ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Jan. 1995, p. 215–220 Vol. 39, No. 1
0066-4804/95/$04.00+0

Randomized, Double-Blind Comparison of Single-Dose Regimens of Rufloxacin and Pefloxacin for Acute Uncomplicated Cystitis in Women

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Received 1 August 1994/Returned for modification 16 September 1994/Accepted 11 October 1994

In a double-blind, randomized, multicenter study, 463 adult women with symptomatic acute uncomplicated cystitis were treated orally with either a 400-mg single dose of rufloxacin ($n = 226$) or an 800-mg single dose of pefloxacin ($n = 237$). *Escherichia coli* (78%) and *Proteus mirabilis* (7%) were the most common isolates from 350 patients with significant pretreatment bacteriuria (uropathogens, $\geq 10^5$ CFU/ml). In the intention-to-treat analysis of patients with significant pretreatment bacteriuria, 343 patients were assessed for bacteriological outcome and 345 were assessed for clinical outcome. The bacteriological cure rate was 88% in the rufloxacin group and 84% in the pefloxacin group (95% confidence interval [CI] for difference in proportions, −4 to 12%), while the clinical resolution rate was 85 and 84%, respectively (95% CI, −8 to 9%). The per-protocol analysis demonstrated that among the 264 assessable patients, the bacteriological cure rate obtained with rufloxacin at 4 weeks of follow-up was comparable to that with pefloxacin (91 versus 85%; 95% CI, −3 to 15%). Among 295 clinically assessable patients, the clinical resolution rate at 4 weeks of follow-up was 89% in the rufloxacin group and 88% in the pefloxacin group (95% CI, −6 to 10%). Potentially drug-related adverse events occurred in 19% of the rufloxacin patients and in 18% of the pefloxacin patients. A single oral dose of 400 mg of rufloxacin is as effective and safe as a single oral dose of 800 mg of pefloxacin for the treatment of acute uncomplicated cystitis in women.

Acute uncomplicated lower urinary tract infections (UTIs) are common in women. Symptomatic cystitis is expected to occur in at least 10 to 20% of the female population during their lifetime. These infections generally respond well to a number of antimicrobial agents administered for 3 to 5 days (1, 27, 34). However, the resistance of uropathogens to conventional antibiotics appears to be increasing nationwide (5, 7, 33). Given their antibacterial activity against gram-negative rods and staphylococci and the high concentrations attainable in urine, fluoroquinolones have an important role in the 3-day treatment of uncomplicated cystitis in women caused by organisms resistant to older antimicrobial agents (1, 29, 34, 37). Fluoroquinolones are also reserved for empirical treatment when the local prevalence of resistance to first-line agents in common uropathogens is high, such as in southern Europe (1,

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5, 7, 29, 33, 34, 37). The long-acting fluoroquinolones, allowing single-dose treatment, have further contributed to the treatment of this urinary infection (29, 34, 37). Single doses of pefloxacin and fleroxacin have been used successfully (13, 31, 36). They are the only fluoroquinolones approved for use in European countries or in the United States as single-dose treatment for this indication.

Rufloxacin is a new fluoroquinolone with broad-spectrum bactericidal activity, including the majority of uropathogens (20, 38). Its spectrum of activity is similar to that of pefloxacin, except for a lower activity against indole-negative *Proteus* spp. (15). It has excellent serum and urine concentrations and a particularly long half-life (35 h) with a slow renal elimination, allowing for once-a-day administration (11, 16, 39). The plasma and urine half-lives of rufloxacin are two times longer than those of pefloxacin (4, 23). Steady high and bactericidal concentrations of 40 μg/ml in urine are ensured for at least 72 h following a single 400-mg oral dose (2, 3). These levels are 20 and 10 times above the MIC at which 90% of the isolates are inhibited for *Escherichia coli* and *Staphylococcus saprophyticus*, respectively. This study was undertaken to determine whether a single dose of rufloxacin (400 mg) is equivalent to a single dose of pefloxacin (800 mg) for the treatment of acute uncomplicated lower UTI in women.

