Out-Patient Antibiotics Switch Therapy in Pediatric Urinary Tract Infection

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Abstract

Objective : To compare the outcomes of out-patient antibiotics switch therapy with the treatment provided in the hospital among pediatric urinary tract infection (UTI) cases.

Material and Method : A comparative study was carried out using the febrile UTI patients of age 1 month - 15 years in the observation room (OPD), Queen Sirikit National Institute of Child Health, Bangkok, Thailand, from 1st January 2000 to 31st December 2000 and the admitted pediatric UTI cases during the same period. The treatment at the OPD was started with parenteral antibiotics, then switched to oral form when the patients were clinically improved and defervesence occurred.

Results : There were 95 cases of pediatric UTI of which 29 cases were treated in the observation room as out-patient, 66 cases were treated as in patients after admitting them. The success rate of treatment was the same in both groups. The patients in the observation room were fit enough to be discharged but continued oral treatment within 1.93 $\pm$ 0.65 days, compared with 6.24 $\pm$ 2.72 days of the admitted group. Gentamicin and ceftriazone were the two most common parenteral antibiotics and norfloxacin was the most commonly prescribed oral antibiotics in both group. Mean age of the OPD group (6.24 $\pm$ 2.72 years) was higher than the admitted group (0.97 $\pm$ 1.7 year). *Escherichia coli* (*E. coli*) was the most commonly found organism in the urine culture and the sensitivity pattern was the same in both groups.

Conclusion : The study revealed that some pediatric UTI patients can be treated as out-patients using antibiotics switch therapy in the observation room instead of being admitted.

Key word : Urinary Tract Infection, Antibiotics Switch Therapy

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The treatment of most bacterial infections needs hospitalization as they require intravenous antibiotics. However, new oral antibiotics with high efficacy and good bioavailability(1) have a major role in treating bacterial infection in the OPD as switch antibiotics therapy. The switch therapy is started with intravenous antibiotics which are continued for 1-2 days until the patients clinically improve. The patients are then switched to oral antibiotics. This method would reduce the cost and risks associated with hospitalization. Since UTI is a common bacterial infection in children, the study was carried out among UTI cases to compare the efficacy of the out-patient switch antibiotics therapy *versus* treatment in the hospital

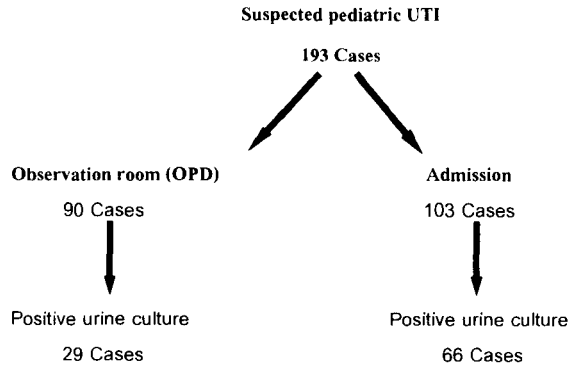

Fig. 1. Suspected pediatric UTI cases.

MATERIAL AND METHOD

This comparative study was conducted at Queen Sirikit National Institute of Child Health (QSNICH), Thailand, from January 1, 2000 to December 30, 2000. The febrile UTI patients were initially treated with intravenous antibiotics in the observation room of the emergency department, for 1-2 days until they clinically improved and defervescence occurred (Fig.1). They were then put on oral antibiotics and sent home. The outcomes were compared with cases of UTI admitted during the same period. Clean-void urine specimens were obtained and cultured. UTI was confirmed by culture in both groups. For outcome evaluation, successful UTI treatment was defined as clinical improvement. There was no relapse of fever and normal urinary examination was done on the seventh follow-up day.

