Short Communication

Comparative efficacy of Levofloxacin and Prulifloxacin against Uropathogenic *Escherichia coli* and *Klebsiella* spp. from a tertiary care hospital and their correlation with expression of lipase and lecithinase

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ABSTRACT

Background: Fluoroquinolone antibiotics are often used for treatment of urinary tract infections. Prulifloxacin is a newer fluoroquinolone antimicrobial, and a prodrug of Ulifloxacin. It has been approved for use in Urinary tract infections and respiratory tract infections in many countries, but comparative studies comparing its efficacy against that of Levofloxacin are rare. **Objectives:** Our study aimed at studying this comparative efficacy. **Methods:** *E. coli* and *Klebsiella* spp. were isolated and identified from urine samples and their antibiogram was seen in respect to Levofloxacin and Prulifloxacin by Diak diffusion method. Antibiogram results were correlated with lecithinase, lipase and protease activities of the bac teria. **Results:** Most of the *E. coli* isolates were resistant to Prulifloxacin, but is was mostly effective against *Klebsiella* spp. **Conclusion:** Prulifloxacin is not a good option for empirical treatment of urinary tract infection, especially those caused by E. coli.

Keywords: Lecithinase, Levofloxacin, Lipase, Prulifloxacin

Fluoroquinolones are very useful for treating Urinary tract infections (UTI), and the commonly used ones are Levofloxacin and Ciprofloxacin [1]. Of these, Prulifloxacin is a new oral fluoroquinolone derivative with broad spectrum in-vitro activity, comparable with Ciprofloxacin, against various Gram negative uropathogenic bacteria [2]. Prulifloxacin, the prodrug of Ulifloxacin, can be administered once daily owing to its long elimination half life [3]. It has been found quite safe and efficacious in UTI and Respiratory tract infections in many Randomised Controlled Studies, especially from Europe, and the most common adverse effects observed after Prulifloxacin administration are nausea, vomiting, rashes and epigastric pain [4]. However, studies from our country comparing Prulifloxacin and Levofloxacin as regards in vitro efficacy against common uropathogens are very scant, although Prulifloxacin is now being routinely administered for pre-emptive treatment of UTI. Hence our study was planned to address these issues.

MATERIALS AND METHODS

This was a laboratory based observational study, carried out in Department of Microbiology of the institute, from June 2015 to September 2015. Ethics committee approval was not sought since this study involved only collection and presentation of routine data from laboratory and patients' identity was not going to be revealed.

Midstream urine samples collected routinely from the patients were inoculated on Cystine Lactose Electrolyte Deficient (CLED) agar (Himedia labs, Delhi, India) and incubated overnight. Colonies were observed for nature of colonies, and identified using Gram staining and standard biochemical tests. For example, *E. coli* was indole positive (in most cases), motile, citrate utilising and Urease negative. *Klebsiella oxytoca* was differentiated from *K. pneumoniae* by indole test (positive in *K. oxytoca*).

Following identification, antibiotic susceptibility of the isolates was carried out using Kirby Bauer disk diffusion test as per CLSI protocol, using Levofloxacin (5 mcg) and Prulifloxacin (5 mcg) disk [5]. Susceptibility was interpreted using standard chart by measuring diameter of zone of inhibition. An isolate was taken to be Prulifloxacin resistant when this diameter was <15 mm, moderately sensitive when diameter was between 15 and 19 mm and sensitive when it was greater than 19 mm, following reports regarding interpretive criteria [6]. For levofloxacin the interpretive criteria and diameters were the same as per standard zone-size interpretive chart.

After that, the isolates were streaked on Egg yolk agar prepared in-house (Nutrient agar, 90 ml + sterile beaten egg yolk, 10 ml), and incubated overnight at 37^0C. Lecithinase activity was defined as distinct zone of opalescence around colonies on egg yolk agar, whereas lipase was defined as appearance of pearly sheen on surface of colonies.

RESULTS

Fifty four (54) urinary *E. coli* isolates were retrieved and tested, and it was seen that most of the *E. coli* isolates were resistant in vitro to Prulifloxacin (85.18%). Resistance to Levofloxacin was also quite high, in the order of 62.9%.

On the other hand, only 4 isolates of *K. oxytoca* and 8 of *K. pneumoniae* could be isolated in this period. Thus E. coli was about 6 times more commonly occurring in urine samples compared to *Klebsiella* spp. Most of the *Klebsiella* spp. (both species taken together) isolates were susceptbile to Prulifloxacin (41.6% resistance) and Levofloxacin (25% resistance). Lipase was found in all *E. coli* and *Klebsiella* spp. isolates. However, lecithinase and protease, both were found in 1 *E. coli* isolate, which was susceptible to Prulifloxacin. These 2 activities were not found in any Prulifloxacin resistant isolate.

DISCUSSION

Prulifloxacin is being widely used nowadays to empirically treat UTI and pneumonia [1,2]. It is generally more active in vitro than other fluoroquinolone antibiotics against a variety of Gram negative bacteria, including *E. coli*, *Pseudomonas aeruginosa*, *Morganella* spp. and others, according to many recent studies [3]. This antibiotic is lipophilic in nature, approved for use in UTI and Lower Respiratory Tract Infection (LRTI) in Europe but still not in the USA, and is also being tried in the treatment of travellers' diarrhoea and also bacterial prostatitis [7]. After absorption, Prulifloxacin is metabolized by esterase enzymes to ulifloxacin; Prulifloxacin is absorbed mainly from the upper gut (upper small intestine) and then metabolized to ulifloxacin in the liver by α-esterase (paraoxonase) (first pass or presystemic metabolism) [8].

Reports in literature are very few and far between, regarding resistance to this new drug in different Gram negative bacteria from urinary isolates in India. In a study from Chandigarh, North India, Mehta *et al* have found that there was no superior activity of Prulifloxacin over other fluoroquinolone antibiotics in treating UTI [9]. As far as we know, this is the first comparative study of Prulifloxacin with Levofloxacin as regards resistance in uropathogenic bacteria and correlation of the same with lecithinase and lipase acitivities from India, and further such studies are earnestly needed in this context. Prulifloxacin could really be a bad option, according to our findings, for empirically treating UTI caused by *E. coli*, but reasonably good when *Klebsiella* spp. is retrieved, pending susceptibility report, particularly in our area.

CONCLUSION

Prulifloxacin is not a good option for empirical treatment of urinary tract infection, especially those caused by E. coli.

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