MATERIALS AND METHODS

Patient population. Four hundred sixty-three nonpregnant female outpatients were recruited by 74 general practitioners in France during 1991 and 1992. Women were eligible if aged between 18 and 75 years, with symptoms of acute cystitis, including dysuria, frequency, strangury and urgency of a recent onset, and in the absence of fever (rectal temperature, ≤37.5°C). Isolation of $\geq 10^5$ CFU of one or two gram-negative uropathogens per ml of midstream urine collected within 48 h prior to treatment was required for final inclusion. The isolated pathogens had to be susceptible to either study drug. Exclusion criteria included recurrent cystitis with more than two episodes in the past 12 months, acute pyelonephritis, presence or suspicion of bacteremia, history or evidence of functional or anatomical abnormalities of the urinary tract, catheterization, known hypersensitivity to quinolones, nursing, or no use of reliable contraceptive methods in women of childbearing potential. Also excluded were patients with creatinine clearance of <30 ml/min, liver dysfunction (aspartate aminotransferase or alanine aminotransferase more than twice and/or serum bilirubin more than 1.5 times the upper normal values), diabetes, and any concomitant infection requiring the use of antibiotics. Similarly, patients treated with oral anticoagulants and immunosuppressors were excluded, as were those with a history of glucose-6-phosphate dehydrogenase deficiency or convulsions.

The study protocol was approved by the Groupe de Reflexion sur l'Ethique Biomédicale de Bicêtre. All patients gave written informed consent.

Study design. The study was a double-blind, randomized, parallel-group, multicenter trial. Patients were randomly assigned to receive orally either a single 400-mg dose of rufloxacin (two 200-mg capsules; Mediolanum Farmaceutici, Milan, Italy) plus two placebo tablets or a single 800-mg dose of pefloxacin (two 400-mg tablets) plus two placebo capsules (double-dummy technique). Treatment was administered prior to the bacteriological confirmation of cystitis.

Study conduct. Before treatment, eligible patients gave a medical history and had a physical examination, at least one clean-catch midstream urine sample was collected for evaluation of pyuria, culture, and susceptibility, and blood samples were taken for hematologic and chemical analyses. Patients returned to the doctor's office for clinical and microbiological assessment 7 to 10 days after treatment (early follow-up visit) and 30 ± 4 days after treatment (late follow-up visit). The early follow-up was planned later than the usually recommended 3 to 5 days (32) to avoid therapeutic urinary levels of the two long-acting drugs at this time (2, 4, 23). Blood tests were repeated at this visit.

Susceptibility tests. Urine samples were collected and processed at the center's local laboratory and examined within 1 h of collection. When delay was unavoidable, refrigeration (4°C) for up to 24 h before examination was allowed. All samples from the same patient were cultured by the same laboratory. Susceptibility tests were carried out by a standard disk diffusion technique (30) with disks containing 10 μg of rufloxacin (Unipath Ltd., Basingstoke, United Kingdom) and commercial disks containing 5 μg of pefloxacin (Sanofi Diagnostic Pasteur, Marnes La Coquette, France) (6). Susceptibility to rufloxacin was defined as susceptible (zone diameter, ≥16 mm), intermediate (13 to 15 mm), or resistant (<13 mm); for pefloxacin, the corresponding zone diameters were ≥21, 16 to 20, and <16 mm.

Efficacy assessments. Efficacy was assessed only in patients with bacteriological confirmation of cystitis (baseline urine culture with $\geq 10^5$ CFU/ml) and with at least one posttreatment visit and urine culture.

Bacteriological outcome at the early and late follow-up visits was classified as follows: cure without reinfection, eradication of the initial pathogen, with $\leq 10^3$ CFU/ml, and no isolation of a new pathogen at both visits 2 and 3; cure with reinfection, eradication of the initial pathogen but appearance of another pathogen, with $\geq 10^5$ CFU/ml at visit 2 or 3; failure with persistence, persistence of the initial pathogen, with $\geq 10^4$ CFU/ml at visit 2; failure with relapse, reappearance of the initial pathogen, with $\geq 10^4$ CFU/ml at the final visit. Bacteriological cure and eradication rate were the primary endpoints for assessing efficacy. The bacteriological cure rate was defined as the percentage of bacteriologically assessable patients who had cure with or without reinfection. The bacteriological failure rate was defined as the percentage of bacteriologically assessable patients who had persistence or relapse. The bacteriological eradication rate was defined as the percentage of initially assessable infecting pathogens which were eradicated.

