ORIGINAL PAPER

URINARY TRACT INFECTIONS

Ciprofloxacin: single versus multiple doses in transrectal ultrasound guided prostate biopsy

Muhammad Rafiq[1], Fawzy Farag[1,2], Kate Manley[1], Edwin Ho[1]

[1]Department of Urology, Norfolk & Norwich University Hospital, Norwich, United Kingdom
[2]Department of Urology, Sohag University Hospital, Sohag, Egypt

Citation: Rafiq M, Farag F, Manley K, Ho E. Ciprofloxacin: single versus multiple doses in transrectal ultrasound guided prostate biops. Cent European J Urol. 2020; 73: 91-93.

Article history
Submitted: Nov. 20, 2019
Accepted: Feb. 23, 2020
Published online: March 23, 2020

Corresponding author
Fawzy Farag
Norfolk & Norwich University Hospital
Department of Urology
Colney Ln
Norwich NR4 7UY, UK
ff.farag@gmail.com

Introduction There is rising concern regarding overuse of fluoroquinolones due to severe musculoskeletal and neurological side effects, and development of resistant microorganisms. In June 2019, the European Commission recommended fluoroquinolones should not be used routinely for prophylaxis in urological surgical procedures. Methods to reduce unnecessary exposure to fluroquinolones should be investigated.

The aim of this article was to determine differences in hospital admission secondary to sepsis following transrectal ultrasound (TRUS) guided prostate biopsies between patients who received single vs. multiple doses of fluoroquinolones.

Material and methods A retrospective analysis (June 2017–September 2018) of 200 consecutive TRUS biopsies at a single centre was undertaken. Group 1 (n = 100) received 750 mg ciprofloxacin 1-hr before their procedure followed by 3 days of ciprofloxacin 250 mg BD. Group 2 (n = 100) received a single dose of 750 mg ciprofloxacin 1-hr before the procedure. Midstream urine (MSU) culture results were examined pre-biopsy and 7 days post-biopsy. Data was also gathered on readmission rates to hospital as a result of urosepsis.

Results A total of 1% of patients in each group required hospital admission secondary to Escherichia coli sepsis. A further 4% (n = 4) in Group 1 developed a urinary tract infection requiring antibiotic treatment post biopsy compared with 1% (n = 1) in Group 2. There was no statistically significant difference in development of infectious complications post-biopsy between the two groups (p >0.05).

Conclusions A single prophylactic dose of 750 mg of ciprofloxacin 1-hour pre-biopsy is as effective as multiple doses for TRUS guided prostate biopsy. Avoiding an unnecessary and prolonged course of fluoroquinolones has advantages in reducing potential side effects and development of resistant pathogens.

Key Words: antibiotics ‹› transrectal ultrasound guided prostate biopsy

INTRODUCTION

Fluoroquinolones have been widely utilised in urological practice due to their broad coverage of gram-negative bacteria and high concentrations found in the urinary tract. More recently however, concerns have been raised regarding their use. Several reports have been published demonstrating the development of enteric bacterial resistant strains secondary to overuse of fluoroquinolones [1, 2, 3]. In addition, fluoroquinolones have been associated with side effects such as tendinopathy, neurological complications such as peripheral neuropathy and cognitive disturbance and gastrointestinal upset. Incidence of side effects reported with fluoroquinolone use has been between 3 and 13%. Higher doses are associated with more severe side effects [4].

In June 2019, the European Commission recommended fluoroquinolones should not be used in prevention of infection in urological surgical procedures

doi: 10.5173/ceju.2020.0067

including transrectal ultrasound (TRUS) guided prostate biopsy [5]. A sepsis rate of around 1% has been reported in the published literature following TRUS biopsy when prophylactic antibiotics are given. Fluoroquinolones are commonly used for prophylaxis in TRUS guided prostate biopsy – ciprofloxacin has been demonstrated to penetrate effectively into prostate tissue [6]. Antibiotic agents such as gentamicin, fosfomycin, and amikacin have also been suggested as alternatives but some of them have to be administered either intravenously or intramuscularly.

There is inconsistent evidence regarding the use of combination versus single antibiotic prophylaxis for TRUS guided prostate biopsy in the literature [7, 8]. Further investigation is required to identify a minimum dose of fluoroquinolone required to achieve a satisfactory reduction in infectious complications whilst limiting potential for side effects or antibiotic resistance.

The difference in hospital admission rates secondary to urosepsis was investigated for patients who received a single dose versus multiple doses of fluoroquinolones as prophylaxis following TRUS guided prostate biopsy.

