

Infectious Complications Following Prostate Biopsy: A Single Institution Review

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Abstract: *Purpose:* Determine incidence of fluoroquinolone-resistant bacteria complications among patients following prostate biopsy at New York Medical College, NY.

Materials and Methods: Retrospective chart review of 229 consecutive patients receiving prostate biopsy between 2009 and 2013 at New York Medical College, NY. Each was administered a Fleet enema the morning of and a three-day course of ciprofloxacin starting the day before biopsy.

Results: The 1.3% (3/229) of patients developed infectious complications following biopsy. Each of the (3/3) species isolated was fluoroquinolone-resistant. Among patients developing infectious complications, all had prior exposure to fluoroquinolones and all infectious complications were fluoroquinolone-resistant.

Conclusion: This study highlights the need for confirming the patient's exposure history with fluoroquinolones and considering another class of antibiotics for patients with prior fluoroquinolone exposure to avoid infectious complications following prostate biopsies.

Keywords: Fluoroquinolone-resistance, antibiotic resistance, prostate biopsy.

INTRODUCTION

Prostate biopsy is one of the most common urologic procedures performed. Approximately one million prostate biopsies are performed annually throughout the United States for the diagnosis of prostate cancer [1]. The procedure is generally well tolerated and has been found to have an acceptably low complication rate for the diagnosis of prostate cancer. The most common complications from prostate biopsy include infection, bleeding, and urinary retention. Rarely, serious infectious complications from prostate biopsy result in ED presentation, hospital admission, sepsis, and/or death [2, 3].

Prophylactic regimens have been developed throughout different groups to further diminish infectious risk. Bowel cleansing regimens to decrease bacterial counts have been shown by some practices to be associated with decreased infectious rates. In a retrospective study of 879 patients by Jeon *et al.*, the most significant influence on infectious complications was the use of pre-biopsy rectal preparation [4].

Cleansing of operative equipment has also been recommended previously. The process for cleansing equipment was recently reviewed in the 2012 AUA Prostate Biopsy White Paper, and the working group recommended cleansing along with steam sterilization as the preferred method for reprocessing prostate biopsy needle guides. However, they advised that high-level disinfection is still an acceptable alternative due to the lack of available data comparing each method [2, 3]. In a recent study by Sabler *et al.*, the FDA sterilization guidelines were followed for processing the reusable transrectal ultrasound transducers, and a contamination rate of 4.76% was found, with no contaminations leading to symptomatic urinary tract infection [5].

Perioperative antibiotics have been adopted by many centers for the prevention of infectious complications. Several different antibiotics have been tried with varying durations of administration, generally 1-3 days. A very common antibiotic regimen has been perioperative ciprofloxacin. This antibiotic is generally well tolerated, and its effectiveness in reducing the incidence of infection after prostate biopsy has been demonstrated in several studies [2, 3, 6]. Several authors have noted that the remaining infectious complications resulting from prostate biopsy are most commonly associated with organisms resistant to Ciprofloxacin. Ciprofloxacin-resistant *E. coli* has been

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implicated as the most common infectious organism to be isolated from patients with sepsis following prostate biopsy [6].

Given the increasing incidence of ciprofloxacin resistance found in patients with infectious complications following prostate biopsy, some practices are exploring the use of different antibiotics. Lange *et al.* reviewed a group of 24 men who presented with urosepsis after prostate biopsy and found that the organisms isolated from both the blood and urine were most sensitive to gentamicin [7]. Lorber *et al.* found that a single 240mg dose of gentamicin during prostate biopsy was able to significantly reduce septic complications at a single institution [8].

Another possible solution to the emergence of fluoroquinolone-resistance proposed by some authors is the employment of screening methods in order to identify the patients most likely to benefit from an alternative antibiotic regimen. Less *et al.* studied the use of rectal swab cultures prior to prostate biopsy to screen for resistance patterns prior to choosing an antibiotic regimen [9]. One limitation to implementing this strategy would be the added logistical and financial burden involved with having each patient scheduled for biopsy present at least 48 hours prior in order to obtain rectal swab cultures. An alternative strategy would be to screen patients most at risk for fluoroquinolone-resistance based on each patient's history and risk factors. Several studies have found an increased risk of fecal carriage of fluoroquinolone-resistant *E. coli* in patients administered fluoroquinolones during the three- to six-month period prior to prostate biopsy, and carriage of these strains has been shown to be a risk factor for infectious complications post-biopsy [10, 11].

