ORIGINAL ARTICLE

DIAGNOSTIC ACCURACY OF MRI IN PATIENTS WITH ELEVATED PSA LEVELS IN PREDICTING PROSTATIC CARCINOMA, KEEPING HISTOPATHOLOGY AS GOLD STANDARD

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ABSTRACT

OBJECTIVE: To determine the diagnostic accuracy of MRI in diagnosis of prostatic carcinoma in patients with raised PSA levels keeping histopathology as gold standard. **MATERIALS AND METHODS:** This cross-sectional validation study was conducted in department of Radiology, KRL Hospital Islamabad, which is equipped with PHILIPS MULTIVA 1.5 TESLA MRI machine after taking permission from The Hospital Ethical Committee for six months from 01-02-20 till 01-08-20. A total of 121 patients were selected with raised PSA levels, who later on underwent MRI with different sequences including T1WI, T2WI, DWI, and dynamic contrast enhanced sequences after giving I/V contrast followed by biopsy and histopathology. Data was collected on a proforma and later on analyzed on SPSS Version 16 while the results were analyzed by descriptive and inferential statistics. **RESULTS:** Out of 121 patients with mean age 51. 23 years with the standard deviation of – 8.57. Out of 121 patients, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI for the diagnosis of prostate carcinoma by taking histopathology as gold standard was found to be 92.3%, 82.7%, 94.4%, 77.4% and 90% respectively. **CONCLUSION:** It is concluded that magnetic resonance imaging is a highly sensitive, specific and rapid method for diagnosing prostate cancer which has potential to complement the current reference standard of histopathology and increase its overall sensitivity.

Keywords: Prostate carcinoma, prostate specific antigen, magnetic resonance imaging and histopathology.

Introduction

The second most common cause of deaths related to malignancy in men is prostate carcinoma.[1] The major benefit we can get from the mp-MRI in clinically significant prostate cancer is reduction in over diagnosis and over treatment of the disease by reducing the unnecessary biopsies. The mp-MRI when used along with PSA levels preceded by the targeted biopsy of the lesion shown on MRI, is more superior than the TRUS biopsy in diagnostic approach of prostate cancer detection.[2] For proper management of prostate carcinoma, the tumor staging is more effective. At TNM stage 1 or 2 therapeutic treatment may be given, when extra capsular extension (T3a), seminal vesical invasion (TVI; T3b) and distant metastasis are not present.[3]

In all men with suspicion of prostate carcinoma, followed by mp-MRI, MRI targeted biopsy and TRUS biopsy, no difference was noted in overall diagnosis of prostate carcinoma, but targeted biopsy through MRI has increased rate of significant prostate cancer

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detection, in comparison to insignificant prostate carcinoma. TRUS biopsy can detect insignificant prostate carcinoma.[4] One study showed sensitivity, specificity and prevalence of carcinoma prostate as 94%, 37 % and 48 % respectively.[6] In evaluation and diagnosis of prostate carcinoma. MR imaging is playing a good role, in which T1, T2 weighted images are combined with recent functional techniques like diffusion weighted images (DWI) and DCE-MR.[7]

In men with age more than 40 years and have raised PSA levels through MRI early detection of carcinoma prostate can be done and their treatment can be started as early as possible, false negative can be reduced and life span may be increased.

Methods and Materials

The study was duly approved by ERC of Institute (ER approval submitted). A total number of 121 patients were included in the study with raised PSA levels by non-probability consecutive sampling.

Inclusion criteria includes patients with raised PSA levels (>4ng/ml) and among 45-75 years age group while, patient with known malignancies, with previous biopsies and deranged RFTs and with known metallic implants were excluded from the study. A written informed consent was taken from the patients who were included in the study. MRI of the patient was done on PHILIPS MULTIVA 1.5 TESLA MRI machine including different sequences including T1WI, T2WI, DWI, and dynamic contrast sequences after giving the contrast. After completion of the MRI study of patient, then the case was reviewed and verified by consultant radiologist on console. Every suspected patient underwent biopsy and histopathology. Patients were then followed and data was recorded on the given proforma. Data was then analyzed on SPSS Version 16. Qualitative variable likely MRI findings, histopathology was measured in frequency or percentage. Quantitative variables like age and PSA levels was measured in mean standard deviation. 2x2 table was constructed to calculate sensitivity, specificity, PPV, NPV.

