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Original article:

Targeted antimicrobial prophylaxis on rectal swab testing before TRUS Guided Prostate Biopsy

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Abstract:

The prostate is a compound tubuloalveolar exocrine gland of the male reproductive system in humans. The mean weight of the normal prostate in adult males is about 11 grams, usually ranging between 7 and 16 grams.The function of the prostate is to secrete a slightly alkaline fluid, milky or white in appearance, that usually constitutes roughly 30% of the volume of semen along with spermatozoa and seminal vesicle fluid[3]. The prostatic fluid is expelled in the first part of ejaculate, together with most of the sperm. In comparison with the few spermatozoa expelled together with mainly seminal vesicular fluid, those in prostatic fluid have better motility, longer survival, and better protection of genetic material. The prostatic gland also contains some smooth muscles that helps during ejaculation of semen.

Introduction:

The prostate is a compound tubuloalveolar exocrine gland of the male reproductive system in humans[1] . The mean weight of the normal prostate in adult males is about 11 grams, usually ranging between 7 and 16 grams[2].The function of the prostate is to secrete a slightly alkaline fluid, milky or white in appearance, that usually constitutes roughly 30% of the volume of semen along with spermatozoa and seminal vesicle fluid[3]. The prostatic fluid is expelled in the first part of ejaculate, together with most of the sperm. In comparison with the few spermatozoa expelled together with mainly seminal vesicular fluid, those in prostatic fluid have better motility, longer survival, and better protection of genetic material. The prostatic gland also contains some smooth muscles that helps during ejaculation of semen.

Prostate cancer is a significant health care problem for American men. It continues to be the most commonly diagnosed malignancy in American men and the second leading cause of cancer deaths [4].Factors that increase the risk of prostate cancer include older age,family history of disease and race. [5].

Trans-rectal ultrasound (TRUS) of the prostate was first reported by Wild and Reid in 1955 and popularized by Watanabe and associates in 1971[6]. TRUS-guided prostate needle biopsies were introduced a decade later in the early 1980s, and in 1989 Hodge et al.[7] proposed the sextant method of prostate biopsy. Technological developments that have improved TRUS and its role in prostate cancer detection include an automated spring-loaded prostate biopsy device, multi-axial planar imaging, and a better understanding of prostate zonal anatomy[8]. In addition improved ultrasound technology, including the introduction of power Doppler ultrasound[9], contrast agents

[10], and new imaging techniques, such as three dimensional image reconstruction [11] may improve the performance of TR US in cancer detection and staging.

McNeal [12] described the concept of zones rather than lobes, and his is the model of prostate anatomy that is most widely accepted. The urethra divides the prostate into an anteriorly located fibromuscular stroma and posteriorly located glandular tissue. The glandular tissue is further subdivided into a peripheral zone (PZ), central zone (CZ), and a transition zone (TZ). The peripheral zone (PZ) comprises the bulk of the normal adult prostate gland (70% of the glandular tissue) and is thought to derive embryologically from the urogenital sinus · The PZ comprises all of the prostatic glandular tissue at the apex and essentially all of the prostatic tissue located posteriorly near the capsule. Approximately 68% of prostatic cancers arise from this zone.

The indications of TRUS guided biopsy include men with abnormal DRE, an elevated PSA (>4.0 ng! mL), or PSA velocity (rate of PSA change) >0.75 ng/mL/yr [13], men who were diagnosed with high-grade prostatic intraepithelial neoplasia (PIN) or atypia on a previous prostate needle biopsy should undergo a repeat biopsy 3 to 12 month later [14]. Less commonly agreed upon recommendations for TRUS-guided prostate needle biopsy include age-specific PSA elevation, ethnicity-specific PSA parameters, a low percentage of free PSA «25%), elevated human glandular kallikrein-2 levels, and a PSA density >0.15, which is a measure of the amount of PSA relative to the overall prostatic volume (PSA divided by the prostate volume in cubic centimeters).Relative indications for TRUS-guided prostate needle biopsy include a palpable abnormality on DRE or a rising PSA suggestive of local, rather than distant, recurrence.

Material & methods:

Study Design: This was a prospective study conducted in the department of urology at Sher-i-kashmir institute of medical sciences Soura Srinagar.

Exclusion Criteria:

- Patients having UTI before TRUS guided biopsy.
- Patients with indwelling catheter.
- Immunocompromised patients.

Procedure:

- Rectal swabs were collected using cotton tipped culture swabs in patients underwent TRUS guided biopsy.
- These swabs were plated on MacConkey Agar +ciprofloxcin plate and one standard MacConkey Agar plate.
- Urinolysis was done in all patients before TRUS guided biopsy to detect the prior urinary tract infection.
- Targeted antimicrobial prophylaxis's was adminstered based on culture report before prostate biopsy.
- All patients were observed for urinary tract complications after TRUS guided prostate biopsy.

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Statistical Analysis:

Statistical Analysis has been done by the using statistical package for the social sciences software programe (SPSS) for Windows 10. Significance has been accepted at the 5% level ($P<0.05$).

Results &observations:

The total of 118 patients were included in the study with a mean age of 60.4 yrs ,who underwent rectal swab culture before TRUS guided biopsy. All the inclusion and exclusion criteria were strictly followed during the study. Culture swabs were collected in all patients3 days before prostate biopsy. In all patients, culture and sensitivity of rectal swab was done and targeted antimicrobial prophylaxis was given before TRUS guided prostate biopsy. After TRUS guided biopsy , routine urine examination was done to diagnosis the post biopsy urinary tract infection. Out of 118 patients included in the study, E.coli resistance to flouroquinolones was seen in 29(24.57%) patients ,uncomplicated urinary tract infection was seen in 1(0.84%) patient and complicated UTI (sepsis and bacteremia) was not seen in any patient.

