Prophylactic role of ciprofloxacin and ceftriaxone in prostate biopsy-related infection: time to Adopt new strategy

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Trans-rectal ultrasound (TRUS) guided prostate biopsy is a commonly performed procedure by urologists and is the gold standard technique for diagnosing prostate cancer. It is estimated that more than 2 million biopsies are conducted annually in the United States and Europe. This procedure carries various risks, including infection. Post-biopsy infections can lead to severe conditions like sepsis, prolonged hospitalization, and increased procedural costs. This is particularly crucial in low-income settings with limited access to universal health insurance.

To mitigate infectious complications following prostate biopsy, the standard recommendation is prophylactic antibiotics. Traditionally, fluoroquinolones have been the go-to choice for this purpose. The American Urological Association (AUA) policy statement on urologic surgery antimicrobial prophylaxis in 2012 recommended fluoroquinolones or first through third-generation cephalosporins for prostate needle biopsies. Recent evidence suggests that fluoroquinolone resistance is on the rise due to their overuse and misuse. In regions like mine where antibiotics are readily available over the counter without prescriptions, the issue of fluoroquinolone resistance could be more severe.

Although my institution lacks specific guidelines for antibiotic prophylaxis during prostate biopsy, fluoroquinolones have been commonly used. Given the increasing resistance of microorganisms causing post-biopsy infections to fluoroquinolones, we undertook a study titled "Prophylactic Role of Ciprofloxacin and Ceftriaxone in Prostate Biopsy-Related Infection: Randomized Comparative Study of Bacterial Spectrum and Antibiotic Sensitivities." The aim of this mini review is to assess infection rates in the study groups and explore emerging strategies to reduce post-biopsy infections.

The prevalence of urinary tract infections was 61% in Group 1, where ciprofloxacin was used for prophylaxis, and 43% in Group 2, where ceftriaxone was administered. Notably, all isolated organisms in Group 1 were resistant to ciprofloxacin, the prophylactic antibiotic used, while a significant portion of bacterial isolates (82.35%) in this group were susceptible to a cephalosporin. In Group 2, where ceftriaxone was employed for prophylaxis, all isolated organisms were resistant to ceftriaxone but sensitive to other cephalosporins (such as ceftazidime, cefepime), ciprofloxacin, levofloxacin, or amoxicillin plus clavulanic acid in most cases.

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The infection rates of 61% and 43% in Group 1 and Group 2, respectively, in this study are considerably high. Another study in Nigeria that conducted rectal swab culture and sensitivity analysis before prostate biopsy revealed that 57% of bacterial isolates were resistant to ciprofloxacin. The observed high resistance to ciprofloxacin and ceftriaxone could be

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attributed to antibiotic abuse and misuse, which has been documented in a third of the Nigerian population.

A study published in 2011 reported infectious complication rates from prostate biopsy ranging from 0.1% to 7%, depending on the antimicrobial agents used. Compared to our findings of 43-61% nearly a decade later, it is evident that post-biopsy infections have been on the rise over the years.

The implications of these findings suggest that the empirical use of ciprofloxacin and ceftriaxone as prophylaxis for prostate biopsy is inadequate and should be discouraged. Consequently, the European Commission has banned fluoroquinolones for antibiotic prophylaxis in urological surgeries and diagnostic interventions due to an unfavorable benefit-risk balance.

From our study, we have learned that while ceftriaxone demonstrated a lower infection rate compared to ciprofloxacin (43% vs. 61%), it did not effectively mitigate post-biopsy infections. Therefore, to address the challenges posed by high fluoroquinolone resistance and the inefficacy of ceftriaxone as an alternative, two approaches to preventing post-biopsy infections have garnered attention and merit exploration: augmented antimicrobial prophylaxis and targeted prophylaxis based on prebiopsy screening for rectal colonization with ciprofloxacin-resistant organisms.

Augmented regimens involve adding a second antimicrobial agent, such as gentamicin, cephalosporin, or piperacillin-tazobactam, to a fluoroquinolone. A previous study conducted in the United States demonstrated the efficacy of augmented prophylaxis by revealing that single-agent antimicrobial prophylaxis, including ciprofloxacin, ceftriaxone, or augmentin, was associated with significantly more infections than ciprofloxacin plus an additional agent like ceftriaxone.

