A COMPARATIVE STUDY OF DIAGNOSTIC ACCURACY FOR PROSTATE CANCER DETECTION BETWEEN ELASTOGRAPY PLUS MRI IMAGE BASED TRUS BIOPSY VERSUS EXTENDED CORE BIOPSY

Urology

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ABSTRACT

BACKGROUND: Prostate cancer is the most common malignancy in men in the western world (1). Serum prostate-specific antigen (PSA) with levels > 4.0 ng/mL considered as abnormal has been used as a screening test for prostate cancer. However, various benign diseases such as acute prostatitis, benign prostatic hypertrophy and previous therapeutic intervention of the prostate can lead to elevated PSA levels; therefore false-positive results from PSA test are not uncommon.(2) .Although blind finger guided transrectal biopsy has been replaced by TRUS guided biopsy,still cancer detection rate is not increased. In this study ,a comparison has been made of diagnostic accuracy of carcinoma prostate detection between elastograpy plus MRI image based trus biopsy versus extended core biopsy .

AIM AND OBJECTIVES: To study and compare the diagnostic accuracy for prostate cancer detection by TRUS guided extended core biopsy and elastography plus MRI image based TRUS biopsy .
To study which of the two technique is more sensitive in detection of prostate cancer and to compare the Gleason score of biopsy .

MATERIAL AND METHODS: We included 25 patients with no clinical suspicious of malignancy and with Serum PSA greater than 4.0 ng/dl . All patient had no hard nodule in DRE. All patients underwent Multiparametric MRI and Elastography . The lesions that are positive in both MRI and Elastography were taken for TRUS guided biopsy.Then random Extended core biopsy taken. All were sent in a separate container for histopathology. Histopathology report is analysed for adenocarcinoma, gleason pattern,score and number of cores positive .Group A consist of cores from MRI and Elastograpy guided TRUS biopsy and Group B is cores from Extended core biopsy. Both group were compared.

RE SULTS: The incidence of prostate cancer detection by MRI plus Elastrography guided TRUS is 13 cases (86.6%).
This biopsy method is considered to be statistically significant as the p value is 0.0387 as obtained by fishers exact test, since p < 0.05. In patients who had prostatic carcinoma, ca detection was 100% (n=22). The sensitivity of mpMRI plus Elastography image based TRUS biopsy method in detecting Pca is 81.90% and specificity is 80 %.The positive predictive value of this 81%.

CONCLUSION: Although mpMRI and Elastography are individually useful for detection of prostate malignancy ,combining both the diagnostic tools for TRUS guided increases the rate of cancer detection than that of Extended core biopsy. This also upgrades the Gleason score and sum also.

KEYWORDS

INTRODUCTION :

Prostate cancer is the most common malignancy in men in the western world (1). Serum prostate-specific antigen (PSA) with levels > 4.0 ng/mL is considered as abnormal and has been used as a screening test for prostate cancer. However, various benign diseases such as acute prostatitis, benign prostatic hypertrophy and previous therapeutic intervention of the prostate can lead to elevated PSA levels; therefore false-positive results from PSA test are not uncommon(2). Although blind finger guided transrectal biopsy has been replaced by TRUS guided biopsy,still cancer detection rate is not increased. Of late Multiparametric MRI (mpMRI) has emerged as an important tool in the diagnosis of prostate cancer(3). Elastography which was first described by Ophir et al.(4) is a relatively new imaging technique that displays the images of tissue stiffness. The mpMRI can be combined with elastography in taking prostate biopsy.

AIM AND OBJECTIVE:

To study and compare the diagnostic accuracy for prostate cancer detection by extended core biopsy and Elastography plus Multiparametric MRI Image based TRUS . 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 consist of Patients attending Urology outpatient department at Govt. Kilpauk Medical College Hospital and Govt. Royapettah Hospital from DECEMBER 2015 to FEBRAURY 2018, Age group of 40 to 80 years, with Serum PSA greater than 4.0 ng/dl. Patients with prior prostatic biopsy or surgery ,patient with prostatitis ,prostatic abscess , patient with bone metastasis and patients with coagulopathies are excluded. After adequate bowel preparation and antibiotic prophylaxis ,all patients underwent 1.5 Tesla Multiparametric MRI with endorectal coil and Grey scale ultrasonography followed by Strain elastography of prostate using GE-Logic S7 machine. All patient underwent TRUS biopsy based on the MRI and elastography images(number of cores based on the suspected lesion: Average – 4), followed by TRUS guided extended core biopsy (13 cores) done by radiologist randomly. About 40 patients were included for the study. Out of 40 cases three patients were not willing to do mpMRI and one patient had claustrophobia in MRI room. Only remaining 36 patients underwent biopsy . All biopsy samples were sent in separate containers for histopathology. Histopathology reports were analyzed for adenocarcinoma, Gleason pattern , score and number of cores positive. The rate of prostate cancer detection was compared between the two types of biopsies. Group A consisted of cores from MRI plus Elastograpy guided TRUS biopsy and Group B were cores from Extended core biopsy. Both group were compared. Statistical significance was taken as P < 0.05. The data was analysed using SPSS version 16 and Microsoft Excel 2007. 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 Fisher Exact Test.
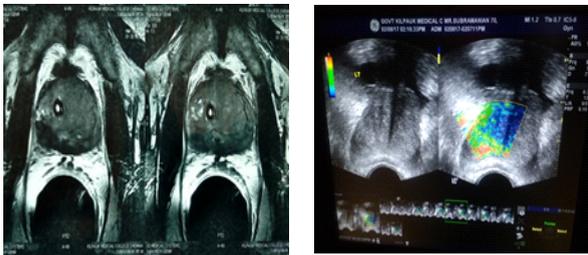
RESULTS :