The time course of symptoms and pyuria was the secondary endpoint. Clinical outcome was assessed at the early and late follow-up visits based on the presence of symptoms using a semiquantitative rating scale ranging from 0 to 4. Pyuria, defined as ≥10 leukocytes per mm^3 of urine, and elevated rectal temperature were also considered. Patients were classified into four clinical categories: resolution, all clinical signs and symptoms of UTI completely resolved at both visits 2 and 3; improvement, sum of symptom scores of ≤3 at both visits 2 and 3; relapse, reappearance of one or more symptoms after clinical cure obtained at visit 2; failure, sum of symptom scores of >3 at visit 2. The clinical resolution rate was defined as the percentage of clinically assessable patients whose infections were resolved.

A primary efficacy analysis (intention to treat) considered all randomized patients with bacteriologically confirmed cystitis and with at least one follow-up urine culture and/or visit. A secondary analysis (per protocol) considered all randomized patients with bacteriologically confirmed cystitis who complied fully with enrollment selection criteria and who completed the two follow-up cultures or visits.

Safety assessment. Spontaneously reported adverse experiences were recorded at visits 2 and 3. Changes in routine laboratory tests at visit 2 were also recorded, and values were compared with the normal range of values at each laboratory. Any patient who received the study drug and who was clinically assessed at least once after treatment was included in the safety analysis.

Statistical methods. Analyses were performed with the SAS package by an independent statistician. Statistical tests were two-tailed; P values of ≤0.05 were considered statistically significant. Assuming a bacteriological cure rate of 90% with pefloxacin at the late follow-up (31, 36), a sample size of 141 bacteriologically assessable patients per group at the late follow-up was needed in order to be 95% confident that rufloxacin is at worst 10% inferior to pefloxacin, with 80% power (18). Assuming that an estimated 30% of randomized patients would be excluded from the per-protocol analysis because of failure in fulfilling inclusion criteria and a further 10% would be excluded because of missed posttreatment visits, a total of 470 patients were planned to be enrolled in the study (22). The efficacy analysis was performed by the chi-square test. Differences in proportions between groups were presented with the relevant 95% confidence intervals (CIs). Variations in routine laboratory values were analyzed by the McNemar test.

RESULTS

Study population. Of the 463 recruited patients, 226 were in the rufloxacin group and 237 were in the pefloxacin group. Mean age ± standard deviation (SD) was 42 ± 17 years (range, 18 to 75) in the rufloxacin group and 41 ± 16 years (range, 18 to 80) in the pefloxacin group. At enrollment, 350 patients (167 on rufloxacin and 183 on pefloxacin) had significant bacteriuria (uropathogens, $\geq 10^5$ CFU/ml), 78 (44 and 34, respectively) had negative urine cultures ($\leq 10^2$ CFU/ml), and 32 (15 and 17, respectively) had a low-count bacteriuria ($>10^2$ to 10^4 CFU/ml). A pretreatment urine culture was missing for three patients in the pefloxacin group. Ninety-three percent of the patients in both groups had isolated or sporadic cystitis (no episodes or one or two episodes of cystitis during the past 12 months). Except for one pefloxacin patient with 38.2°C fever, renal stones, and a history of recurrent upper UTI, no patient had flank pain and/or costovertebral angle tenderness associated with fever of ≥37.5°C or other host factors suggesting upper tract infection. Only 8 patients on rufloxacin and 12 on pefloxacin did not show pyuria. Of these, five and nine, respectively, had bacterial counts of $\geq 10^5$ CFU/ml, while three and two, respectively, had counts of $<10^5$ CFU/ml. The two treatment groups were comparable with respect to demographic

TABLE 1. Pretreatment-isolated uropathogens by treatment group

Pathogen	No. of isolates (no. resistant)		Total no. (%) of isolates
	Rufloxacin group	Pefloxacin group	
Escherichia coli	128 (1)	152	280 (78.4)
Proteus mirabilis	16 (2)	10 (1)	26 (7.3)
Klebsiella spp.	4	2	6 (1.8)
Enterococcus faecalis	4 (1)	4 (1)	8 (2.2)
Staphylococcus saprophyticus	6 (2)	3 (2)	9 (2.5)
Others	12 (2)	16 (4)	28 (7.8)
Total	170 (8)	187 (8)	357 (100.0)

TABLE 2. Patient accountability for efficacy and safety analyses[a]

