



Research Article

A COMPARATIVE STUDY OF DIAGNOSTIC ACCURACY FOR PROSTATE CANCER DETECTION BETWEEN BLIND TRANSRECTAL BIOPSY VERSUS MULTIPARAMETRIC MRI IMAGE BASED TRUS BIOPSY

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ABSTRACT

Introduction: Prostate cancer (PCa) is one of the most commonly diagnosed cancer in males. The diagnosis of carcinoma prostate cancer remains one of the only blind biopsy procedures done for cancer detection. Although the blind, finger guided transrectal biopsy has been replaced by TRUS-guided biopsy, in developing countries like India, blind biopsies are still being employed. Of late, Multi parametric MRI guided TRUS biopsies and mpMRI fusion biopsy are currently being employed in many of the centres for accurate diagnosis of prostate cancer. The objective of my study is to study and compare the diagnostic accuracy for prostate cancer detection by blind transrectal biopsy and Multiparametric MRI Image based TRUS biopsy MRI Image based TRUS biopsy.

Materials And Methods: Patients attending Urology outpatient department at Govt. Kilpauk Medical College Hospital and Govt. Royapettah Hospital, Age group of 40 to 80 years

With either hard, nodular prostate on digital rectal examination (DRE) or with a serum PSA value more than 4ng/ml from January 2015 to February 2016. All the eligible patients were subjected to 1.5 Tesla Multiparametric MRI. After adequate bowel preparation and antibiotic prophylaxis, blind, finger guided transrectal biopsy (12cores) was done by urologist. This was followed by TRUS biopsy based on the MRI images

Results: In this study, about 40 patients who fulfilled the inclusion criteria were included in the study. All 40 patients underwent both blind finger guided transrectal biopsy and mpMRI image based TRUS biopsy. Out of the 40 patients, only 9 (22%) patients who underwent blind finger guided transrectal biopsy were found to be cancer positive on histopathological examination. In comparison, 22 (55%) patients who underwent mpMRI image based TRUS biopsy were found to be cancer positive on HPE. 12 of the patients who had negative biopsy report with the blind finger guided method were found to be cancer positive on mpMRI image based TRUS biopsy

Conclusion: The overall value of MRI guided TRUS biopsy method in detecting prostatic carcinoma as a combined screening and case-finding test is very good. More chance of missing the cancerous lesion (false negative) by blind transrectal method. Significant upgrading of Gleason Score in mpMRI based TRUS biopsy in comparison to the other.

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INTRODUCTION

Prostate cancer (PCa) is one of the most commonly diagnosed cancer in males and is considered as the second most common cause of cancer related death in men. The diagnosis of carcinoma prostate cancer remains one of the only blind biopsy procedures done for cancer detection. Although the blind, finger guided transrectal biopsy has been replaced by TRUS-guided biopsy, in developing countries like India, blind biopsies are still being employed in many of the centres for diagnosis of prostate cancer. Of late Multiparametric MRI (mpMRI) has emerged as an important tool in the diagnosis of prostate cancer. mpMRI guided TRUS biopsies and mpMRI fusion biopsy are currently being employed in many of the centres for accurate diagnosis of prostate cancer

AIMS AND OBJECTIVES

To study and compare the diagnostic accuracy for prostate cancer detection by blind transrectal biopsy and Multiparametric MRI Image based TRUS biopsy MRI Image based TRUS biopsy. To study which of the two biopsy technique is more sensitive in detection of prostate cancer. To compare the Gleason score of the biopsy positive cases