Despite the increase in resistance patterns among patients with infectious complications, fluoroquinolones remain the standard antimicrobial prophylaxis during prostate biopsy. The 2012 AUA White Paper pertaining to prostate biopsy recommends using either a fluoroquinolone or a first, second, or third-generation cephalosporin as a single dose [12].

At New York Medical College (NYMC), we found that 85% of the *Escherichia coli* isolated between January and December of 2012 were susceptible to ciprofloxacin, a 2% increase in susceptibility from 2009 (January - December) figures, when the percent of *E. coli* found to be susceptible to ciprofloxacin was 83%. Between January and December of 2012, 84% of the isolated *Proteus mirabilis* species were found to be

sensitive to Ciprofloxacin (Unpublished). This is a decline from 95% of the *Proteus* species found to be susceptible to ciprofloxacin from 2009 (January-December) figures at our institution. Interestingly, during this period, little change was found in susceptibility patterns to levofloxacin among *E. coli* species – 85% susceptible in 2012 compared to 84% in 2009. However, while 97% of the *Proteus* species were found to be susceptible to levofloxacin in 2009, only 82% of the *Proteus* species isolated were susceptible in 2012 (Unpublished).

Although prostate biopsy is a relatively well-tolerated procedure for diagnosing prostate cancer, the procedure is not without risks. Furthermore, a certain percentage of patients undergoing this procedure will inevitably have a negative biopsy (63% in our case). Therefore, it is important to guard against any potential complications and to have an adequate understanding of the risks of the procedure when counseling patients who may be in lower risk categories. The recent development of fluoroquinolone-resistant infections calls attention to one of the most important risks of biopsy, infection. We conducted this study to improve our understanding of the prevalence of fluoroquinolone-resistant pathogens and their effect on infectious complications after prostate biopsy at NYMC.

MATERIALS AND METHODS

A retrospective chart review of all patients undergoing prostate biopsy at the NYMC institution was performed. Using pathology reports and procedure codes collected by the department of Urology at NYMC, all prostate biopsies performed between January 1, 2009 and June 1, 2013 were identified. A total of 229 transrectal ultrasound-guided prostate biopsies were performed during this time period. All biopsies were performed in accordance with the standard institution-approved protocol. This protocol involves avoiding all blood thinners within 7 days of the procedure, administering a three-day course of ciprofloxacin beginning the day prior to the procedure, and administering a Fleet enema the morning of the procedure. Twelve cores were taken from each patient in double sextant fashion after the administration of 10cc of 2% lidocaine at the seminal vesicle-prostate junction.

All patients were explained the risks, benefits and alternatives to prostate biopsy. All were instructed on the risks of bleeding and infection after biopsy and were instructed to return to the hospital if they were

unable to urinate or developed painful urination, nausea, vomiting, fever, or chills.

We reviewed the individual charts for biopsy outcomes and postoperative complications. Data was collected from each patient by reviewing each patient's follow up visits in the urology clinic and screening for emergency department presentations or hospital admissions within 60 days of biopsy. All patients presented to our clinic within 30 days after prostate biopsy for follow up. Charts were reviewed to determine the presence of clot retention, urinary tract infection, and causative organisms with antibiotic-sensitivity profile in urine and blood cultures, and presence of sepsis. Postoperative biopsy results were recorded, along with the history of exposure to fluoroquinolones prior to biopsy.

