The Medical Journal of Basrah University

APPLICATION OF SWITCH THERAPY IN CHILDREN WITH SEVERE INFECTIONS

Sofik V.Vartan, Aida Abd Al-Karim

ABSTRACT

Application of switch therapy in severe infections among children admitted to pediatric unit in Basrah maternity and children hospital was studied. Forty-six cases were involved; 27 cases with septicaemia, 9 with bronchopneumonia, 7 with meningitis and 3 cases with acute pyelonephritis. All cases were treated with intravenous (I.V.) antibiotics for 2-3 days, then switched to oral antibiotics either of same class (27 cases) or of another class with the same spectrum of activity (19 cases). They were discharged from hospital and followed up for the rest 7days.Results showed that clinical improvement started 2days after (I.V.) antibiotics and cure clinically alone or with investigations was obtained at the end of oral antibiotic treatment course in 42 cases (91.3%). Failure of switch therapy was reported in 4 cases (8.7%) who required readmission and further I.V. antibiotic treatment. Great cost savings were also found, as the cost with switch therapy is 10,000-15,000 I.D. Per patient as compared to 21,000-36,000 I.D per patient in cases of full course I.V. antibiotic treatment and hospitalization for 10days. It is concluded that switch therapy is generally safe procedure to be applied for the treatment of severe infections among children. It will reduce the duration of hospital stay and the load on nursing mother. It is a great cost saving procedure, as well.

INTRODUCTION

Switch therapy is defined as the early transition from intravenous to oral antibiotics during treatment of infection[1].

Two types of switch therapy are available:

1. *The substitution of a member of a class of agents for a therapeutic equivalent.*
2. *The change to different class of agents with same spectrum[2].*

There has been growing interest in recent years in early switch therapy; antibiotics are administered intravenous during the early phase of infection and then continued orally. This approach is clinically effective and can minimize the hospital stay. It is also a cost-effective strategy[3]. In addition to the tremendous cost savings, the advantages of switch therapy are impressive and include: - it is more comfortable to the patient, easing load on nursing staff[4], it decreases the number of nosocomial infections and lowers the incidence of intravenous line infection[5]. In addition it will avoid the psychological and physiological reactions that occur due to intravenous cannulation in children, as they are painful procedures, distressful for children, their parents and their health care providers[6]. The concept of when and how to approach the patient for conversion to oral therapy is now the focus of controversy[7]. It was concluded that early transition after 2days to an oral antibiotic after an abbreviated course of intravenous therapy is substantially less expensive and has comparable efficacy to conventional intravenous therapy[8]. So early switch is justified after 2-3days of intravenous administration in the following circumstances:-

1. *The patient must show clinical improvement.*
2. *Oral therapy should result in sufficiently high levels at infection site.*
3. *The patient must be capable of taking oral medicine and there must be no signs of malabsorption, and interactions with food or with other drugs should be taken into account[4]. Despite of all these advantages, still there is a barrier to the acceptance of switch therapy which is due to lack of understanding of its efficacy, safety & cost advantages[9]. Therefore, the aim of this study is to apply switch therapy in severe infections among children to see its success and failure rates according to the clinical outcome as well as its cost advantages.*

PATIENTS AND METHODS

Forty-six children with age ranging from 2 months-11years were admitted to the pediatric unit in Basrah maternity & children hospital during the study period of 9 months. They were diagnosed clinically alone or with investigations as septicaemia (27cases), bronchopneumonia (9), meningitis (7) and acute pyelonephritis (3). They were treated with different antibiotics administered intravenous for 2-3 days (duration of hospitalization), then discharged on 3rd-4th day on oral antibiotics either of the same class (27 cases) or of another class of same spectrum of activity (19 cases)

Sofik V.Vartan, MBChB, MSc, Department of Pharmacology, College of Medicine, University of Basrah, Basrah, Iraq
Aida Abd Al-Karim, MBChB,CABP, Department of Pediatrics, College of Medicine, University of Basrah, Basrah, Iraq

according to the criteria mentioned previously[4]. The treatment with follow up, clinically alone or with investigations, were continued for the rest 7days. Cost assessment was made for the days of hospitalization and intravenous therapy as well as for oral therapy after discharge.

RESULTS

1- Time of switch therapy

Thirty-three cases (21 cases of septicaemia, 6 cases of bronchopneumonia, 3 cases of meningitis and 3 cases of acute pyelonephrtis) all required intravenous antibiotic for 2days and then switched to oral antibiotics on 3rd day and discharged from hospital. Eleven cases (6 of septicaemia, one of broncho-pneumonia and 4 cases of meningitis) required intravenous therapy for 3 days and switched to oral therapy on 4th day and discharged from hospital. The remaining 2 cases of bronchopneumonia required one day intravenous therapy, then switch to oral therapy on 2nd day and discharged from hospital. (Table-1).