Chi's square and student *t*-test were used for statistical analysis

RESULTS

From 193 cases of suspected pediatric UTI, ninety cases were treated as out-patients in the observation room and one hundred and three cases were admitted. Among these, 29 OPD cases and 66 admitted cases were confirmed to have UTI by culture. The mean age of the OPD group; 2.29 ± 2.57 years was higher than the admitted group; 0.97 ± 1.7 years (Table 1). Urinary examination revealed numerous while blood cell (WBC) in 25 per cent (OPD group) and 38 per cent (admitted group). *E. coli* was the most common organism in urine culture and the sensitivity pattern was not statistically different in both groups (Table 2). Gentamicin and ceftriazone were the two most common initial parenteral antibiotics used and norfloxacin was the most commonly prescribed oral antibiotics in both groups (Table 3). Length of stay in the observation room (OPD group) was 1.93 ± 0.65 days, compared with 6.24 ± 2.72 days in the admitted group. The successful outcome of treatment was 96.5 per cent in the OPD group and 100 per cent in the admitted group (Table 4). One case who was treated with parental antibiotics in the observation room had to be admitted as the clinical condition did not

Table 1. Characteristics of the OPD and admitted group.

	Observe (n = 29)	%	Admit (n = 66)	%	P-value
Age (yr)	2.29 ± 2.57		0.97 ± 1.73		0.06
Sex (M : F)	1 : 1.9		1 : 1.3		0.52
Underlying KUB disease	-		88		0.03
Fever > 39.5°C	9	31	12	18	0.26
Numerous WBC in U/A	6	21	25	38.1	0.15
WBC count in CBC	19.88 ± 6.44		21.53 ± 7.48		0.29

Table 2. Urine culture and susceptibilities.

	Observe (n = 29)	%	Admit (n = 66)	%	P-value
Urine culture					
E. coli	27	93	53	80	0.2
Proteus	-	-	4	6	
Klebsiella	1	3.4	3	4.5	
Resistant to					
Norfloxacin	2	6.5	4	6.1	0.7

Table 3. Parenteral and oral antibiotics.

	Observe (n = 29)	%	Admit (n = 66)	%	P-value
Parenteral antibiotics					
Gentamicin	17	58.6	38	57.5	0.5
Ceftriazone	11	37.9	19	28.7	
Ampicillin	1	3.4	6	9.1	
Switch to oral antibiotics					
Norfloxacin	23	79.3	50	75.7	0.34
Amocycillin/clavulanic acid	3	10.3	3	4.5	

Table 4. Outcome of treatment.

	Observe (n = 29)	%	Admit (n = 66)	%	P-value
Day of defervesence	1.69 ± 0.66		3.10 ± 2.00		0.02
Hospital day	1.93 ± 0.65		6.25 ± 2.72		0.00082
Success of treatment	28	96.5	66	100	0.3

improve. There was no death among both groups. There was no re-hospitalization in the OPD group

DISCUSSION

Antibiotics switch therapy has been used in many community-acquired bacterial infections such as pneumonia, cellulitis, enteric fever and urinary tract infection. At present, there are different regimens(2) in the treatment of pediatric febrile UTI such as traditional in-patient parental antibiotics therapy, out-patient parental therapy or switch antibiotics therapy. The present study showed the higher efficacy of out-patient antibiotics switch therapy compared with that of the admitted group. The success of out-patient antibiotics switch therapy was the same as the hospitalized group. The out-patient treatment can lower the average length of hospitalization by 4.31 days

The authors did not go into detail about cost analysis in the present study. Norsavan P, reported the cost saving of antibiotics switch therapy(3). Unit cost of hospitalization in Thailand was about 700 baht. Approximately 3,000 baht when they follow switch therapy. This does not include the money saved by the reduced number of family visits. Total costs of therapy and follow-up shown in a study by Hoberman (4) was $1,463 for oral therapy compared with $3,577 for intravenous therapy (n = 20). The other benefits of the out-patient switch therapy include less unnecessary paper work, less psychological trauma to the child and decreased risk of cross infection.

