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Original Article

Comparison of Intramuscular Injection of Single-Dose Ceftriaxone and Oral Amoxicillin in Acute Otitis Media in Children

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ABSTRACT

Background: *The present study evaluated efficacy of a single injection of ceftriaxone 50mg/kg IM in comparison with a 10-day treatment course with oral amoxicillin 50mg/kg/d in 3 divided doses for acute otitis media in children.*

Materials and Methods: *A randomized clinical trial was performed on 110 children between 5 months to 12yr who randomly were divided in to ceftriaxone group (n=54) and amoxicillin group (n=56) as case and control groups, respectively.*

Results: *Demographic data and clinical manifestations of patients were similar in both groups.*

Forty-eight (88.9%) and 51 (91%) patients were cured in case and control groups, respectively. There was no significant different in response to therapy between the two group (p<0.05).

Conclusion: *This study showed that the efficacy of single injection of ceftriaxone 50mg/kg IM was equal to a 10-day treatment course with oral amoxicillin 50mg/kg/d divided in 3 doses in non-complicated acute otitis media in children.*

Key words*: ceftriaxone, Amoxicillin, Acute otitis media.*

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INTRODUCTION

Acute otitis media is the second prevalent disease after common cold in children with a peak of 6-20 months of age.

Additionally, it is one of the most common causes of antibiotic administration by pediatricians.

An important characteristic of acute otitis media is trend to recurrence and chronicity which is more prominent in young children.

Although acute otitis media is a self-limited disease, antibiotic therapy has been accepted as a

principle in developed countries, because complications such as meningitis and hearing loss may threaten especially young children.

Nowadays a 10-day course therapy with amoxicillin is recommended in many texts as standard treatment in acute otitis media.

It is expected that most parents do not complete the course of treatment for the children for many reason.

Oral amoxicillin should be divided in multiple doses per day; furthermore, because of gastrointestinal (GI) complications, bad taste of the drug and long period of treatment, the children may not accept this drug well.

Consequently, a simple earache will convert to a complicated otitis or drug-resistant microorganisms may develop.

At present, about 40% of non-typable *Hemophilus influenza* and nearly all types of *Moraxella catarrhalis* are resistant to amino-penicillins particularly amoxicillin.

Therefore, an alternative and effective drug regimen is necessary in these patients.

Based on previous studies, GI complications of ceftriaxone in comparison with amoxicillin are less but its effect on intestinal flora has been equal to amoxicillin.

Ceftriaxone is one of the most long-acting third generation cephalosporins which occasionally named as Rocephin.

Some studies are shown that a single-dose of ceftriaxone intra muscularly IM can prepare a serum level more than minimal inhibitory concentration (MIC) for typic pathogens of acute otitis media.

On the other hand, the level of ceftriaxon within the liquid of middle ear has been reported about 10% of its serum level, meaning that this drug can prepare a required MIC for common pathogens of acute otitis media in children for 56 hours.

A single-dose of ceftriaxone IM has been recommended as a standard treatment for gonococcal infection in literature.

The present study tried to compare single-dose ceftrixone IM with a 10-day oral amoxicillin for treatment of acute otitis media in children.

MATERIALS AND METHODS

A randomized clinical trial with a parallel design was performent on all pediatric patients with acute otitis media aged between 5 months and 12yrs. referred to emergency room of Bahrami Hospital from September 2006 to September 2007.

Those patients who met inclusion criteria (n=110) were randomly divided into two groups as: ceftriacone group(n=54) and amoxicillin group (n=56), then an interventional therapy was done for both groups.

Since, based on pervious studies, the efficacy of amoxicillin in acute otitis media in children has been estimated 83-96% vs. 77-99% for other drugs , sample size was considered 48 patients for each group.

Inclusion criteria for acute otitis media were having at least one symptom (fever, earache and irritability) and one sign (opacity, erythema and bulging of tympanic membrane) should be detected in otoscopy.

Exclusion criteria were as follows:

- Antibiotic therapy two weeks before admission
- Age > 5months or > 12yr
- Known cases of chronic otitis
- Myringotomy
- An extensive scar on tympanic membrane in otoscopy
- Immunoincompetency
- Coagulation disorders
- Coinfection of pneumonia, pharyngitis, or cellulitis
- No participate in follow-up periods

- No successful otoscopic examination (for any reason)
- Those patients who had allergic reaction to cephalosporins.

Ceftriaxone group received ceftriaxone 50mg/kg IM as single dose and considered as case group.

Amoxicillin group also received amoxicillin 50mg/kg/d orally divided in 3 doses per day and considered as control group.

Demographic data, clinical signs, otocopy results and type of therapy were recorded in previously prepared sheets.

Three to five days after initiation of treatment , clinical status of patients was assessed by the physician who re-examined 10 days after treatment and then recorded the findings in above-mentioned sheets .

Monthly (totally, for 3 months), the patients were followed-up by telephone for evaluation of drug complications, recurrence and complete response to treatment.

After one year, both groups were compared with each other regarding response to treatment.

Finally, after collection of data and preparation of a code sheet both groups were assessed and analyzed by Chi-square, Fishers exact and T-student tests.

Since the patients were followed-up by telephone and complications were under control, there was no concern about administration of ceftriaxone IM.

Moreover, those patients who were excluded from the study had necessary therapeutic management.

RESULTS

One-hundred and ten patients with mean age of 21.5 months were enrolled in the study.

Among them, 54 cases with mean age of 19.67months were in ceftriaxone group and 56 cases with mean age of 22.57 months were in amoxicillin group.