Parameter	No. of patients		
	Rufloxacin group	Pefloxacin group	Total
Enrolled	226	237	463
Baseline culture $\geq 10^5$ CFU/ml	167	183	350
Efficacy, intention-to-treat analysis			
Bacteriological response			
Both follow-up cultures missing	2	5	7
Patients analyzed	165	178	343
Clinical response			
Both follow-up visits missing	2	3	5
Patients analyzed	165	180	345
Efficacy, per-protocol analysis			
Bacteriological response			
Resistant pathogen	8	8	16
Baseline gram-positive strain or susceptibility test missing	5	2	7
Follow-up culture(s) missing	21	31	52
Follow-up culture(s) outside planned days	0	6	6
Antibiotics during follow-up	0	1	1
Double inclusion	1	3	4
Patients analyzed	132	132	264
Clinical response			
Resistant pathogen	8	8	16
Baseline gram-positive stain or susceptibility test missing	5	2	7
Follow-up visit(s) missing	10	14	24
Follow-up visit(s) outside planned days	1	2	3
Antibiotics during follow-up	0	1	1
Double inclusion	1	3	4
Patients analyzed	142	153	295
Safety analysis			
Both follow-up visits missing	8	9	17
Patients analyzed	218	228	446

[a] For patients with multiple reasons for exclusion, only the first to occur was counted.

characteristics and clinical signs and symptoms of cystitis, including bacteriuria and pyuria.

From the pretreatment urine culture, 357 uropathogens were isolated from the 350 patients with significant bacteriuria, the most frequent being *E. coli* (78%) and *Proteus mirabilis* (7%) in both groups (Table 1). *S. saprophyticus* (3%) was the most common isolate among gram-positive cocci. Three patients on rufloxacin and four on pefloxacin had mixed infections. No significant differences between groups were found in the prevalence of different infecting pathogens (Table 1).

A breakdown of patient accountability for the different analyses is listed in Table 2. The number of patients excluded and the reasons were evenly distributed between the treatment groups.

Bacteriological results. The bacteriological response among the 350 patients with significant pretreatment bacteriuria is given in Table 3. No significant differences between groups were noted. In the intention-to-treat analysis, the bacteriological cure rate was 87.9% in the rufloxacin group and 84.3% in the pefloxacin group (95% CI of the difference, −4.4 to 11.6%). At the per-protocol analysis, the bacteriological cure rate was 90.9% in the rufloxacin group and 84.5% in the pefloxacin group (95% CI of the difference, −2.5 to 14.7%). Bacteriological failure was mainly due to relapse rather than to persistence of the infecting pathogens. No host factors accounting for failure were identified. The persisting pathogen was resistant at baseline in two of seven rufloxacin patients with bacteriological persistence (*Streptococcus* species and *S. saprophyticus*) and in one of seven pefloxacin patients (*Enterococcus faecalis*).

Bacteriological eradication rates were higher with rufloxacin than with pefloxacin, the differences not reaching statistical significance (Table 4). In the intention-to-treat analysis, 88.1% of all assessable pathogens were eradicated in the rufloxacin group, compared with 84.1% in the pefloxacin group. Similarly, no statistically significant differences were found between the groups in the eradication of the different uropathogens. *E. coli* was eradicated in 88.2 and 83.7% of the two groups, respectively. Both drugs eradicated all *Proteus* species. Rufloxacin eradicated 80% of the *S. saprophyticus* isolates, and pefloxacin eradicated 100%.

Clinical results. As shown in Table 3, no statistically significant differences in clinical resolution rates between the rufloxacin and pefloxacin treatment groups were found in either the intention-to-treat analysis (84.8 versus 84.4%; 95% CI of the difference, −7.8 to 8.6%) or per-protocol analysis (89.4 versus 87.6%; 95% CI of the difference, −6.1 and 9.7%). The time course of clinical signs and symptoms did not show any differences between the two quinolones. In all, disappearance of clinical symptoms was observed in approximately 80% of the patients at the early follow-up visit.

Safety assessment. A total of 446 patients (218 on rufloxacin and 228 on pefloxacin) were analyzed for safety. Adverse events were reported in 42 (19.3%) patients of the rufloxacin group and in 40 (17.5%) of the pefloxacin group, a nonsignificant difference (95% CI, −5.9 to 9.5%). Adverse events potentially related to the study drugs are given in Table 5. No event was definitely related to the drug or serious. Only one patient with severe abdominal pain and vomiting after pefloxacin treatment refused to undergo the follow-up. Central nervous system-related events were significantly more frequent in rufloxacin-treated patients ($P < 0.008$). Specifically, more insomnia events were reported in the rufloxacin group (6.9 versus 1.8%). Conversely, gastrointestinal tract-related events were more frequent in pefloxacin-treated patients, the difference approaching statistical significance ($P = 0.059$). No clinically significant adverse changes in hematological parameters from the pretreatment values were reported. A significant decrease in kalemia (from 4.6