Table 1. ***Time of switch therapy.***

Type of disease	Number of cases	Duration of intravenous therapy (days)	Time of switch therapy & discharge
Septicaemia	21 6	2 3	3rd day 4th day
Broncho-pneumonia	2 6 1	1 2 3	2nd day 3rd day 4th day
Meningitis	3 4	2 3	3rd day 4th day
Acute pyelonephritis	3	2	3rd day

2- Types of oral antibiotics

➢ Switching to oral antibiotics of same class

Ampicillin intravenous was used for 7 cases of septicaemia and switched to oral amoxicillin, and for one case of bronchopneumonia switced to oral ampicillin. Ceftriaxone intravenous was given to 4 cases of septicaemia and 3 cases of acute pyelonephritis and switched to oral cephalexin. Cefotaxime intravenous was given to 7cases of septicaemia, broncho-pneomonia and meningitis, and switched to oral cephalexin or cefixime. Ampiclox intravenous also was given to one case of septicaemia and 4 cases of bronchopneumonia and all switched to oral amoxicillin (Table-2).

Table 2. ***Switching to oral antibiotics of the same class of intravenous antibiotics.***

Type of disease	Number of cases	Type of intravenous antibiotics	Type of oral antibiotics
Septicaemia	6 4 3 1 1	Ampicillin+ Gentamicin Ceftriaxone Cefotaxime Ampiclox Ampicillin	Amoxicillin Cephalexin Cephalexin Amoxicillin Amoxicillin
Broncho-pneumonia	2 1 4	Cefotaxime Ampicllin Ampiclox	Cefixime Ampicillin Amoxicillin
Meningitis	2	Cefotaxime	Cefixime
Acute pyelonephritis	3	Ceftriaxone	Cephalexin
Total cases	27		

- **Switching to oral antibiotics of another class of same spectrum of activity**

Cefotaxime intravenous was given to 10 cases of septicaemia, bronchopneumonia and meningitis and switched to oral ampicillin, co-trimoxazole, amoxicillin or erythomycin. Ampicillin+gentamicin intravenous was given to six cases of septicaemia and switched to oral co-trimoxazole. Two cases of septicaemia were treated with intravenous ampiclox and one case with intravenous ceftriaxone and they were switched to oral cephalexin and co-trimoxazole respectively.(Table-3).

Table 3. ***Switching to oral antibiotics of another class of same spectrum of activity of*** intravenous ***antibiotics***

Type of disease	Number of cases	Type of intravenous antibiotics	Type of oral antibiotics
Septicaemia	6	Ampcillin+ Gentamicin	Co-trimoxazole
	3	Cefotaxime	Ampicillin,co-trimoxazole or amoxicillin
	2	Ampiclox	Cephalexin
	1	Ceftriaxone	Co-trimoxazole
Broncho-pneumonia	2	Cefotaxime	erythromycin
Meningitis	5	Cefotaxime	Amoxicillin or Co-trimoxazole
Total cases	19		

3- Patients outcome at the end of switch therapy

Forty-two cases (91.3%) showed good clinical response and cure clinically alone or with investigations at the end of switch therapy. While 4 cases of septicaemia (8.7%) showed failure of switch therapy and they required readmission and further intravenous therapy (Table-4). There were 5 different cases who received switch therapy but they were not included in this study because they did not come for follow up.

Table 4. ***Patient's outcome at the end of switch therapy.***

Number of cases	%	Outcome
42	91.3	Good clinical response & cure
4	8.7	Required readmission for further intravenous therapy

4- Cost assessment

At the time of this study, the cost of the full course of intravenous antibiotic for 10 days with hospitalization is 21,000 I.D/patient admitted in common wards and 36,000 I.D/ patient in private wards. While the total cost for 10 days treatment of infections in case of switch therapy is 10,000-15,000 I.D/patient (7000 I.D/patient and 12,000 I.D/patient for 3days intravenous treatment and hospitalization for common and private wards respectively, plus 1,500-3,000 I.D for oral antibiotics thereafter) (Table-5).

Table 5. *Cost assessment.*

Type of therapy	Cost (I.D) per patient	
	Common wards	Private wards
Full course(10 days intravenous therapy with hospitalization)	21,000	36,000
Switch therapy	10,000	15,000