In ceftriaxone group, 48 patients (88.9%) showed complete response to treatment in comparison with 55 patients (91.1%) in amoxicillin group (x=0.14, $p<0.05$).

One (1.9%) out of 6 patients with no response to therapy in ceftriaxone group, had a topical dermatitis and re-infected during 3 months after completion of treatment.

Among 5 patients with no response in amoxicillin group, 2(3.6%) were re-infected during 3 months after completion of treatment in whom one had history of frequent hospitalization due to pneumonia.

Therefore, there was no statistically significant difference in re-infection after 3 months of therapy between two groups ($p<0.05$).

Demographic data of patients in both groups and their clinical characteristics are shown in table 1.

Table 1. Comparison of demographic data and statistical analyses (x2 test, fisher's exact test) between ceftriaxone group and amoxicilin group.

Characteristics	Amoxicillin	Ceftriaxone	p-value
Mean age	22.57	19.67	0.7
Sex			
Female	26(64.4%)	24(44.4%)	0.83
Male	20(53.6%)	30(55.6%)	
Season of referral			
Autumn	24	29	
Winter	12	18	
Spring	13	4	
Summer	5	5	
Symptom:			
Otalgia	39(69.6%)	41(75.9%)	0.45
Irritability	38(67.9%)	39(72.2%)	0.61
Fever	33(58.9%)	25(64.8%)	0.52
Vomiting	9(16.1%)	11(20.4%)	0.55
Diarrhea	7(12.5%)	8(14.8%)	0.72
Rash	2(3.6%)	3(5.6%)	0.67
Involved ear			
Left	28	24	
Right	24	23	-
Bilateral	4	7	
Otoscopy			
Discoloration	47(83.9%)	51(90.7%)	0.28
Opacity	29(51.8%)	27(50%)	0.85
Bulging	14(28.2%)	17(31.5%)	0.45
Response	51(91.1%)	48(88.9%)	0.7
Recurrence during 3 months after treatment	2(2.6%)	1(1.9%)	1

Of 110 patients, 80(72%) were less than 2 yrs (mean age 12.7 months), and 30(27.3%) greater than 2 (mean age 43.6 months) .

In amoxicillin group 34 of 38 patients (<2) and 17 of 18 patients (>2) responded to therapy (X^2=0.6, p<0.05).

In ceftriaxone group, 34 of 42 patients (> 2) and 11 of 12 patients (<2) responded to therapy (X^2= 0.67, p<0.05).

There was no significant difference in response to treatment with ceftriaxone and amoxicillin between the two age group (p>0.05).

In amoxicillin group, 26 were female and 30 were male, 26 and 30 patients responded to therapy , respcctively (X^2= 0.72 , p< 0.05).

In ceftriaxone group, 24 were females and 30 were males in whom 22 and 26 patients, respectively, responded to therapy (x= 0.13, p> 0.05).

There was no significant difference in response to treatment with ceftriaxone and amoxicillin according to gender (p> 0.05).

DISCUSSION

The results of this study showed equal efficacy of injection of ceftriaxone intramuscularly with a 10-day oral amoxicillin in non- complicated acute otitis media in children (p<0.05).

In other studies , the response rates for administration of a 10-day oral amoxicillin and injection of single dose of ceftriaxone IM were 90-92% and 85-90%, respectively (8,9,10).

In 1993, one study performed on 233 patients with otitis media aged from 5 months to 5 yrs. in whom 117 patients received amoxicillin, of which 105 (91%) showed complete response to therapy and were cured.

Among the remaining 116 patients who received ceftriaxone, 106 (91%) improved completely (p>0.05) (3).

Another study was conducted in Beijing Hospital in China on 212 children aged ranging from 5 months to 12 yrs. and its criteria was consiste with those of our study.

Among 106 children who had received ceftriaxone, 103 (97.17%) completely improved and in amoxicillin group (106 children) 196 (90.58%) were cured (p<0.05).

The majority of studies indicated that amoxicillin 80-100 mg/kg showed be effective and safe in infants <2yr, those children who had been recently received β-lactam antibiotics and children who were supervised in nursery and were in contact to other children, because the prevalence rate of resistant pneumococcus is higher in these children (1,2,12).

There was no significant difference in the recurrence rate of the disease during 3 months after treatment between two groups (p>0.05), the result was consistent with other studies performed in America, Europe and, the Fart East.

Regarding response to therapy, there were no differences in age (p<0.05) and gender (p<0.05) between ceftriaxone group and amoxicillin group with other confirmed studies.

Regarding drug complications, 2 patients in ceftriaxone group and 3 patients in amoxicillin group developed rashes, the difference was not singnificant (p<0.05)

Other studies have not mentioned about this issue, but they showed that ceftriaxone had less GI complications than amoxicillin in spite of the fact that both drugs have the same effect on intestinal flora.

However, ceftriaxone can remarkably reduce the colonization of Pneumococcus, Hemophilus influenza and Moraxella catarrhalis in nasopharynx.

The easily use of single dose of ceftriaxone IM has recommended it as an appropriate and ideal method of treatment.

The limitation of our study was no consider of blinding because of obligation of the parents to be aware of treatment method.

If child does not have a good compliance to use an oral amoxicillin or has allergy to β-lactams, we recommend a single injection of ceftriaxone IM as drug of choice in treatment of acute otitis media.

CONCLUSION

The efficacy of single dose of ceftriaxone IM (50mg/kg) was equal to a 10-day oral amoxicillin (50mg/kg/d divided in 3 doses) in treatment of non-complicated acute otitis media in children.

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