On safety analysis, the out-patient treatment turned out to be safer because there was no re-hospitalization and there was no death in the present study, however, the follow-up was very short (one week

after treatment). Renal scan was not done to check if the children had developed renal scar in the long-term follow-up. Many studies[5,6] indicated that delayed or inadequate treatment in acute pyelonephritis may be associated with renal scar. But in a recent study[4], the incidence of renal scarring in children with acute pyelonephritis was not statistically significant (16.9% for oral therapy and 13.9% in the intravenous therapy group). The present study also showed that young children aged under 1 year were not at higher risk for renal scarring compared with those aged between 1 to 2 years.

Defervescence occurred in 1.69 days (out-patient therapy) earlier than 3.10 ± 2.00 days (admitted group). The out-patient group spent not more than 48 hours (2 days) for parental antibiotics in the emergency room before switching to oral antibiotics at home.

Characteristics of both groups are shown in Table 1. The age of the admitted group was younger than the out-patient group. There were 8 cases with underlying kidney-ureter-bladder diseases each in the admitted group such as reflux nephropathy. No other statistically significant characteristics were found. It was indicated that physicians in the OPD preferred to admit the younger (< 1 year) febrile UTI patients and those with underlying kidney disease than to treat them as out-patients.

E. coli was the most prevalent pathogen isolated from children with febrile UTI in many previous studies[7]. In the present study, *E. coli* was also the most common in both groups. There was no statistically significant difference of *E. coli* susceptibility in both groups. Thus showing that these factors did not influence the outcome of the treatment.

In antibiotics switch therapy, the authors started the treatment with parental antibiotics because the children were clinically sick, unable to eat and some of them had nausea and vomiting in the early acute phase of infection. Initial parental route would rapidly reach antibiotics concentration above minimal inhibitory concentration (MIC). Thus, the concentration was high enough to kill a lot of organisms in the acute phase. Johnson CE[8] reported that the initial daily dose of ceftriaxone will prevent later admission because vomiting on the first day may prevent absorption of oral antibiotics. Gentamicin was another drug that was recommended in the initial treatment of switch therapy because of its bactericidal activity. Recently, a single daily dose[9] of gentamicin has been accepted as an effective treatment for UTI.

Characteristics of good oral antibiotics include bactericidal activity, good compliance, good bio-availability and fewer side effects. Norfloxacin was the drug of choice in the present study because of its convenient twice a day dose. The price of this drug is low. Another benefit of norfloxacin is that, the MIC level for *E. coli* was only 0.12 μg/ml. But the drug also has some disadvantages such as low blood level and low renal excretion. The bad taste of grinded norfloxacin is difficult to swallow. In practice, physicians or nurses in the observation room must teach the parent how to mix the medicine with a sweet syrup and must wait until the young children have swallowed it.

Amoxycillin/clavulanic acid is a good oral antibiotics because it has good bio-availability, high serum concentration and high renal excretion. Disadvantages are high MIC_{90} for *E. coli* and the common gastrointestinal side effects.

This study was conducted before the launch of oral third generation cephalosporin in the authors' hospital. Oral third generation cephalosporin may be a good drug in switch therapy[10] because of good convenience (single daily dose) bactericidal activity, low MIC_{90} level for *E. coli* and fewer side effects.

The success in antibiotics switch therapy depends upon better oral antibiotics.

SUMMARY

Some children with febrile UTI can be treated as out-patients in the observation room, especially those who are not clinically very sick, without vomiting, no underlying renal disease, older age group and those who have less than 100 cells/hpf. Urinary analysis the therapy can reduce unnecessary admission and paper work and will potentially lower the total cost of treatment.

