Successful Treatment of Late Onset Infection Due to Multi-Drug Resistant *Acinetobacter Lwoffii* in a Low Birth Weight Neonate Using Ciprofloxacin

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Abstract

This report presents the case of a low birth weight neonate with multidrug-resistant *Acinetobacter Lwoffii* infection who was successfully treated with ciprofloxacin and co-trimoxazole. Use of ciprofloxacin in pediatric populations was reviewed. The infant responded to the antibiotic regimen with sterilized cerebrospinal fluid with no adverse effects attributable to the ciprofloxacin. Although ciprofloxacin has been found to cause irreversible damage to cartilage in laboratory animals, a review of the literature found that this complication rarely occurs in pediatric patients. Ciprofloxacin has been found to be effective in the treatment of multidrug-resistant gram negative infections in pediatric patients, including premature infants. Ciprofloxacin should be considered in the treatment of neonatal infection caused by multidrug-resistant gram-negative organisms.

Key word : *Acinetobacter Lwoffii*, Low Birth Weight, Ciprofloxacin

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Neonatal infections including bacterial meningitis are associated with high mortality and long-term neurodevelopment sequelae. Third-generation cephalosporins have a role in the treatment of gram-negative infections especially of the central nervous system because of their excellent activity and high level in cerebrospinal fluid. However, widely used antibiotics in the neonatal intensive care unit increase multidrug-resistant bacteria to cephalosporin. Ciprofloxacin, a fluoroquinolone derivative of nalidaxic, acts by inhibiting bacterial DNA gyrase. It is effective against gram-negative organisms and

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Table 1. Hematological values before, during and after treatment with ciprofloxacin.

	Hospital day					
	D1	D3	D4	D9	D12	D37
White cells (10^3/mm^3)	12.8	12	16	23.3	34.2	7.1
Hematocrit (volume %)	59	56	52.6	45.5	38.5	26.9
Platelet (10^3/ mm^3)	158	117	68	75	195	275
PMN (%)	67	71	68	75	78	10

Table 2. Biochemistry and culture results of cerebrospinal fluid and blood before, during and after treatment with ciprofloxacin.

	Hospital day			
	D9	D12	D14	D18
White cell (cells/mm^3)	1	2,200	4,000	300
PMN (%)	0	90	95	60
Protein (mg/dl)	207.3	416	342	328.5
Sugar (mg/dl)	29	2	0	9
Blood sugar (mg/dl)	93	97	68	83
CSF culture *Acinetobacter Lwoffii*	+	+	+	-

penetrates the cerebrospinal fluid well despite its use in pediatric patients is limited mainly because of its side effects. We used ciprofloxacin successfully to treat a low birth weight infant with multidrug-resistant *Acinetobacter Lwoffii* infection.

CASE REPORT

A 1950-gm boy was born at 33 weeks' gestation to a 40-year old, Thai female, by cesarean section due to frank breech and placenta previa. The infant was empirically started on ampicillin and gentamicin on the first day of life for respiratory distress and possible sepsis. The antibiotics were changed to 3rd generation cephalosporin and amikacin after one day due to clinical deterioration. The infant improved gradually but developed apnea on the eight day of life. *Acinetobacter Lwoffii* was found from the tip of the umbilical catheterization culture. Antibiotics were changed to imipenam. The patient continued to have apnea although still on a respirator. Sepsis work up was done with complete blood count, hemoculture and lumbar puncture (Table 1, 2). The baby developed a seizure at 12 days of age. Lumbar puncture was done again and CSF profile showed polymorphonuclear cell predominance. Antibiotic was switched to meropenam instead of imipenam (20mg/kg/dose every 12-hour). Cerebrospinal fluid culture from both specimens grew *Acinetobacter Lwoffii* resistant to both imipenam and meropenam but sensitive to ciprofloxacin, chloramphenical and co-trimoxazole. On the 14th day of life, 2 days after starting meropenam, repeat spinal tap showed more polymorphonuclear cell and *Acinetobacter Lwoffii* still positive in the cerebrospinal fluid. On the 16th day of age, antibiotic was changed to ciprofloxacin (30 mg/kg /dose q 12-hour) and co-trimoxazole (20 mg/kg/day of trimethoprim). Good response to treatment was seen in the CSF with negative culture on 18 days of life. Antibiotic was prescribed for 21 days. No complications were found in the course of this treatment and laboratory examination of blood for electrolyte, urea nitrogen, creatinine and liver function were all normal. Eye exam and brain stem auditory evoked response were also normal after treatment. Growth and development at follow-up clinic were normal at 6 months old.

DISCUSSION

Ciprofloxacin has been found to cause irreversible damage to cartilage in juvenile laboratory animals, leading to its limited use in pediatrics (1). This drug has been used on a basis in treatment of shigellosis(2) and the treatment of multidrug-resistant typhoid fever(3).

Growth in children treated with ciprofloxacin has been found to be normal(4) and monitoring by magnetic resonance imaging in cystic fibrosis patients showed no development of the characteristic cartilaginous abnormalities seen in experimental animals(5).

Ciprofloxacin appears to be effective in the treatment of infants and small premature babies with systemic sepsis(6), meningitis(7), and brain abscess (8) caused by multidrug-resistant organisms. Toxi-

city seems to be uncommon in infants and low birth weight babies but one report did link the use of ciprofloxacin to greenish discoloration of teeth[9] and pseudomembranous colitis with perforation in infants with exposure to ciprofloxacin in breast milk [10].

Using broad-spectrum antibiotics in the NICU increases colonization with bacteria, fungi and promotes the emergence of resistant organisms [11]. This antibiotic has never beeen used in our unit, so ciprofloxacin resistant bacteria has not occurred. As with other antibiotics, the increased use of ciprofloxacin can lead to an increase in resistance, which is mediated by an alteration in the organism's DNA gyrase or a change in the permeability of the cell membrane to the drug[12]. An increase in the prevalence of ciprofloxacin-resistant Salmonella, Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa have all been reported[13-15]. Neonatologists should be aware of the possible role of ciprofloxacin in the management of neonates because of the increasing prevalence of resistant gram-negative organisms in NICU.

From our experience, we suggest that ciprofloxacin can be effective in the treatment of serious infections especially central nervous system infection by multidrug-resistant bacteria. Monitoring of the drug should be done while on therapy.

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ความสำเร็จในการรักษาทารกน้ำหนักน้อยที่ติดเชื้อ *Acinetobacter Lwoffii* ที่ดื้อยาด้วย Ciprofloxacin

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รายงานความสำเร็จในการรักษาทารกน้ำหนักน้อยที่ติดเชื้อ *Acinetobacter Lwoffii* ที่ดื้อยาหลายชนิด ด้วย ciprofloxacin และ co-trimoxazole ทารกมีภาวะกระแสโลหิตเป็นพิษและเยื่อหุ้มสมองอักเสบจากเชื้อ *Acinetobacter Lwoffii* ผู้ป่วยได้รับการรักษาด้วยยา ciprofloxacin และ co-trimoxazole และตอบสนองดีต่อยาที่ใช้และไม่พบโรคแทรกซ้อนแม้ว่าจะมีรายงานมีการทำลายกระดูกอ่อนในสัตว์ทดลองจากการให้ยา ciprofloxacin, จึงควรพิจารณาการใช้ยาชนิดนี้ในทารกที่มีการติดเชื้อที่มีปัญหาการดื้อยา

คำสำคัญ : *Acinetobacter Lwoffii*, ทารกน้ำหนักน้อย, ciprofloxacin

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