MATERIALS AND METHODS

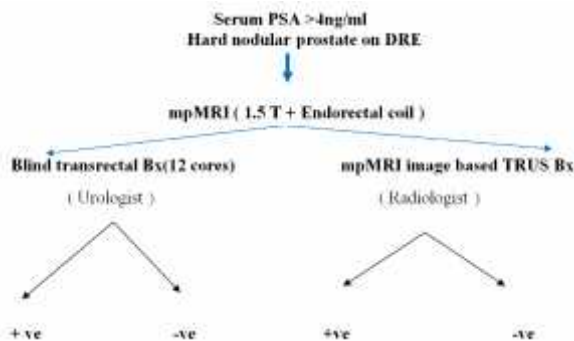
Study Group

Patients attending Urology outpatient department at Govt. Kilpauk Medical College Hospital and Govt. Royapettah Hospital from dec 2013 to, Age group of 40 to 80 years, With either hard, nodular prostate on digital rectal

examination (DRE) or with a serum PSA value more than **4ng/ml**. Patients with prior prostatic biopsy or surgery and Patients with coagulopathies are excluded.

METHODS

All the eligible patients were subjected to 1.5 Tesla Multiparametric MRI with endorectal coil and the prostatic image was stored. The image was blinded to the person (urologist) taking blind transrectal biopsy. After adequate bowel preparation and antibiotic prophylaxis, blind, finger guided transrectal biopsy (12cores) was done by urologist. This was followed by TRUS biopsy based on the MRI images (number of cores based on the suspected lesion: Average – 4), which was done by the radiologist. About 40 patients were included for the study. The rate of prostate cancer detection was compared between the two types of biopsies. The patients were divided into two groups, one undergoing blind transrectal biopsy whereas the other undergoing mpMRI image based TRUS biopsy. The correlation of the Blind Transrectal Biopsy and MRI Guided TRUS Biopsy results were reported as sensitivity and specificity. Statistical significance was taken as $P < 0.05$. The data was analysed using SPSS version 16 and Microsoft Excel 2007. Retrospective assessment of risk factors were done in the patients and retrospectively they were divided into prostate cancer positive and prostate cancer negative. Descriptive statistics was done for all data and were reported in terms of mean values and percentages. Suitable statistical tests of comparison were done. Continuous variables were analysed with the unpaired t test. Categorical variables were analysed with the Chi-Square Test and Fisher Exact Test



OBSERVATION AND RESULTS

Data Analysis

The increased mean age values in Pca positive group compared to Pca negative group is considered to be statistically significant as the p value of 0.0112 obtained by unpaired t- test, since $p < 0.05$. In patients belonging to Pca negative group, majority of the study subjects belonged to the 61-70 years age class interval (n=8, 44.44%) with a mean age of 59.50 years. In the PCa positive group majority belonged to the 61-70 years age class interval (n=13, 59.09%) with a mean age of 64.50 years. The increased IPSS in Pca negative group compared to Pca positive group considered to be statistically significant as the p value of 0.0450 obtained by Fishers exact test, since $p < 0.05$. In patients belonging to Pca negative group, majority of the study subjects belonged to the severely symptomatic class interval (n=10, 55.56%). In the PCa positive group majority belonged to the moderately symptomatic class interval (n=15, 68.18%). In patients belonging to Pca negative group, the incidence of obesity is

38.89 % (n=7). In PCa positive group the incidence of obesity is 50 % (n=11). The increased incidence of obesity in PCa positive group compared to Pca negative group is **not** statistically significant as the p value is > 0.05 as per fishers exact test. The increased incidence of hard consistency on DRE in Pca positive group compared to Pca negative group is considered to be statistically significant as the p value of < 0.0001 obtained by fishers exact test, since $p < 0.05$. In patients belonging to Pca negative group, incidence of hard consistency on DRE was 16.67% (n=3). In the PCa positive group, incidence of hard consistency on DRE was 86.36% (n=19). The increased presence of nodules on DRE in Pca positive group compared to Pca negative group is considered to be statistically significant as the p value of < 0.0001 obtained by fishers exact test, since $p < 0.05$. In patients belonging to Pca negative group, presence of nodules on DRE was 33.33% (n=6). In the PCa positive group, presence of nodules on DRE was 95.45% (n=21). The decreased mean prostate volume values in Pca positive group compared to Pca negative group is considered to be statistically significant as the p value of 0.0089 obtained by unpaired t- test, since $p < 0.05$. In patients belonging to Pca negative group, majority of the study subjects belonged to the 41-60 cc prostate volume class interval (n=10, 55.56%) with a mean prostate volume of 51.06 cc. In the PCa positive group majority belonged to the 41-60 cc prostate volume class interval (n=10, 45.45%) with a mean prostate volume of 37.95 cc. The increased mean serum PSA values in Pca positive group compared to Pca negative group is considered to be statistically significant as the p value of 0.0002 obtained by unpaired t- test, since $p < 0.05$.