MATERIAL AND METHODS

The Norfolk and Norwich University Hospital is a tertiary referral centre in Norfolk, United Kingdom, covering a population of 1,000,000. Around 400 TRUS biopsies are performed in the outpatient setting per year, in addition to the trans-perineal approach.

Electronic records at our centre were reviewed to retrieve data of 200 consecutive men who underwent TRUS guided prostate biopsy between June 2017 and Sep 2018. Data was gathered for 100 patients before and 100 patients after a change in antibiotic prescribing policy. Group 1 (n = 100) received single dose of 750 mg ciprofloxacin an hour before TRUS guided prostate biopsy followed by a 3-day course of ciprofloxacin 250 mg twice daily. Group 2 (n = 100) received a single dose of 750 mg ciprofloxacin an hour before TRUS guided prostate biopsy and received no further doses. In order to identify the incidence of urinary tract infection (UTI) and hospital admissions secondary to sepsis following TRUS biopsy in each group, MSU culture results were examined for pre- and post-biopsy samples, as were admission rates to hospital and / or positive blood culture results within 7 days of the procedure.

Data between Groups 1 and 2 were compared, and assessment of statistical significance was dose using Fishers Exact test, with a significance level set at 0.05.

RESULTS

Data from 200 patients was included in the final analysis. The median age was 73 years (range 49–84). All pre-biopsy MSU samples were negative for infection prior to TRUS guided prostate biopsies. A total of 62 patients (62%) were diagnosed with prostate cancer in Group 1, while 65 patients (65%) had this diagnosis in Group 2 ($p > 0.05$).

In Group 1, only one patient (1%) developed Escherichia Coli (E. coli) sepsis confirmed on urine and blood cultures. This necessitated hospital admission and management with intravenous antibiotics. Another patient (1%) developed a symptomatic UTI with positive urine cultures (E. coli) and was treated with oral antibiotics as an outpatient. In Group 2, one patient (1%) was admitted to hospital with sepsis and positive urine cultures (E. coli) which was treated with IV antibiotics. Four patients (4%) developed symptomatic UTI as proven by MSU and were treated in community with oral antibiotics. There were no patients requiring high dependency support, radiological or surgical intervention in either group.

A comparison between groups 1 and 2 has demonstrated that there is no significant difference between rates of hospital admission with sepsis or symptomatic UTI treated in the outpatient setting ($p > 0.05$).

DISCUSSION

TRUS guided prostate biopsy is a nonsterile procedure and necessitates passage of a needle through the rectal wall – due to the high likelihood of infection, antibiotic prophylaxis is required to reduce the risk [9]. Protocols for prophylactic antibiotics for TRUS guided prostate biopsy vary between NHS Trusts in the UK and are dependent on local policy. The rates of UTI and sepsis following TRUS guided prostate biopsy reported in literature are 2.5–9.2% and up to 1%, respectively [11]. A large population-based study performed in Australia revealed a 1.7% rate of readmission due to infection within 7 days following TRUS biopsies [10].

The Enterobacteriaceae family are responsible for up to 80% of UTIs [12]. Extended spectrum beta lactamases (ESBL) present a serious challenge to antibiotic treatment of UTIs as they are encoded on a large plasmid that adds to the resistance determinants for antibiotics including fluoroquinolones [13].

The trends of resistance of facultative anaerobic gram-negative bacilli of Citrobacter-Enterobacter-Serratia genera (CES) UTIs of inpatients and outpatients have been investigated in a 10-year survey which found that ESBL producing organisms were detected in up to 9% and 29% from outpatients and

inpatients respectively [9]. The combination of developing resistant CES strains and their intrinsic non-susceptibility to many antibiotics limit the therapeutic alternatives for outpatients in particular.

Studies examining resistance patterns and epidemiology of E. coli and Klebsiella associated urinary tract infections in both inpatients and outpatients, have suggested that E. coli is the most common isolate (56% for outpatients vs. 42% for inpatients) with higher resistance pattern to several antibiotics including fluoroquinolones in inpatients. The development of antibiotic-resistant pathogens causing UTIs present serious therapeutic challenges especially in outpatients settings [14].

To date, there is no consensus regarding the most effective approach to antibiotic prophylaxis around the time of TRUS biopsy. Some studies have suggested that multiple dose therapy is better [7], whilst other studies reported no difference in outcomes between both single or multiple doses [8]. This study adds to the body of literature [12, 14] to suggest that there is no statistically significant difference in the rate of infections or sepsis requiring hospital admission between patients who had a single versus multiple doses of prophylactic antibiotic for TRUS guided prostate biopsy.

