



A STUDY ON EFFICACY OF T2-WEIGHTED AND DIFFUSION WEIGHTED IMAGES IN DETECTION OF SUSPECTED CASES OF PROSTATE CANCER

Radiodiagnosis

Dr. Shachee Zinzuvadia

3rd year resident, Dept. of Radiodiagnosis, GMCH, Udaipur. 12,B Shantinagar soc. Alkapuri, Vadodara, Gujarat- 390007.

Dr. Pooja*

2nd year resident, Dept of Radiodiagnosis, GMCH, Udaipur. Prakash bhawan main road friend's colony, Patna,Bihar -800025 *Corresponding author

Dr. N. C. Sharma

Professor & Head, Dept of Radiodiagnosis, GMCH, Udaipur. 209,Priyadarshini nagar, Bedla Road, Udaipur 313001.

ABSTRACT

Prostate cancer is the seventh most common cancer in males in India. Its mortality in India is 2.5/100,000. Aim of the study is to evaluate the role of T2 weighted imaging, diffusion-weighted Imaging and the combination of these magnetic resonance techniques in the detection and localization of prostate cancer. The early detection, characterization and localization of prostate lesions will help in the management of prostate carcinoma and also helps so that definitive treatment can be initiated in early stages.

KEYWORDS

prostate cancer, T2 weighted images , Diffusion weighted images

INTRODUCTION

Prostate cancer is a disease of elderly men. Its age adjusted incidence rate in India is 3.7 cases/100,000 (WHO 2008) and is the seventh most common cancer in males in India. Its mortality in India is 2.5/100,000. With the increase in life expectancy of our country the burden of prostate cancer is expected to rise in India. Clinically the patients with prostate cancer in early stages are asymptomatic; in later stages symptoms include hematuria, urgency, nocturia, frequency, hesitancy and bone pain if there is metastasis. Even though $<4\text{ng/ml}$ is considered normal limit, 4 to 9% of men with PSA level in this range are found to have prostatic cancer. To men with PSA level in range of 4 to 100ng/ml occult cancer can be present.

MATERIALS AND METHODS

The study was conducted in 46 patients clinically suspected to have prostatic cancer who underwent MRI investigation at Geetanjali Medical College and Hospital Udaipur, using siemens magnetom avento 1.5 tesla machine with a body phase array coil. Multiphase scanning using T2W and diffusion weighted imaging was performed. ADC values were generated along areas of interest. TRUCUT biopsy was done for histological diagnosis in all cases.

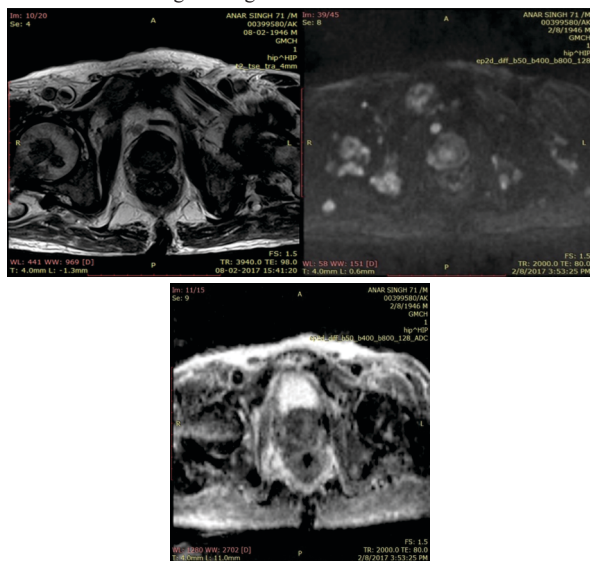


Figure 1- Central And Peripheral Zones Showing Restricted Diffusion And

Corresponding Adc Drop And Hypointense On T2wi (adc Values-1.0x10-3)

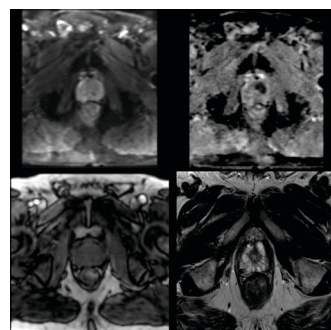


Figure 2 - Dwi Showing Restricted Diffusion On Left Side With Corresponding Signal Drop On Adc And Hypointensity On T2wi

RESULTS

Table - 1 Age Distribution

Age Group (yrs)	No.	%
50-59	10	21.74%
60-69	7	15.22%
70-79	23	50.00%
80-89	6	13.04%
Total	46	100.00%

All patients were more than 50 years. Maximum number of patients belonged to 7th decade (50%).

Table - 2 Gleason Score in patients with prostate cancer

Findings	No.	%
≤ 6	11	36.67%
≥ 7	19	63.33%

Out of the 30 biopsy proven cases of carcinoma prostate, 19 patients had Gleason score of ≥ 7 .