In patients belonging to Pca negative group, majority of the study subjects belonged to the 4-20 ug/ml serum PSA class interval (n=17, 94.44%) with a mean serum PSA of 10.60 ug/ml. In the PCa positive group majority belonged to the 4-20 ug/ml serum PSA class interval (n=7, 31.82%) with a mean serum PSA of 44.41 ug/ml. The increased Pca detection by transrectal biopsy method in is considered to be statistically significant as the p value of 0.0021 as obtained by fishers exact test, since $p < 0.05$. In patients who did not have prostatic carcinoma, ca detection was 0% (n=0). In patients who had prostatic carcinoma, ca detection was 40.91% (n=9). The increased Pca detection by MRI guided TRUS biopsy method is considered to be statistically significant as the p value of < 0.0001 as obtained by fishers exact test, since $p < 0.05$. In patients who did not have prostatic carcinoma, ca detection was 0% (n=0). In patients who had prostatic carcinoma, ca detection was 100% (n=22). In our study majority of the patients had adenocarcinoma as the HPE diagnosis (n=22, 55%) followed by adenomatous hyperplasia (n=15, 37.50%). In our study 22.50% (n=9) of the blind transrectal biopsy patients had positive biopsy results. Whereas 55% (n=22) of the MRI guided TRUS biopsy patients had positive biopsy results. The increased gleason score in MRI guided TRUS biopsy method in comparison to the transrectal biopsy method is considered to be not statistically significant since $p > 0.05$. The increased gleason score by MRI guided TRUS biopsy method in relation to transrectal biopsy method is considered to be statistically significant with a p value of 0.0187 as obtained by fishers exact test, since $p < 0.05$. In patients belonging to to transrectal biopsy group, 0% had maximum gleason score of 4+4 (n=0). In the MRI guided TRUS biopsy group, 33.33% had maximum gleason score of 4+4 (n=3).

ANALYSIS AND DISCUSSION

In this study, about 40 patients who fulfilled the inclusion criteria were included in the study. All 40 patients underwent both blind finger guided transrectal biopsy and mpMRI image based TRUS biopsy. Out of the 40 patients, only 9 (22%) patients who underwent blind finger guided transrectal biopsy were found to be cancer positive on histopathological examination [1]. In comparison, 22 (55%) patients who underwent mpMRI image based TRUS biopsy were found to be cancer positive on HPE [2].

Blind Transrectal Biopsy

The sensitivity of blind transrectal biopsy method in detecting Pca is low (40.90%). Only 9 patients were CaP positive. 12 of the patients who had negative biopsy report with the blind finger guided method were found to be cancer positive on mpMRI image based TRUS biopsy[3]. Thus 12 patients had false negative report. The negative predictive value of this method was found to be 58.1%. This means that prostatic carcinoma positive biopsy results occur less consistently in those undergoing blind transrectal biopsy[4]. Given a sensitivity of 40.90%, we can safely conclude that only 41% of the patients on blind transrectal biopsy will have prostatic carcinoma positive results. The specificity of blind transrectal biopsy method in detecting Pca negative individuals is (100%). This means that prostatic carcinoma negative biopsy results occurs with extreme consistency in those without PCa in this method[5]. Given a specificity of 100%, we can safely conclude that 100% of the patients without PCa will have prostatic carcinoma negative biopsy results in this method. The negative predictive value was 58.10% which means that only 58% of the patients with a negative biopsy result for prostatic carcinoma are PCa free by this method.