Results

A total of 121 patients visiting department of Radiology KRL Hospital Islamabad who met the inclusion criteria were included in this study.

Out of 121 patients minimum age of the patient was 48 while maximum age of the patients was 75 years. Mean age in our study was 51. 23 years with the standard deviation of – 8.57. Mean PSA level in our study was 9.47 – 2.51 months. As presented in (Tab.1).

Variable	Mean	Standard Deviation	Min-Max
Age (years)	51 . 23	± 8.57	48 - 75
PSA level (NG/ML)	9.47	± 2.51	6 - 14

Table 1: Descriptive statistics n=121

Frequency distribution of prostate carcinoma showed that out of 121 patients, 92 (76%) and 29 (24%) had and did not have prostate carcinoma respectively. As shown in (Fig.1).

Frequency distribution of MRI showed that out of 121 patients, 90 (74.4%) and 31 (25.6%) had and did not have prostate carcinoma respectively. As shown in (Fig.2).

Out of 121 patients, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI for the diagnosis of prostate carcinoma by taking histopathology as gold standard was found to be 92.3%, 82.7%, 94.4%, 77.4% and 90% respectively. As shown in (Tab.2,3).

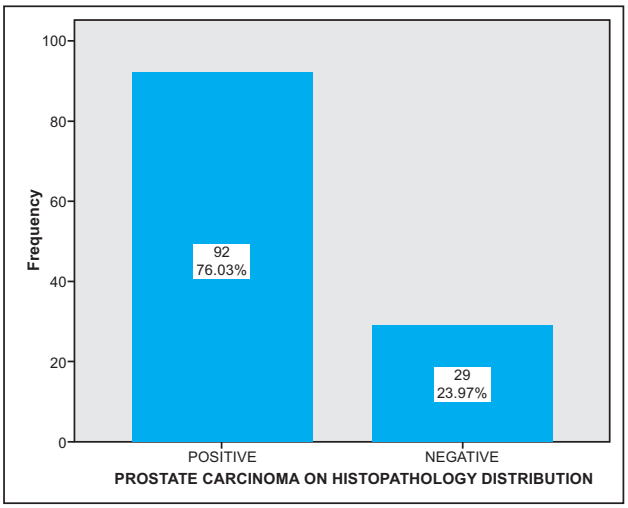

Figure 1: Prostate carcinoma on histopathology distribution n=121

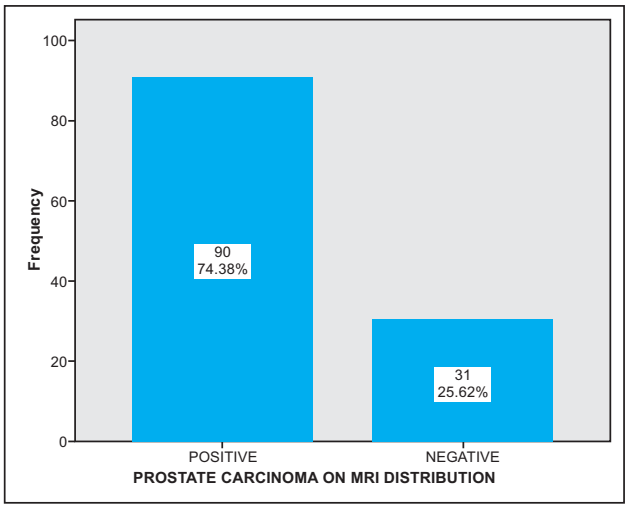

Figure 2: Prostate carcinoma on MRI distribution n=121

MRI	Histopathology		Total
	Positive	Negative	
Positive	85 (TP)	05 (FP)	90
Negative	07 (FN)	24 (TN)	31
Total	92	29	121

Table 2: Diagnostic accuracy of MRI for the diagnosis of prostate carcinoma by taking histopathology as gold standard n=121

Sensitivity	TP/TP+FN x 100	92.3%
Specificity	TN/TN+FP x 100	82.7%
Positive predictive value	TP/TP+FP x 100	94.4%
Negative predictive value	TN/FN+TN x 100	77.4%
Diagnostic accuracy	TP + TN/Total patients x 100	90%