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การรักษาโรคติดเชื้อทางเดินปัสสาวะในเด็กแบบผู้ป่วยนอกโดยการใช้ยาปฏิชีวนะแบบเปลี่ยนวิธีการรักษา

ธัญญณัฐ บุนนาค, พบ, ชูเกียรติ เกียรติขจรกุล, พบ**

วัตถุประสงค์: เพื่อศึกษาเปรียบเทียบการรักษาผู้ป่วยเด็กโรคทางเดินปัสสาวะอักเสบโดยใช้ยาปฏิชีวนะแบบ เปลี่ยนวิธีการรักษา ระหว่างการรักษาที่ห้องสังเกตอาการแบบผู้ป่วยนอกกับการรักษาแบบผู้ป่วยใน

ผู้ป่วยและวิธีการ : ศึกษาในผู้ป่วยเด็กที่ได้รับการวินิจฉัยว่าเป็นโรคทางเดินปัสสาวะอักเสบและมีไข้ร่วมด้วย ซึ่งได้รับการยืนยันโดยการเพาะเชื้อในปัสสาวะ อายุตั้งแต่ 1 เดือน - 15 ปี ที่ห้องสังเกตอาการของแผนกผู้ป่วยนอก สถาบันสุขภาพเด็กแห่งชาติมหาราชินี ตั้งแต่ 1 มกราคม 2543 - 31 ธันวาคม 2543 เปรียบเทียบกับการรักษาแบบผู้ป่วยใน ผู้ป่วยทุกรายจะได้รับยาปฏิชีวนะเริ่มต้นด้วยยาฉีด จนกระทั่งอาการทางคลินิกดีขึ้นและไข้ลดลง จึงเปลี่ยนเป็นยากิน และให้กลับบ้าน และมีการนัดติดตามผลการรักษาในเวลาอีก 7 วันต่อมา

ผลการศึกษา : มีผู้ป่วยจำนวนทั้งสิ้น 95 ราย แบ่งเป็นการรักษาแบบผู้ป่วยนอก 29 ราย และผู้ป่วยใน 66 ราย ผลการรักษาพบว่าการรักษาแบบ switch antibiotic therapy แบบผู้ป่วยนอกที่ห้องสังเกตอาการกับแบบผู้ป่วยในไม่แตกต่างกัน โดยผู้ป่วยมีอาการไข้ลด, อาการทางคลินิกดีขึ้น ไม่มีไข้กลับเป็นซ้ำ และผลการตรวจปัสสาวะกลับมาอยู่ในเกณฑ์ปกติ ผู้ป่วยใช้เวลารักษาในห้องสังเกตอาการแบบผู้ป่วยนอกเพียง 1.9 วัน ทำให้กลับบ้านได้เร็วขึ้น 4. 3 วัน เมื่อเทียบกับการรักษาแบบผู้ป่วยใน ซึ่งใช้เวลาเฉลี่ย 6.2 วัน การรักษาเริ่มต้นด้วยยาฉีด Gentamicin หรือ ceftriazone เป็นส่วนใหญ่ ส่วนยากินใช้ยา norfloxacin เป็นส่วนใหญ่ ลักษณะของผู้ป่วยนอกที่แตกต่างจากกลุ่มผู้ป่วยในได้แก่อายุมากกว่าและไม่มีประวัติอดีตเป็นโรคระบบทางเดิน-ปัสสาวะมาก่อน

สรุป : ผู้ป่วยเด็กโรคทางเดินปัสสาวะบางรายสามารถให้การรักษาได้ที่ห้องสังเกตอาการของแผนกผู้ป่วยนอก โดยเริ่มต้นด้วยยาฉีดจนกระทั่งไข้ลดและอาการดีขึ้น ซึ่งใช้เวลาเฉลี่ย 2 วัน แล้วจะช่วยให้ลดการรับผู้ป่วยไว้ในโรงพยาบาลที่ไม่จำเป็นและลดค่าใช้จ่ายในการรักษาโดยรวม

คำสำคัญ : โรคติดเชื้อทางเดินปัสสาวะ, การรักษาด้วยปฏิชีวนะแบบเปลี่ยนวิธีการรักษา

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