Table - 3 T2W + DWI in Detection of Prostate Cancer

T2W + DWI Findings	Histopathology Positive	Histopathology Negative	Total
Lesion Detected	25	3	28
Lesion Not Detected	5	13	18
Total	30	16	46

As per this table

Sensitivity	83.33%
Specificity	81.25%
Positive Predictive value	89.29%
Negative Predictive value	72.22%
Accuracy	82.61%

Table - 4 Comparison of Various Imaging Modality used in Detection of Prostate Cancer

Findings	Sensitivity	Specificity	PPV	NPV	Accuracy
T2W	86.67%	81.25%	89.66%	76.47%	84.78%
DWI	83.33%	81.25%	89.29%	72.22%	82.61%
T2W + DWI	90%	81.25%	90%	81.25%	86.96%

DISCUSSION

We performed a study at Geetanjali Medical College and Hospital, Udaipur in 46 patients clinical, suspected to have prostate cancer based on clinical symptoms and raised PSA > 4 ng/ml. We evaluated the role of following MR sequences T2W, DWI and T2W + DWI in detection and localization of prostate cancer.

In the present study, all the patients presenting to us were elderly males with age above 50 years. The youngest patient in this study was of age 51 years and the eldest one was 85 years. The mean age in the study group was 67. The maximum number of patients belonged to age group of 70 to 79 years.

The most common presenting complaint of these these patients was lower urinary tract symptoms like poor stream and hesitancy, noted in 77% of the patients. 17.3% of the patients presented with hematuria. The patients presenting to us at an advanced stage of the disease with bony metastasis constituted 6.5% of the study group. These findings were similar to the established literature for symptoms of prostate cancer¹. Serum prostate specific antigen level and clinical symptoms were evaluated as screening test in our study. PSA levels in our study ranged from 5.0 ng/ml to 100ng/ml. Although PSA level of 4-10 ng/ml is considered to be overlap between benign prostatic hyperplasia and prostate cancer². We found that in our study 31%(4/14) of this range had prostate cancer and 75% (24/32) of the patients with PSA > 10 ng/ml had prostate cancer. Four cases in our study would have been missed if PSA > 10ng/ml was used to guide biopsy. In our study we also evaluated the role combined T2W and DWI as compared to these used alone for detection of prostate cancer. In addition of ADC to T2W, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 90%, 81.25%, 90%, 81.25% and 86.96% respectively. The addition of ADC to T2W increased the sensitivity to 90% compared to 86% for T2W alone and 83% for DWI alone. The specificity 81% remained same compared to T2W alone and compared to DWI.

CONCLUSION

46 patients of suspected prostate cancer on the basis of clinical history and raised PSA levels were taken up for evaluation by MRI using body phase array coil, obtaining T2W and Diffusion weighted MR sequences. TRUCUT biopsy was done for histological diagnosis in all cases.

T2W and DWI combined together had a sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 90%,81.25%, 90%, 81.25% and 86.96% respectively. T2W+DWI was better in detection of prostate cancer than T2W and DWI alone. With increased sensitivity and accuracy compared to T2W, while specificity remained the same, T2W+DWI had better sensitivity and accuracy and same specificity as compared to DWI. Both results were statistically significant.

A significant negative correlation found between mean ADCs of tumors in peripheral zone and their Gleason scores. Difference in ADC values between well differentiated (gleason score ≤ 6) and moderately and poorly differentiated prostate carcinoma (gleason score 7). ADC value significantly decreases as the Gleason score increases. The result was statistically significant.

REFERENCES

1. GLOBOCAN 2008, international agency for research on cancer WED, france 2010, <http://globocan.iarc.fr/>.
2. Neal De, Kelly JD. The prostate and seminal vesicle in Result William NS, Bulstrode CJK, editors Short practice of Surgery 24th ed Landon Edward Arnon publishers 2004.
3. Gilbertos VA. Cancer of the prostate gland: results of early digenesis and therapy undertaken for cure of the disease. JAMA 1971;215:81-54
4. Shih-kal L, Tsai YS, Lis Y, Tsui T. Diagnostic performance of a random versus Lesioa- Directed biopsy of the preside from transrectal ultrasound J Ultrasound Med 26:11-17
5. Catalona WJ, Smith DS, Ratliff, et al Measurement of prostate-specific antigen m serum as a screening test for prostate cancer. N Engl J Mc-u 1991; 324: 1156-1161.
6. Catalona WJ, Smith DS, Ratliff TL, Basler JW: Detection of organ-confined prostate cancer is increased through prostate-specific antigen-based screening JAMA 1993; 270(8).
7. Malik R, Pandya VK, Naik D. Trus for evaluation of prostatic lesions and there histopathological correlation. Indian J radiol imaging 2004; 14: 155-157.

8. Lee F, Peter LJ, Sorens T, Torp-pedersen, Mettlin C, McHugh TA: prostate Cancer: Comparison of Transrectal US and Digital rectal examination for screening Radiology 1988;390-394
9. Presti JC, Hricak H, Narayan PA, Shinohara K, White S, Carroll PR Local Staging of Prostatic Carcinoma : Comparison Of Transrectal Solography and Ednorectal MR imaging. AJR 1996;166:103-108
10. Steinfeld AD, Question regarding the treatment of localized prostate cancer. Radiol 1992;184: 593-598
11. Choi YJ, Kim JK, KIm KW, Kim N, Choi ek and cho KS. Functional MR imaging of prostate cancer. Redigraphics 2007127: 63-75
12. Mcneal JE, Normal anatomy of prostate and changes in benign prostatic hypertrophy and carcinoma. Semin US CT MRI 1988;4: 329-334