

An Outbreak of *Serratia marcescens* on the Neonatal Unit: Description and Investigations

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Abstract

In september 2013, an outbreak of *Serratia marcescens* infection occurred in the neonatal intensive care unit of children's hospital Abderrahim Harrouchi in Casablanca. Rapid microbiological investigation led to identify nine cases of *S. marcescens* sepsis. The environmental investigation didn't detect *S. marcescens*. Strict hygiene measures were led to early interruption of the outbreak, without recurrences to this date still.

Keywords: *Serratia marcescens*; Neonatal infection; Outbreak

Introduction

Serratia marcescens is an Enterobacteriaceae opportunistic gram negative, nosocomial pathogen [1].

Several outbreaks of *Serratia marcescens* in neonatal intensive care unit (NICU) were documented in recent years, causing potentially fatal sepsis, meningitis or pneumoniae in very premature or low birth weight neonates with mortality rates as high as 44% [2,3].

Normally, *S. marcescens* is not a part of the intestinal bacterial flora of neonates [4].

This bacterium may be transmitted to neonates through feeding, contaminated antiseptics and breast pumps and it can be spread via contact with patient [5].

The objective of this study is to identify the clinical and epidemiological characteristics of *S. marcescens* infections, and propose an urgent management strategy to control the outbreak.

Patients and Methods

Retrospective study of the cases of *Serratia marcescens* outbreaks for a period of one month from September to October 2013 in newborns aged between 0-28days in neonatal unit of Abderrahim El Harrouchi's hospital in Casablanca.

Results

Nine cases of nosocomial infection of *Serratia marcescens* were registered (7 inborn and 2 out born). The breakdown by gender in our series shows: six girls and three boys, four of whom were premature, three newborn weighed less than 2000 g. The reason for hospitalization was respiratory distress in 8 cases and an anoxic ischemic encephalopathy in one case. Seven neonates were receiving antibiotics (3rd generation cephalosporins). The average time of onset of nosocomial infection was 5 days +/- 2,16.

Clinical presentation	Number of cases	percentage
Septic shock	5	56%
Neurological signs	2	22%
Failure of extubation	2	22%

Table 1: Clinical presentation of nosocomial infection of *S. marcescens*.

ANTIBIOTICS	RESULTS
Ampicillin	Resistant
Amoxicillin/Acide clavulanic	Resistant
Cefolatin	Resistant
Ceftazidim	Sensible
Aztreonam	Sensible
Colistin	Intermediary
Cefoxitin	Resistant
Ertapenem	Sensible
Amikacin	Sensible
Ciprofloxacin	Sensible
Imipenem	Sensible
Cotrimoxazole	Sensible

Table 2: Susceptibility to antibiotics of *Serratia marcescens*.

The Clinical presentation was a septic shock in 5 cases, neurological signs in 2 newborn, a failure of extubation in 2 cases (Table 1), and biologically a significant increasing C-reactive protein (CRP) values in all cases.

The bacteremia was found in all patients associated with two meningeal locations. Blood cultures in all cases grew *S. marcescens* fully susceptible to imipenem, amikacin and ciprofloxacin (Table 2). All our patients were treated with imipenem and amikacin in all cases and ciproxin in both case of meningeal location. Five neonates with clinical signs of sepsis died, leading to a mortality rate of 54%.

Some days after neonates became symptomatic, extensive environmental microbiological investigations started. Swabs were taken from numerous surfaces, including walls, floors with their edges

and corners, doors and door handles, shelves, benches, hoods, sinks, cradles and ventilators, stethoscopes and other personal medical devices. No common point source was identified, strict hygiene measures lead to early interruption of the outbreak, without recurrences to this date. (possible sources were disposed and renewed, including parenteral nutrition, disinfectants, soaps and soap dispensers, cotton and tissues, other hygienic measures were taken, such as hand washing with alcohol based solutions at all sites in the ward, and using gloves when assisting and caring for neonates) (Table 3).

Case	Sex	Gestational age (weeks)	Birth weight (g)	Invasive Procedures	Culture (Blood)	Results	Culture (CSF)	Results	Evaluation
1	F	37	3900	Respiratory distress	<i>S. marcescens</i>		<i>S. marcescens</i>		Survived
2	M	29	1250	Respiratory distress	<i>S. marcescens</i>		(-)		Died
3	F	40	3200	Respiratory distress	<i>S. marcescens</i>		(-)		Died
4	M	34	2500	Respiratory distress	<i>S. marcescens</i>		(-)		Survived
5	M	35	1550	Respiratory distress	<i>S. marcescens</i>		(-)		Survived
6	F	37	2300	Respiratory distress	<i>S. marcescens</i>		(-)		Died
7	F	39	3780	Respiratory distress	<i>S. marcescens</i>		(-)		Died
8	F	38	3600	anoxicischemic encephalopathy	<i>S. marcescens</i>		<i>S. marcescens</i>		Died
9	F	36	1750	Respiratory distress	<i>S. marcescens</i>		(-)		Survived

UVC: Umbilical Venous Catheter; PVC: Peripheral Venous Catheter; CSF: Cerebrospinal Fluid

Table 3: Clinical characteristics and culture results of the nine infants infected with *serratia marcescens*.

Discussion

Serratia marcescens is an important nosocomial pathogen, especially in neonatal intensive care units (NICU) 11-15%, and it may causes serious infections, including bacteremia (42%), pneumonia (13%), urinary tract infections (8%) and meningitis (7%), with significant morbidity and mortality rate among newborns (44%) [6,7].

Risk factors for acquisition of nosocomial infections in NICUs are low birth weight, long duration of hospitalization and receiving of critical care [8].

In an outbreak *S. marcescens*, extensive environmental microbiological investigations are needed to identify sources and reservoirs [2].

Previous publications have reported various sources of contamination such as breast pumps [5], plastic bottles used for umbilical irrigation [9], scalp vein needles [10], soap dispensers [11] or nail brushes [12], but no source was identified in our study.

Reported morbidity and mortality rates associated with *S. marcescens* outbreaks vary. During an outbreak in a French maternity hospital, only one newborn developed bacteremia and colonization was revealed in the stool samples obtained from 36 newborn [6].

In a report by Halle et al. [13], 27 infants in an NICU were involved in an outbreak, 14 of these infants developed septicemia and/or meningitis, 11 of whom died. In our study, we observed 5 cases of septicemia with fatal outcomes.

Under such circumstances, strict measures such as relocating nurses, closure of wards to new admissions and even temporary total closures of NICU were necessary to contain the spread of microorganism [7,14].

Conclusion

This report serves as reminder of the importance to keep up hygiene precautions at any time specifically in high risk settings such as a NICU.

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