DISCUSSION

In recent years, switch therapy (short intravenous antibiotic therapy for 2-3 days followed by oral treatment for the remainder of the course) was advocated.[10] In our study all cases were treated with intravenous antibiotics for 2-3 days and then switched to oral antibiotics for the rest course of treatment. This time of switch therapy has been suggested by several other studies[8,11,12]. Switch therapy has been applied in the present work as soon as patients started to show clinical improvement (2-3 days in most of cases). Patients were then discharged on oral antibiotics when they tolerated one dose of oral therapy and this was found to be safe and in agreement with previous studies.[1,13] Two types of switch therapy have been tried in this study; the first is switching to same class of antibiotics, one example is ampicillin intravenous to oral amoxicillin. Such type of switch therapy have also been tried previously[1,14]. The second type is using oral antibiotics of other class but of same spectrum of activity, for example cefotaxime intravenous to oral amoxicillin, co-trimoxazole or erythromycin and this is found to be in agreement with previous studies performed by Paladino JA, et al and Grossman RF who tried switching of intravenous aminoglycosides, cephalosporins and beta-lactams to oral fluoroquinolones in adults[15,16]. In assessing patient's outcome at the end of switch therapy, we found that good clinical response and cure was obtained in 42 cases (91.3%) with failure in 4 cases (8.7%). Failure of switch therapy has also been reported in previous studies[17] where patients required readmission and further intravenous therapy. Cost assessment in the present study have shown a great cost saving of about 20,000 I.D per patient and such finding is in agreement with several studies done in UK & USA which have found that the use of oral antibiotics is beneficial for reducing cost of medications, for example in UK, they found that oral antibiotics were cheaper, easier to administer and if used routinely in the 800 or so patient admitted annually would lead to saving of around 176.000 pounds a year[18]. In United States, switch therapy was associated with an average cost saving of $293 per patient[15] and the total hospital saving for 1994 based on the 80 patient treated with switch therapy was $114.080[14]. Finally, we conclude that switch therapy seems to be a reasonable procedure for hospitalized patients who have already shown a good clinical and laboratory response to therapy with intravenous antibiotics. The early hospital discharge will decrease patient's risk for other nosocomial infections and is associated with clinical cure rate equivalent to conventional intravenous therapy in addition to it's remarkable cost saving. It is recommended that every attempt should be made to switch hospitalized patients with infections from intravenous to oral antibiotics therapy as soon as clinical improvement makes it possible.

REFERENCES

1. Ramirez JA, Srinath L, Ahkee S, et al. Early Switch from intravenous to oral cephalosporines in the treatment of hospitalized patients with community-acquired pneumonia. Arch. Intern. Med. 1995; 155 (2): 1273-1276.
2. Goldenberg MM. Cost containment in Fluoroquinolone use. P&T. 1999; 24 (4): 180-182.
3. Cunha BA. The antibiotic treatment of community-acquired atypical and nosocomial pneumonias. Med. clin. North. Am. 1995; 79 (3): 581-597.
4. Sevinc F, Prins JM, Koopmans RP, et al. Early change from intravenous to oral antibiotics: Switch therapy. Ned-Tijdschr-Geneeskd. 1999; 143(47): 2364-2369.

5. Cunha BA. Intravenous to oral antibiotic switch therapy-A cost-effective approach. Postgrad. Med. 1997; 101(4): 111-2,115-8, 122-3 passim.
6. Kennedy RM, Luhamnn JD. Advances in decreasing distress during painful procedures in the emergency department. Paed..Clin.North. Am. 1999; 46(6): 1215-1240.
7. Cassiere HA, Fein AM. Duration and route of antibiotic therapy in community acquired pneumonia: Switch and step-down therapy. Semin-Respir-infect. 1998; 13(1): 36-42.
8. Omidvari K, de-Borisblanc Bp, karam G, et al. Early transition to oral antibiotic therapy for community-acquired pneumonia: duration of therapy, clinical outcomes and cost analysis. Respir-Med.1998; 92(8): 1032-1039.
9. Bernestein JM. Treatment of community-acquired pneumonia-ISDA guidelines. Infectious diseases society of America. Chest. 1999; 115 (3 suppl): 9S-13S.
10. Sevinc F, Prins JM, koopmans RP, et al. Early switch from intravenous to oral antibiotics. guidelines and implementation in a large teaching hospital. J-Antimicrob-Chemother 1999; 43(4): 601-6.
11. Siegel R. Strategies for early discharge of the hospitalized patient with community- acquired pneumonia Clin-Chest-Med. 1999; 20 (3): 599-605.
12. Siegel R. How short can courses be in lower respiratory tract infections? J-Int-Med-Res.2000; 28(suppl 1): 37A-47A.
13. Ramirez JA, Bordon J. Early switch from intravenous to oral antibiotics in hospitalized patients with bacteremic community-acquired *streptococcus pneumoniae* pneumonia.Arch-Intern-Med. 2001; 161(6): 848-50.
14. Ramirez JA. Switch therapy in community-acquired pneumonia. Diagn-Microbiol-Infect-Dis. 1995; 22(1-2): 219-23.
15. Paladino JA, Sperry HE, Backas JM, et al. Clinical and economic evaluation of oral ciprofloxacin after an abbreviated course of intravenous antibiotics. AM-J-Med.1991; 91(5): 462-70.
16. Grossman-RF. The role of fluoroquinolones in respiratory tract infections. J-Antimicrob-Chemother. 1997; 40(suppl.A): 59-62 .
17. Ahkee S, Smith S, Newman D, et al. Early switch from intravenous to oral antibiotics in hospitalized patients with infections: a 6- month prospective study. Pharmacotherapy. 1997; 17 (3): 569-75.
18. Chan R, Hemeryck L, O'Regan M, et al. Oral versus intravenous antibiotics for communityuyjhmn67 acquired lower respiratory tract infection in general hospital: Open, randomized controlled trial. BMJ. 1995; 310(6991): 1360-2.