mpMRI image based TRUS biopsy

In this method 22 out of 40 patients were found to be cancer positive. Rest of 18 negative cases were either benign conditions or did not have any abnormality[6]. Thus, the sensitivity of MRI guided TRUS biopsy method in detecting Pca in our study was extremely high (100%). This means that prostatic carcinoma positive biopsy results occur more consistently in those undergoing mpMRI image based TRUS biopsy. The specificity of MRI guided TRUS biopsy method in detecting Pca negative individuals is also high(100%)[7]. This means that prostatic carcinoma negative biopsy results occurs with extreme consistency in those without PCa in this method. Given a specificity of 100%, we can safely conclude that 100% of the patients without PCa will have prostatic carcinoma negative biopsy results. The positive predictive value was 100%, which means that 100% of the patients with a positive biopsy result for prostatic carcinoma in this method actually have PCa[8]. The negative predictive value was 100% which means that 100% of the patients with a negative biopsy result for prostatic carcinoma in this method are PCa free.

Comparative Studies

On comparing this data with other studies, Kasivisvanathan et.al[9] studied and carried out MRI guided prostate biopsy in 182 patients and they reported a sensitivity of 95 % and a specificity of 90%. Haffner et.al[10] studied and carried out MRI- TRUS biopsy in 555 men with suspected malignancy

and reported a sensitivity of 80% and specificity of 75 %. Hishokori *et al*[11] made a comparative study between TRUS and mpMRI targeted biopsy in 226 men and came out with sensitivity for the both group being 70% and 90% respectively. The specificity was 65 % for the former and 85 % for the later.

Gleason Score Upgrading

Out of the 9 patients, who had positive biopsy report for cancer in both the methods, 6 patients had an upgraded gleason score with mpMRI image based TRUS biopsy compared to the blind finger guided transrectal biopsy group. Thus around 66% of biopsy positive patients had an upgrading of the Gleason score [12]. This implies that the patient who had lower Gleason score on blind transrectal biopsy, the same patient had higher Gleason score on mpMRI image based TRUS biopsy. A study by Siddhique *et al*[13] showed an Gleason upgrading by 42 % in their study which compared TRUS biopsy with MRI fusion biopsy.

Number of cores

The number of biopsy cores taken in the blind finger guided transrectal group was standard 12 core biopsy for all the patients. Whereas in the second group (mpMRI image based TRUS Bx), biopsy were only taken only from the suspected sites[14]. The average number of cores taken by this method was about 4. Thus with minimum number of cores, more of cancer positive patients were detected by this method.

Retrospective analysis of the risk factors for carcinoma prostate

The mean age values was meaningfully more in PCa positive group compared to the PCa negative group by 8% with a mean difference of 5 years.

The incidence of severely symptomatic state assessed by IPSS was meaningfully more in PCa negative group compared to the PCa positive group by 2.44 times with a difference of 32.83 percentage points. The incidence of family history of prostatic carcinoma was meaningfully more in PCa positive group compared to the PCa negative group by 2.45 times with a difference of 16.16 percentage points[15]. The incidence of smoking was meaningfully more in PCa positive group compared to the PCa negative group by 3.82 times with a difference of 46.97 percentage points. The incidence of alcoholism was meaningfully more in PCa positive group compared to the PCa negative group by 3.82 times with a difference of 46.97 percentage points.

Retrospective analysis of physical findings and investigations

The incidence of hard consistency on DRE was meaningfully more in PCa positive group compared to the PCa negative group by 5.18 times with a difference of 69.70 percentage points[16]. The presence of nodules on DRE was meaningfully more in PCa positive group compared to the PCa negative group by 2.86 times with a difference of 62.12 percentage points. The mean prostate volume values was meaningfully less in PCa positive group compared to the PCa negative group by 35% with a mean difference of 13.10 cc[17]. The mean serum PSA values was meaningfully more in PCa positive group compared to the PCa negative group by 4.19 times with a mean difference of 33.81 ug/ml.

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