TABLE 3. Bacteriological and clinical responses by treatment group, showing intention-to-treat and per-protocol analyses

Type of analysis and response	No. (%) of patients	
	Rufloxacin group	Pefloxacin group
Intention-to-treat analysis		
Bacteriological response	165	178
Cure without reinfection	127 (88)[a]	136 (84)[a]
Cure with reinfection	18	14
Relapse	13	21
Persistence	7	7
Clinical response	165	180
Resolution	140 (85)	152 (84)
Improvement	13	12
Relapse	4	8
Failure	8	8
Per-protocol analysis		
Bacteriological response	132	132
Cure without reinfection	105 (91)[a]	103 (85)[a]
Cure with reinfection	15	9
Relapse	12	19
Persistence	0	1
Clinical response	142	153
Resolution	127 (89)	134 (88)
Improvement	10	10
Relapse	3	8
Failure	2	1

[a] Percentage showing cure with and without reinfection.

TABLE 5. Potentially drug-related adverse events[a]

Adverse event	No. of events	
	Rufloxacin group (n = 218)	Pefloxacin group (n = 228)
Gastrointestinal	23	36
Nausea	14	17
Vomiting	1	6
Dyspepsia	1	2
Diarrhea	1	0
Flatulence	1	1
Abdominal pain	5	9
Dry mouth	0	1
Central nervous system	28	14
Dizziness	5	5
Headache	4	3
Insomnia	15	4
Ataxia	1	1
Sleepiness	0	1
Hallucinations	1	0
Tinnitus	2	0
Skin	4	2
Pruritus	0	1
Erythema	3	1
Eczema	1	0
Miscellaneous	7	13

[a] Some patients reported more than one type of adverse event by body system. Skin events were not of a photosensitivity type.

to 3.0 mEq/liter) was observed in one rufloxacin-treated patient.

DISCUSSION

Bactericidal concentrations in urine for up to at least 3 days following administration (4, 25, 39) make the long-acting fluoroquinolones adequate and effective for single-dose treatment of uncomplicated cystitis in women (13, 31, 36). Conversely, some concern has been expressed about single-dose treatment with the conventional fluoroquinolones in that *S. saprophyticus* infections fail to respond and lead to frequent recurrences (1, 10, 26, 27, 34). Considering the relatively higher costs compared with traditional therapy with trimethoprim-sulfamethoxazole or ampicillin-amoxicillin, single-shot treatment with long-acting fluoroquinolones is an alternative for women with multiple allergies, intolerance, or suspected or proven resistant organisms. They may also be adopted empirically in countries where the resistance of gram-negative uropathogens to traditional antimicrobial agents is high (5, 7, 33).

TABLE 4. Eradication of pathogens from bacteriologically assessable patients

Pathogen	No. of isolates eradicated/total no. of assessable isolates			
	Intention-to-treat analysis		Per-protocol analysis	
	Rufloxacin group	Pefloxacin group	Rufloxacin group	Pefloxacin group
Escherichia coli	112/127	123/147	103/114	99/119
Proteus mirabilis	16/16	10/10	11/11	6/6
Proteus spp.	1/1	5/5	1/1	3/3
Klebsiella spp.	2/4	2/2	1/2	2/2
Enterococcus faecalis	4/4	2/4	2/2	0/0
Staphylococcus saprophyticus	4/5	3/3	0/0	0/0
Others	9/11	8/11	4/4	4/4
Total	148/168	153/182	122/134	114/134

In our study, rufloxacin appeared to be as effective as pefloxacin, and both drugs achieved a bacteriological cure rate at the 4-week follow-up in the same range as that reported for 3-day treatment with norfloxacin, ofloxacin, and lomefloxacin (1, 10, 26).

