007;35(5):256-61.

10. Fowler KA, Locken JA, Duchesne JH, Williamson MR. US for detecting renal calculi with nonenhanced CT as a reference standard. Radiology. 2002;222(1):109-13.

11. van Randen A, Laméris W, van Es HW, van Heesewijk HP, van Ramshorst B, Ten Hove W, et al. A comparison of the Accuracy of Ultrasound and Computed Tomography in common diagnoses causing acute abdominal pain. Euro Radio. 2011;21(7):1535-45.

12. Nicolau C, Claudon M, Derchi LE, Adam EJ, Nielsen MB, Mostbeck G, et al. Imaging patients with renal colic- consider ultrasound first. Insights Imaging. 2015;6(4):441-7.