Based on our data, we believe that our findings add an evidence of efficacy of single prophylactic dose of ciprofloxacin compared to multiple doses of ciprofloxacin in prophylaxis for TRUS guided prostate biopsy. This might significantly help reduce the potential side effects in view of recent rising concerns about this issue.

Our study has some limitations which include its small sample size and retrospective nature. Further prospective randomised controlled studies are required to validate our data.

CONCLUSIONS

These findings provide evidence of the equivalent efficacy of a single prophylactic dose of ciprofloxacin compared to multiple doses of ciprofloxacin in prophylaxis for TRUS guided prostate biopsy. This reduction in dose serves to limit the potential adverse side effects associated with fluoroquinolones. Our recommendation is to apply the current protocol of single dose of ciprofloxacin 750 mg 1 hour prior to the procedure.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

References

1. Feliciano J, Teper E, Ferrandino M, et al. The incidence of fluoroquinolone resistant infections after prostate biopsy- are fluoroquinolones still effective prophylaxis? J Urol. 2008; 179: 952-952.
2. Patel U, Dasgupta P, Amoroso P, Challacombe B, Pilcher J, Kirby R. Infection after transrectal ultrasonography-guided prostate biopsy: increased relative risks after recent international travel or antibiotic use. BJU Int. 2012; 109: 1781-1785.
3. Taylor S, Margolick J, Abughosh Z, et al. Ciprofloxacin resistance in the faecal carriage of patients undergoing transrectal ultrasound guided prostate biopsy. BJU Int. 2013; 111: 946-953.
4. Pham TDM, Ziora ZM, Blaskovich MAT. Quinolone antibiotics. Medchemcomm. 2019; 10: 1719-1739.
5. European Association of Urology. Re: European Commission ruling on the indications for use of fluoroquinolones [Internet]. 2019. Available from: https://apurologia.pt/wp-content/uploads/2019/06/Communication-letter-fluoroquinolonesl.pdf
6. Lugg J, Lettieri J, Stass H, Agarwal V. Determination of the concentration of ciprofloxacin in prostate tissue following administration of a single, 1000 mg, extended-release dose. J Chemother. 2008; 20: 213-218.
7. Bootsma AMJ, Laguna Pes MP, Geerlings SE, Goossens A. Antibiotic prophylaxis in urologic procedures: a systematic review. Eur Urol. 2008; 54: 1270-1286.
8. Raman JD, Rjepaj C, Otteni C. A single 80 mg intravenous gentamicin dose prior to prostate needle biopsy does not reduce procedural infectious complications. Cent European J Urol. 2015; 68: 229-231.
9. Aron M, Rajeev TP, Gupta NP. Antibiotic prophylaxis for transrectal needle biopsy of the prostate: a randomized controlled study. BJU Int. 2000; 85: 682-685.
10. Roth H, Millar JL, Cheng AC, Byrne A, Evans S, Grummet J. The state of TRUS biopsy sepsis: readmissions to Victorian hospitals with TRUS biopsy-related infection over 5 years. BJU Int. 2015; 116 Suppl: 49-53.
11. Loeb S, Vellekoop A, Ahmed HU, et al. Systematic review of complications of prostate biopsy. Eur Urol. 2013; 64: 876-892.
12. Adeolu M, Alnajar S, Naushad S, S Gupta R. Genome-based phylogeny and taxonomy of the 'Enterobacteriales': proposal for Enterobacterales ord. nov. divided into the families Enterobacteriaceae, Erwiniaceae fam. nov., Pectobacteriaceae fam. nov., Yersiniaceae fam. nov., Hafniaceae fam. nov., Morganellaceae fam. nov., and Budviciaceae fam. nov. Int J Syst Evol Microbiol. 2016; 66: 5575-5599.
13. Walker KJ, Lee YR, Klar AR. Clinical Outcomes of Extended-Spectrum Beta-Lactamase-Producing Enterobacteriaceae Infections with Susceptibilities among Levofloxacin, Cefepime, and Carbapenems. Can J Infect Dis Med Microbiol. 2018; 2018: 3747521.
14. Gajdacs M, Abrok M, Lazar A, Burian K. Comparative Epidemiology and Resistance Trends of Common Urinary Pathogens in a Tertiary-Care Hospital: A 10-Year Surveillance Study. Medicina (Kaunas). 2019; 55. pii: E356.