All patients in our study were presented with either obstructive or irritative LUTS. The mean age of patients was 62.41 (49 to 75). The mean serum PSA for patients was 13.67 ng/dl (5.5 to 41.7).11 cases presented with AUR and patients were catheterized . In Patients with catheter, it was easy to identify the urethra in TRUS and safely do biopsy without injuring the urethra. The mean size of prostate in all 36 patients was 50.67 mg (30 to 85 mg). The mean size of prostate and serum PSA of patients with carcinoma prostate were 15.2 mg and 17 ng/dl respectively . Prostatic carcinoma detection with extended core biopsy was 40% (n=6). The incidence of prostate cancer detection by MRI plus Elastrography guided TRUS is 13 cases (86.6%).

MRI plus Elastrography guided TRUS biopsy method is considered to be statistically significant as the p value is 0.0387(since p < 0.05) as obtained by fishers exact test. In our study majority of the patients had adenomatous hyperplasia (n=21,58%) as the HPE diagnosis , followed by adenocarcinoma (n==15,41%). The increased Gleason score by MRI guided TRUS biopsy method in relation to extended core 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 extended core biopsy group, 0% had maximum gleason score of 4+4 (n=0). In MRI plus elastography guided TRUS biopsy group, 33.33% had maximum gleason score of 4+4 (n=3).

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Fig 1 MRI prostate showing hyperintense area fig 2 Real time elastro graphy

ANALYSIS AND DISCUSSION:
Neoplastic cells have greater cell density that alters the tissue elasticity and stiffness (5). This principle is used in real time elastography. Currently available Elastography techniques can be categorized by the measured physical quantity:

1) strain imaging, and 2) shear wave imaging.
Here in this study the Strain elastography was used and its diagnostic value in prostate malignancy was evaluated.

In this study, about 36 patients who fulfilled the inclusion criteria were included in the study. All 36 patients underwent both mpMRI plus elastography guided TRUS biopsy and extended core biopsy. Out of the 36 patients, only 6(40%) patients who underwent extended core biopsy were found to be cancer positive on histopathological examination . In comparison, 13 (86.6%) patients who underwent mpMRI plus Elastography image based TRUS biopsy were found to be cancer positive on HPE. The sensitivity of mpMRI plus Elastography image based TRUS biopsy method in detecting Prostae cancer was 81.90% and specificity was 80 % . The positive predictive value of this method was found to be 81%.

Kasivisvanathan et.al(6) 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(7) studied and carried out MRI-TRUS biopsy in 555 men with suspected malignancy and reported a sensitivity of 80% and specificity of 75 %. Whereas Cochlin *et al.*(8) reported that RTE had a sensitivity of 51% and a specificity of 83% for detecting prostate cancer in individual patients, and a sensitivity of 31% and specificity of 82% for detecting individually biopsied areas of the prostate. The sensitivity and specificity of extended core biopsy in this study is 16% and 81.82% and positive predictive value of 66.67%. Around 56% of biopsy positive patients had an upgrading of the Gleason score that is the patient who had lower Gleason score on extended core biopsy, had higher Gleason score on mpMRI plus elastography image based TRUS biopsy. A study by Siddhique *et al*(9)

showed an Gleason upgrading by 42 % in their study which compared TRUS biopsy with MRI fusion biopsy. Prostate cancer lesions can be isoechoic by TRUS , two common forms of prostate pathology (prostatitis and BPH) can mimic the TRUS appearance of prostate cancer and TZ cancers are difficult to detect (10). Hence to evaluate this populations it could be better to go with mpMRI with real time elastography . RTE can be used to illustrate tissue elasticityadequately to a depth of 5 cm, but we think that for BPH, and in the lateral part of the elastograms, and with increasing depth of US, many 'stiffness artefacts' are detectable. Tilting the US probe should be helpful in overcoming these 'lateral stiffness artefacts',but the 'deep stiffness artefacts' with increasing depth of TRUS could be over come with MRI images (11).

CONCLUSION:
Although mpMRI and Elastography are individually useful for detection of prostate malignancy ,combining both the diagnostic tools for TRUS guided increases the rate of cancer detection than that of Extended core biopsy. This also upgrades the Gleason score and sum also.

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