Table showing Age distribution of patients

Age(in years)	Frequency	Percentage
55-70	87	73.37
>70	31	26.63
Total	118	100

Mean age =60.4 yrs

Our study showed a flouroquinolone resistance in24.57 % (29/118) patients on rectal culture swab testing. The flouroquinolone sensitivity of E. coli was seen in 75.43% (29/118) of patients.

TABLE SHOWING THE PREVELANCE OF E. COLI RESISTANCE TO FLUOROQUINOLONES.

E. COLI	No. of patients	Percentage
Sensitivity to FQs	89	75.43
Resistance to FQs	29	24.57
Total	118	100

In our study , post biopsy urinary tract infection was seen in 01 patient (0.84%), which is statistically significant (p=0.031). Out of 118 patients included in the study, no patient developed post biopsy complicated urinary tract infection (sepsis and bacteremia) which is also stastistically significant while comparing with empirical prophylaxis.

Table showing the Incidence of urinary tract infection after targeted antimicrobial prophylaxis before TRUS guided biopsy.

No of patients	Uncomplicated UTI	Sepsis	Bacteremia
118	01	Nil	Nil

Discussion:

This study was conducted at Sher-i-Kashmir institute of Medical Sciences Soura Srinagar in the Department of Urology.It was a prospective gender specific (male) study to assess the efficacy of targeted antimicrobial prophylaxis and to detect the flouroquinolone resistance in the rectal flora of patients underwent TRUS biopsy.

Most of the urologists prefer to use antimicrobial prophylaxis before TRUS guided prostate biopsy. Currently, there are two approaches for antimicrobial prophylaxis before TRUS guided prostate biopsy, to reduce the post TRUS biopsy urinary tract infections. One is empirical prophylaxis and another is the targeted antimicrobial prophylaxis. Empirical prophylaxis has initially shown promising results, but it fails to assess the rectal source of

post-biopsy infections and its use is directly related to increasing antimicrobial resistance. Alternatively, rectal swabs can guide targeted antimicrobial prophylaxis, determine the population of flouroquinolone resistant bacteria and help in identifying the specific pathogens associated with post biopsy urinary tract infections[19].Patients receiving empirical antimicrobial prophylaxis before TRUS biopsy had five-fold increase in the rate and severity of post-biopsy infections due to presence of fluoroquinolone resistant bacteria in the rectal flora[20].This finding supports the use of pre-biopsy rectal cultures to identify patients at risk and to select the targeted antimicrobial prophylaxis that is likely to be very effective. In our study, following targeted antimicrobial prophylaxis before TRUSPB, the uncomplicated urinary tract infection was seen in 01 patient(0.84%).Our results are consistant with the study carried out by Amelia Cussans at el .In their study, they found uncomplicated urinary tract infection 0.72% of patients. Our study is also comparable with the study done by Aradas at el[21] done in 2012.In their study. they found uncomplicated urinary tract infection in 0.69% of patients. Another study done by Suwantarat at el found the incidence of uncomplicated urinary tract infection in 5.30% of patients after empirical antibiotic prophylaxis. Therefore, there is a significant decrease in the infectious complications after culture directed antimicrobial prophylaxis. Hence, our study supports the use of targeted antimicrobial prophylaxis before TRUSPB.

In our study, no patient had complicated UTI (sepsis and bacteremia).Our study is comparable with the study done by Duplessis at el[22] who studied a total of 235 patients . In their study, following targeted antimicrobial prophylaxis, complicated urinary tract infection (sepsis ,bacteremia) was not seen in any patient. Our results are also comparable with the study done by Taylor at el, Aradas at el ,Caskurla at el and Farrell at el .In all these studies, complicated UTI were not seen in any patient. Our study showed that there was relatively a high prevalence of floroquinolone resistance (24.29%) in our community. Our study is consistent with the study done by Amelia cussans at et]who found a fluoroquinolone resistant E. coli in approx. 23% of patients. Another study done by Micheal A. Liss at el found the prevalence of ciprofloxacin resistant E.coli in 25% of patients on rectal swab which is comparable with our study

The study done by Dai at el ,Duplessis at el and Suwantarat at el found a fluoroquinolone resistant E.coli in approximately 13% of patients. In our study, FQs resistance was seen in 24.29% of patients. It may be due to injudicious use of antibiotics in our community.

There are several other alternative strategies to targeted antimicrobial therapy that have been implemented in some centers, aiming to reduce PTBIC risk .One of the strategy is the use of rectal cleansing and disinfection. The aim behind pre-biopsy cleansing enemas is the reduction of microbial burden, thereby reducing the bacterial inoculation into the prostate tissue by the biopsy needle. It may also improve TRUS visualization of the prostate by reducing faecal artefacts. However, there is no evidence that enemas provide a clinically significant outcome advantage and the procedure causes inconvenience and increased cost. Therefore, this practice is currently not recommended in European guidelines. Rectal disinfection using agents, such as povidone-iodine or chlorhexidine, has also been studied; however, data are currently inconclusive . Washing the biopsy needle with povidone-iodine has been proposed, although this technique has not been shown to reduce PTBIC rates [110]. Transperineal biopsy is another approach which can be used with the aim to reduce infection rates and also to allow saturation, targeted or mapping

biopsies. However, lack of conclusive evidence of overall benifit and the burden of additional cost limit the widespread replacement of TRUS biopsy with this method.

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