The characteristics of the population studied responded to those expected for a target population of women with acute uncomplicated cystitis (14). Patients were mostly premenopausal women, with a mean age of 40 years. *E. coli* was the predominant (78%) causative pathogen, followed by *P. mirabilis* (7%) and *S. saprophyticus* (3%). A total of 76% of the eligible subjects had significant bacteriuria ($\geq 10^5$ CFU/ml). This figure is in agreement with that found by other authors in this indication (10, 12, 26, 36). The prevalence of *S. saprophyticus* infections was relatively lower than expected (34). This organism is often present in urine at counts of between $>10^2$ and 10^4 CFU/ml, which are lower than for gram-negative uropathogens (17). No *S. saprophyticus* isolate was found in our study among the baseline organisms with $<10^5$ CFU/ml. The low prevalence of this organism in the population studied may therefore reflect a different epidemiological pattern of the disease in France. Furthermore, our patients were recruited during two winter seasons and one summer season, and it has been reported that *S. saprophyticus* is most frequently isolated during the summer (35).

We adopted 10^5 CFU/ml as the cutoff for the definition of

significant bacteriuria and for inclusion in the efficacy analysis because this was the criterion accepted when the study was designed, providing good discrimination between true UTI and contamination. A retrospective examination of urine culture results for patients with counts of between $>10^2$ and 10^4 CFU/ml showed that in most, the isolated organisms were unidentified, fastidious polymorphs, contaminant *Staphylococcus epidermidis*, lactobacilli, or other gram-negative enteric bacteria different from *E. coli*, which at low counts are known to be recovered more commonly from asymptomatic women or from women with vaginal symptoms (17, 24). This suggests that this subgroup of patients could have had urogenital infections caused by gonococci, chlamydiae, or *Ureaplasma urealyticum*, with the low-count bacteriuria not being etiologic. These patients did not represent our target population.

The drop-out rate due to missing follow-up urine cultures was 9% in the rufloxacin group and 13% in the pefloxacin group. This is very close to that estimated and indicates good compliance. The comparable number of drop-outs in the two treatment groups and of patients excluded from the per-protocol analysis ensured the absence of biases. In addition, the bacteriological and clinical cure rates obtained in the per-protocol and intention-to-treat analyses did not differ significantly, as indicated by the overlapping 95% CIs.

The two treatments resulted in a comparable high rate of bacteriological cure at 4 weeks posttreatment (91% with rufloxacin and 85% with pefloxacin, per-protocol analysis). The bacteriological success is reduced to 80 and 78%, respectively, if patients with reinfections are considered failures. The number of bacteriologically assessable patients per group at the late follow-up was slightly lower than planned. With this sample size, the power to detect a 10% difference in bacteriological cure rate at the late follow-up was 77%.

The bacteriological cure rate obtained with 800 mg of pefloxacin was slightly lower than that obtained in other studies (31, 36). One possible explanation is that we adopted more rigorous criteria in the classification of bacteriological outcome. Patients with posttreatment counts of 10^4 CFU/ml were considered to have bacteriological persistence rather than eradication, and patients with a baseline resistant pathogen were included in the intention-to-treat analysis.

With both drugs, a high eradication rate was obtained for almost all bacterial species, including *S. saprophyticus* and *P. mirabilis*. The unexpected good cure rate for *S. saprophyticus* and *P. mirabilis* may be related to the particularly high and prolonged concentrations of both quinolones in urine, largely exceeding the MICs for these uropathogens. Furthermore, the low number of quinolone-resistant causative *P. mirabilis* may have further accounted for the high eradication rate.

Clinical results in the two groups were also comparable, resolution being achieved in about 85% of the patients in both groups. Fewer clinical as opposed to bacteriological failures were observed, since most microbiological failures were *E. coli* relapses accompanied by only mild or no symptoms in patients classified as showing clinical improvement or resolution.

In general, rufloxacin was well tolerated and appeared to have the same safety profile as other fluoroquinolones (9, 28). The incidence of adverse events observed with rufloxacin was comparable to that with pefloxacin. However, rufloxacin caused more sleep disturbances than pefloxacin. These symptoms were the most common events reported also in a previous study on rufloxacin (21). The type and frequency of adverse events observed with pefloxacin were similar to those in other studies (31, 36).

The results of the present study confirm the value of a single-dose regimen with long-acting fluoroquinolones in the treatment of uncomplicated UTIs. The patient sample size was large enough to minimize the type 2 error and to conclude with sufficient statistical power that rufloxacin is equivalent to pefloxacin. Rufloxacin can therefore be considered an effective and safe alternative for single-dose treatment of acute uncomplicated cystitis in women. A direct comparison is warranted to determine whether a single dose of rufloxacin, a less expensive regimen possibly causing fewer adverse events, is as effective as a 3-day course of rufloxacin or other quinolones.

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