A review of our study data indicates that in Group 1, all isolated organisms except for three E. coli strains were susceptible to a cephalosporin (ceftazidime, cefuroxime, or ceftriaxone). Therefore, a combination of ceftazidime and ciprofloxacin would have reduced positive urine cultures in this group to only 3 out of 28 (10.71%). Similarly, in Group 2, all the isolated organisms except one (Pseudomonas spp) were sensitive to ceftazidime or a fluoroquinolone (ciprofloxacin/levofloxacin). Hence, a combination of ceftazidime and ciprofloxacin would have decreased positive urine cultures in this group to just 1 out of 28 (3.57%).

In targeted therapy, the selection of antibiotic prophylaxis is guided by the results of prebiopsy rectal swab culture and sensitivity testing. A study conducted in Lagos, Nigeria, by Doherty and colleagues demonstrated a post-biopsy infection rate of 2% with targeted therapy, representing a 5.6-fold reduction in infection rates compared to empirical antibiotic prophylaxis.

In conclusion, empirical use of ciprofloxacin or ceftriaxone as prophylaxis for prostate biopsy is inadequate and should be discouraged. Targeted and augmented prophylactic regimens have shown promising results and should be considered best practice.

REFERENCES

1. Stacy Leob, Annelies Vellekoop, Hashim U. Ahmed, James Catto, Mark Emberton, Robert Nam, Dereck J Rosario, VicenzoScattoni, YariLotan. Systematic review of complications of prostate biopsy. European Urol. 2013;64(6):876-892
2. Mathew R. Coopeeberg, Joseph C. Presti JR, Katsuto Shinohara, Peter R. Carrol. Neoplasm of the prostate gland. In: Jack W McAninch, Tom F. Lue eds. Smith and Tanagho's General urology. 18th ed. McGraw Hill. 2013 pp 350-379
3. Wolf JS, Bennett CJ, Dmochowski RR, Hollenbeck BK, Pearle MS, Schaeffer AJ, Pace KT. Best practice policy statement on urologic surgery antimicrobial prophylaxis. J Urol. 2012; 180(5): 2262-2263
4. Borghesi M, Ahmed H, Nam R, Schaeffer E, Schiavina R, Taneja S, et al. Complications after systematic, random, and image-guided prostate biopsy. EurUrol(2017) 71(3):353–365.
5. Ahmed HU, El-ShaterBosaily A, Brown LC et al: Diagnostic accuracy of multi-parametric MRI and TRUS biopsy in prostate cancer (PROMIS): a paired validating confirmatory study. Lancet 2017; 389: 815
6. Liss MA, Ehdaie B, Loeb S et al: An update of the American Urological Association white paper on the prevention and treatment of the more common complications related to prostate biopsy. J Urol 2017; 198: 329.
7. Odo C, Afogu EN, Odoemene CA, Obi AO, Mbaeri TU, Obiesie EA et al. Prophylactic role of ciprofloxacin and ceftriaxone in prostate biopsy-related infection: randomized comparative study of bacterial spectrum and antibiotic sensitivities. African Journal of Urology 2021; 27:157-162
8. Doherty A. F., Ikuerowo S. O., Jeje E. A., Ibrahim N. A, Ojongbede O. L., Mutiu W. Bet. al prospective randomized comparative study of targeted versus empirical prophylactic antibiotics in the of infective complication following transrectal ultrasound-guided prostate biopsy. Annals of African Medicine 2019; 18(3)132-137
9. Chukwu E.E., Oladele D. A., Awoderu O.B, Afocha E.E, Lawal R.G, Abdus-salam I et al. A national survey of public awareness of antimicrobial resistance in Nigeria. Antimicrob Resist Infect Control. 2020; 9:72-81
10. Liss MA, Chang A, Santos R, Nakama-Peeples A, Peterson EM, Osann K, et al. Prevalence and significance of fluoroquinolone-resistant Escherichia coli in patients undergoing transrectal ultrasound-guided prostate needle biopsy. J Urol 2011; 185:1283-1288.
11. Bonkat G, Pilatz A and Wagenlehner F: Time to adapt our practice? The European Commission has restricted the use of fluoroquinolones since March 2019. EurUrol 2019; 76: 273.
12. JA Karlowsky, LJ Kelly, C Thornsberry, ME Jones, AT Evangelista, IA Critchley, DF Sahm. Susceptibility to fluoroquinolones among commonly isolated Gram-negative bacilli in 2000: TRUST and TSN data for the United States. Tracking resistance in the United States today. The surveillance network. Int J Antimicrob Agents, 2002; 19:21–31
13. Marino K, Parlee A, Orlando R, Lerner L, Strymish J, GuptaK. Comparative effectiveness of single versus combination antibiotic prophylaxis for infections after transrectal prostate biopsy. Antimicrob Agents Chemother. 2015; 59 (12): 7273-7275.