International Journal of Antimicrobial Agents 43 (2014) 301–309

Contents lists available at ScienceDirect

International Journal of Antimicrobial Agents

journal homepage: http://www.elsevier.com/locate/ijantimicag

Review

Baseline prevalence of antimicrobial resistance and subsequent infection following prostate biopsy using empirical or altered prophylaxis: A bias-adjusted meta-analysis

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ARTICLE INFO

Article history:
Received 6 November 2013
Received in revised form 5 January 2014
Accepted 11 January 2014

Keywords:
Prostate biopsy
Post-surgical complications
Fluoroquinolone resistance
Rectal culture
Antimicrobial prophylaxis

ABSTRACT

Transrectal ultrasound-guided prostate biopsy (TRUSPB) is a commonly performed urological procedure. Recent studies suggest that pre-biopsy screening for fluoroquinolone-resistant (FQ-R) pathogens may be useful in reducing post-biopsy infections. We sought to determine the baseline prevalence of fluoroquinolone (FQ) resistance in rectal flora and to investigate the relationship between pre-biopsy carriage of FQ-R pathogens and the risk of post-TRUSPB infection. Electronic databases were searched for related literature. Studies were assessed for methodological quality and comparable outcomes prior to meta-analysis (using quality- and random-effects models). Nine studies, representing 2541 patients, were included. The prevalence of FQ resistance was higher (20.4%, 95% CI 18.2–22.6%) in rectal cultures obtained following FQ-based prophylaxis compared with those obtained before (12.8%, 95% CI 10.7–15.0%). Overall infection rates in patients using empirical prophylaxis were higher (3.3%, 95% CI 2.6–4.2%) than in those using altered (targeted/protocol) regimens (0.3%, 95% CI 0–0.9%). Higher infection rates were seen in men with FQ-R rectal cultures (7.1%, 95% CI 4.0–10.5%) than in those with FQ-sensitive (FQ-S) rectal cultures (1.1%, 95% CI 0.5–1.8%). For every 14 men with FQ-R rectal cultures, one additional infection was observed compared with men with FQ-S rectal cultures. Prior FQ use and prior genitourinary infection were significant risk factors for FQ-R colonisation. FQ resistance in rectal flora is a significant predictor of post-TRUSPB infection and may require re-assessment of empirical antimicrobial prophylaxis methods. Altered prophylaxis based on rectal culturing prior to TRUSPB may reduce morbidity and potentially provide economic benefits to health services.

1. Introduction

Transrectal ultrasound-guided prostate biopsy (TRUSPB) is a commonly performed procedure to establish a histological diagnosis of prostate cancer. It is estimated that approximately one million biopsies are performed each year in the USA [1,2]. Post-TRUSPB infections are likely to be caused by inoculation of the prostatic vasculature and urinary tract with rectal flora [2,3].

Pre-biopsy antimicrobial prophylaxis is effective in reducing post-TRUSPB infectious complications [4]. Fluoroquinolone (FQ) antimicrobials are the most commonly used prophylactic agents and are advocated by North American, European and other international urology associations [5–7]. However, prophylactic strategies differ between institutions and urologists, with variations seen in classes of antimicrobial agents used, duration of use and bowel preparation regimens employed [8,9]. Despite widespread use of antimicrobial prophylaxis, serious post-TRUSPB infections causing hospitalisation are reported in up to 6% of

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0924-8579/$ – see front matter
http://dx.doi.org/10.1016/j.ijantimicag.2014.01.008

patients, with rates reported to be increasing worldwide [1,2,10,11]. In addition to the associated morbidity experienced by patients, post-TRUSPB infection results in considerable adverse economic consequences to health systems [12,13].

Escherichia coli is the most commonly isolated organism from post-TRUSPB infections [14]. Increasingly, antimicrobial-resistant *E. coli* is described as an important pathogen in post-TRUSPB infections, with the two commonest resistance phenotypes being FQ resistance and extended-spectrum β-lactamase (ESBL) production [10,15–18].

FQ resistance in rectal flora, as a result of FQ use and/or overseas travel, particularly to areas of high endemicity of FQ resistance, are reported as important predisposing risk factors for post-TRUSPB infection with a FQ-resistant (FQ-R) pathogen [2,10,15–20].