RESULTS

Of the 229 patients that underwent prostate biopsy at our institution, we found that 1.3% (3/229) developed infectious complications following biopsy. Each (3/3) species isolated was fluoroquinolone-resistant, while 66% (2/3) of the bacterial isolates were *E. coli* positive. Only one patient out of the three had *Proteus* species isolate. Antibiotic sensitivity assays showed that both *E. coli* isolates were resistant to Gentamicin while the *Proteus* isolate was sensitive to it. All three isolates were sensitive to the Carbapenem class. Of the patients with infectious complications after biopsy, none had positive blood cultures. Only one of the three (1/3) patients with fluoroquinolone-resistant infection had a positive history of treatment with this antibiotic class prior to the biopsy. Two of the three patients presented to the hospital with febrile UTI, while only one patient (1/3) returned to clinic and was found to have a urinary tract infection (UTI) after complaining of minor lower urinary tract symptoms. Only 0.87% (2/229) had infectious complications warranting admission to the hospital. Of the 226 patients that did not develop infection after biopsy and consequently were sensitive to the prophylactic regimen, 29% (65/226) had a positive history of fluoroquinolone exposure prior to the procedure. None of the 229 patients required intensive care unit monitoring after biopsy. No patients developed clot retention after biopsy.

DISCUSSION

Overall, the NYMC institutional protocol has been effective at maintaining a low rate of infectious complications after prostate biopsy. Only 3 infectious

complications were observed among the 229 patients, and only 0.87% (2/229) had an infectious complication that warranted admission to the hospital. None of the patients required intensive care unit monitoring after biopsy. Our results suggest that the relationship between recent fluoroquinolone exposure prior to biopsy and the risk of developing infection from fluoroquinolone resistant organisms is uncertain. Of the three patients that developed fluoroquinolone-resistant infection, only one (1/3) patient had prior exposure to this antibiotic class. Of the 66 total patients in our study that had prior exposure to fluoroquinolones, only 1.5% (1/66) developed a fluoroquinolone-resistant infection. These findings suggest a more intricate and possibly multifactorial explanation for incidence of fluoroquinolone-resistant infection. Additionally, our data suggests that augmentation with Gentamicin may be ineffective in further reducing the rate of infectious complication as suggested by Lange *et al.* Instead, our results indicate that a Carbapenem class antibiotic such as Imipenem would be needed in order to cover all the resistant species isolated in patients returning with sepsis. However, prophylactic use of carbapenems, even after selectively administering them to only those with prior fluoroquinolone exposure, would subject 29% of patients undergoing prostate biopsy to a costly and powerful antibiotic class. Such an approach could lead to further resistant species in the community at a time when carbapenem-resistance is emerging throughout the country. This study suggests that despite the emergence of fluoroquinolone-resistant organisms, infectious complications after prostate biopsy can still be largely prevented by following the AUA recommendations of perioperative fluoroquinolone, Fleet enema, and adequate sterilization of biopsy probes.

Nevertheless, one should bear in mind that in a retrospective study, one cannot be assured that all complications are accounted for. First of all, the patient population of 229 was extremely small. It is possible that patients with complications after biopsy may have presented their cases to an outside hospital or clinic. Also, since the data was not being gathered prospectively, all complications may not have been specifically accounted for on follow up visits.

The future direction for this quality improvement project will be to conduct a prospective study at the NYMC institution. The next step will be to determine if implementing one of the interventions reviewed in the literature could eliminate infectious complications. Given the results of our study, one effective measure

may be to screen a patient's medical record for prior exposure to any fluoroquinolones and to provide alternative antibiotic coverage to any patient with prior exposure. An alternative, more elaborate process would be to implement rectal swabbing prior to biopsy and adjust antibiotic prophylaxis according to the cultures and sensitivities identified by the culture.

CONCLUSIONS

The problem of the recent increase in post prostate biopsy induced fluoroquinolone-resistant organisms is a matter of grave concern and should be addressed urgently. Following a standard protocol, the rate of complications following prostate biopsy at the NYMC institution was found to be 1.3%. No serious adverse events following prostate biopsy were observed. All patients with infectious complications following prostate biopsy were found to have fluoroquinolone-resistant urine cultures. Further research for this quality improvement study could focus on determining the possibility of further decreasing our infectious complication rate by using different antibiotics based on prior fluoroquinolone exposure or based on fecal culture and sensitivity patterns. A national surveillance system should be established to monitor trends in these infections.

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