Table 3: Diagnostic accuracy, sensitivity, specificity, positive predictive valve, negative predictive value of MRI for the diagnosis of prostate carcinoma by taking histopathology as gold standard n=121

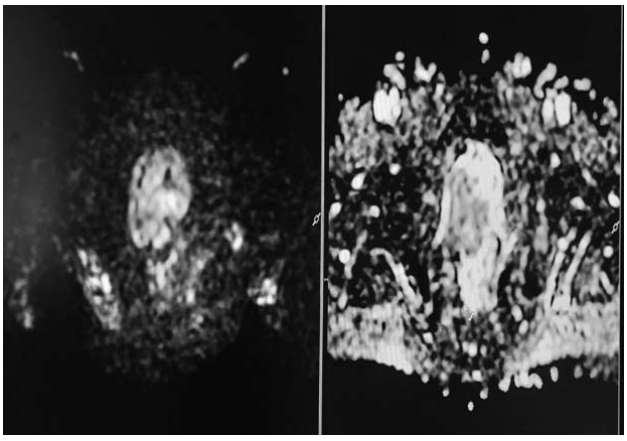

Figure 1: A hypointense lesion in the right peripheral zone of the prostate gland with extracapsular extension which is showing patchy restricted diffusion.

Out of 121 patients, sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRI for the diagnosis of prostate carcinoma by taking histopathology as gold standard was found to be 92.3%, 82.7%, 94.4%, 77.4% and 90% respectively.

Discussion

The second most common malignancy in males after the bronchogenic carcinoma is prostatic carcinoma.[8] This malignancy has multiple risk factors including family history and racial prevalence, however statistics show that there are no clear cut preventive measures hence an earlier diagnosis can lead to a better out come.[8] We can adopt different methods for prevention and screening of prostatic malignancies by employing the specific antigen of prostate, serum PSA quantification, however studies have shown that this screening had its own limitations leading to an overall over diagnosis of the prostatic malignancy, leading to a decline in the above mentioned screening tool.[9] Many other studied have also proved that PSA cannot be kept as a screening tool as it leads to overdiagnosis and unnecessary intervention and treatment.[10] Hence in addition to PSA levels we should employ other non invasive methods for the diagnosis of suspected patients with elevated PSA levels, MRI is one of these tools. As far as multiplanar MRI images are concerned the most important sequences employed are the

T2WI, The diffusion weighted images and the dynamic contrast enhanced sequences.[11] Many studies have advocated the role of MRI in the diagnosis of prostatic malignancies with a good sensitivity and specificity, when they were correlated with the histopathological evidence.[12] On MRI imaging a peripheral location, low signal intensity on T2WI, Diffusion restriction and dynamic curves showing washout on delayed phases are in favour of a malignant looking lesion.[13] The (Fig.1) shows a hypointense lesion in the right peripheral zone with extracapsular extension, A peripheral hypointense enhancing lesion showing extracapsular extension and involvement of adjacent structures with lymphadenopathy is highly suggestive of a malignant lesion with invasion of adjacent structures . Employing these three sequences of MRI a PIRADS scoring system to stratify the risk of prostate carcinoma has been established.[14] Lesions with score 3 and above are associated with a high positive predictive value for malignancy, hence an indication to carry out histopathology and further evaluation and management.[15] A positive histopathological correlation and pirads scoring and MRI has been established and validated in studies conducted world wide, but also MRI has added advantages in detection of extraprostatic extent of malignancy, nodal involvement an well as bony metastatic deposits.[16] Along with the above discussed characteristics, the dynamic contrast enhancement pattern, diffusion restriction and extracapsuar extension is a predictor of aggressiveness of the lesion and is associated with a higher grade of malignancy.[17] Multiple other studies as well as our study advocate positive correlation between MRI features and PIRADS classification and histopathological outcome.[18] Many studies have validated that MRI is proved to be the most favourable method of prediction of prostatic MRI.[19] Hence we can confidently say that MRI can predict prostatic malignancy as supported by our study in addition to the PSA levels, by avoiding over diagnosis, and warranting adequate intervention, following a timely diagnosis and management.

Conclusion

Magnetic resonance imaging has high sensitivity, specificity, and diagnostic accuracy in diagnosis of prostate cancer, accurately detecting prostate cancer location and severity when compared with gold standard histopathology. It thus has an important role in planning for future prostate biopsy.

Conflict of Interest: None

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