Various strategies to combat this increasingly important issue have been proposed. Addition of broad-spectrum antimicrobial agents, such as amikacin, to empirical FQ-based prophylaxis has been reported to reduce post-TRUSPB infection rates [21,22]. Recently, a prophylaxis strategy targeted to antimicrobial susceptibility, as demonstrated on pre-biopsy rectal cultures, has been reported to reduce post-TRUSPB infections and subsequent morbidity as well as to provide cost benefits to health systems owing to fewer hospital re-admissions [23,24]. To date, however, the relationship between pre-biopsy colonisation with antimicrobial-resistant pathogens and the subsequent risk of post-biopsy infection has not been well defined.

Accordingly, the aims of this study were (i) to systematically determine the baseline prevalence of FQ resistance based on pre-TRUSPB rectal cultures, (ii) to investigate the relationship between FQ resistance and the subsequent risk of post-TRUSPB infections and (iii) to determine predisposing risk factors for FQ resistance and/or subsequent post-TRUSPB infection.

2. Methods

A systematic review was carried out using the guidelines published by the Cochrane Collaboration [25]. The PRISMA statement was used to guide reporting [26]. A protocol of this review has not been registered previously.

2.1. Data sources

An electronic search for all related literature, published in English, was performed during August 2013 using the following databases: Cochrane Central Register of Controlled Trials (CENTRAL); MEDLINE via OVID (1970 – August 2013); EMBASE (1970 – August 2013); and CINAHL (1981 – August 2013). A combination of synonyms for the following terms was used: prostate, biopsy, transrectal, transperineal, swab, culture. The search strategy for each database is listed in Supplementary Table S1. The reference lists of relevant manuscripts and review articles were hand-searched for suitable studies. All search results were exported to EndNote X6 (Thomson Reuters, Carlsbad, CA) and duplicates were removed (see Fig. 1).

2.2. Eligibility criteria

Studies were selected if the manuscript was published in English and reported males undergoing TRUSPB who had pre-procedural rectal swabs or stool cultures taken. No specific exclusion criteria were applied, other than those factors limiting complete assessment of studies (including published abstract and duplicate publication).

Two authors (MJR and PH) independently assessed the search strategy and initially screened studies based on title and abstract.

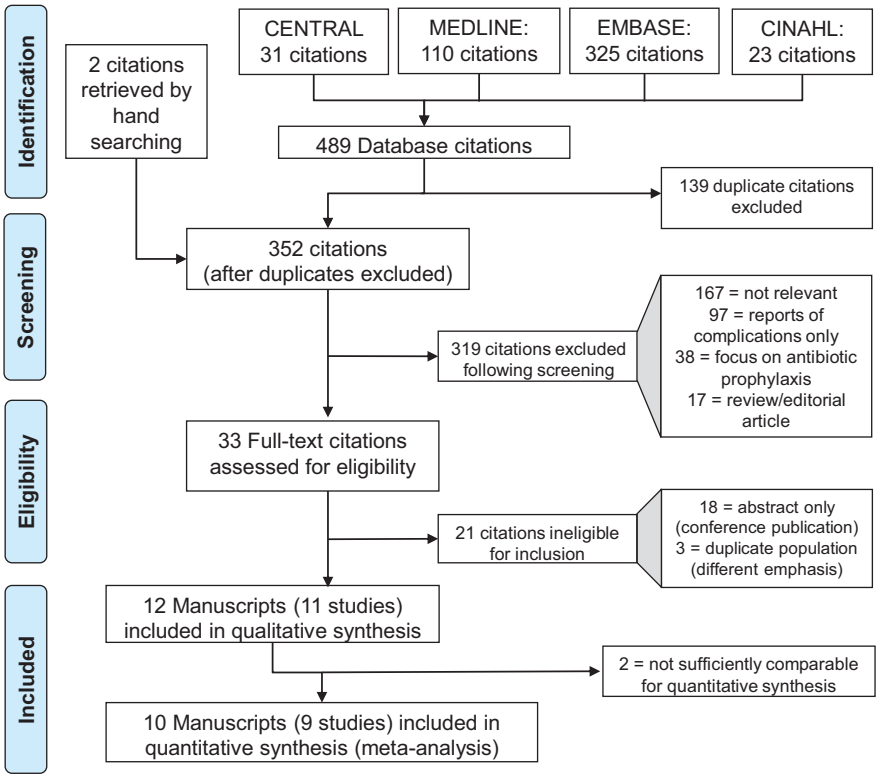

Fig. 1. PRISMA flowchart of study selection [26]. From the initial search strategy yielding 489 studies, removal of duplicates and unsuitable studies resulted in nine studies for consideration in the meta-analysis.