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Antibiotical Susceptibility of Acinetobacter Species Isolated from Nosocomial Infections in Sina Hospital, Tabriz (2000-2008)

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Abstract: Introduction: Acinetobacter species are one of important causes of nosocomial infections in many hospitals. The aim of this study is to evaluate the incidence of acinetobacter infection and identifying pattern of antibiotical susceptibility in different species of acinetobacter in Sina hospital. Methods: In a analytic cross sectional study all patients hospitalized from year 2000 to year 2008 were studied. Study population was those with isolated acinetobacter from blood, urine, respiratory tract discharges, sputum, wound discharges and burnings after 48 hours of hospitalization. Then, antimicrobial susceptibility tests were done on acinetobacter isolates. Results: Resistance rate to aminoglycosides, third generation cephalosporins and quinolones were high in years 2006, 2007 and 2008 respectively. Burning and surgery ICU wards had the most isolation of acintobacters. Resistance rate to carbapenems were 25% in year 2005, 37.5% in year 2007 and 64.7% in year 2008. Isolation of acintobacters was mainly from the burning wounds, respiratory tract discharges, blood, wounds, urine or Foley catheter. Conclusion: According to multi drug resistance of acintobacters, physicians usually face problems in controlling the nosocomial infections due to this organism. Complete resistance of acinetobacter to third generation cephalosporins and quinolones and increasing resistance to aminoglycosides are indicative of inappropriate use of these types of antibiotics in this period. If we did not avoid administering antibiotics none principally, soon should expect complete resistance to other types of antibiotics certainly carbapenems.

Key words: Acinetobacter; Susceptibility; nosocomial.

INTRODUCTION

Acinetobacter species were considered rather safe organisms for human in the past. Unfortunately, in the past years increasing number of infections related to different species of acinetobacter resistant to some drugs have been reported from different parts of the world. These infections are basically nosocomial and generally occur for the patients hospitalized in ICU and have basic problems (Bergogne-Berezin, 1987; Bergogne-Berezin, 1996; Bergogne-Berezin, 2001; Paul M, 2002; Wright, 2005).

The main problems caused by acinetobacter in the hospital, mostly involve severely ill patients in ICU, especially who need mechanical ventilation and patients with burning ulcers and injuries (traumatic patients). Infections related to acinetobacter include pneumonia due to ventilator, skin and soft tissue infections, wound infections, urinary tract infections, meningitis and blood infections (Van Looveren, 2004; Peleg, 2008).

Nowadays, acinetobacter Baumannii due to its extended increased ability in gaining drug resistance causes a lot of problems (Davis, 2008; Cisneros, 2002; Cardoso, 1999; Dijkshoorn, 2007). A. Baumannii is an important reason of nosocomial infections in many hospitals and because of its environmental long lasting and ability to cause resistance to several antimicrobial agents, its control and treatment is difficult (Cisneros, 2005; Bergogne-Berezin, 1986).

Wide use of antimicrobial drugs in hospitals leads to an increase in the number of A. Baumannii which are resistant to wide range of antibiotics, including wide spectrum betalactams, aminoglycosides, and fluoroquinolones (Abbo A, 2005; Bayram A, 2006). Due to multi-drug resistance of acinetobacters, physicians usually face problems in controlling the nosocomial infections caused by this organism.

Method (Procedure):

In an analytic cross sectional study, all patients hospitalized from 2000 to 2008 were studied. In this

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study, patients were investigated retrospectively from 2000 to 2007 and then prospectively up to the end of 2008. Study population was those with isolated acinetobacter from blood, urine, respiratory tract discharges, sputum, wound discharges and burnings after 48 hours of hospitalization in one of the general surgery, urology, ENT, internal, ICU, burning and infectious ward. Also colonization cases with disease were separated from those without colonization. Then, antimicrobial sensitivity tests on acinetobacter isolates were first performed with the disk Diffusion method and then MIC study of species according to NCCLS (Now Clinical Laboratories Standards Institutes) instruction were done.

Statistical Analysis:

Data were analyzed using SPSS version 16 (SPSS, Inc., Chicago, IL, USA). Results are expressed as mean ± SD unless otherwise indicated. Categorical variables were analyzed using Pearson's Chi-square or Fisher's exact test. A p-value of <0.05 was considered statistically significant.

Results:

From 157 patients including 98 male (62.4%) and 59 women (37.6%) that resistance rate to antibiotics were studied, 42 (67.7%) of male and 20 (32.3%) of female patients had clinical value.

Resistance to different kinds of antibiotics in different years is shown in table 1. Results are indicator of increasing resistance to cephalosporins and aminoglycosides. The most site of organism isolation was from burn site (61 cases, 38.2%) that 22 cases (35.4%) had clinical value. Upper airway discharges were the second site (42 cases, 26.8%) with clinical value in 13 cases (20.9%). Other sites were blood (21 cases, 13.4%), urine or folly catheter (13 cases, 8.3%), non burn ulcers (17 cases, 10.8%), with clinical value in 14 cases (22.5%), 5 cases (8%), 7 cases (11.2%), respectively. Resistance was seen in each of bile duct and gastrointestinal discharges and dialysis catheter in one case (0.6%).

Resistance prevalence in each bedridden ward is shown in diagram 1. Burning ward and ICU of surgery had the most resistance. Clinical value in ICU and ICU of surgery was 53.2% and 46.7%, retrospectively.

Mortality rate in different years according to resistant acinetobacter in infection site are shown in diagram 2. The least and the most mortality were seen in years 2001 and 2006, respectively. Improvement rate in resistant isolates in different sites are demonstrated in diagram 3. According to this diagram, burning ulcer has the most improvement rate.

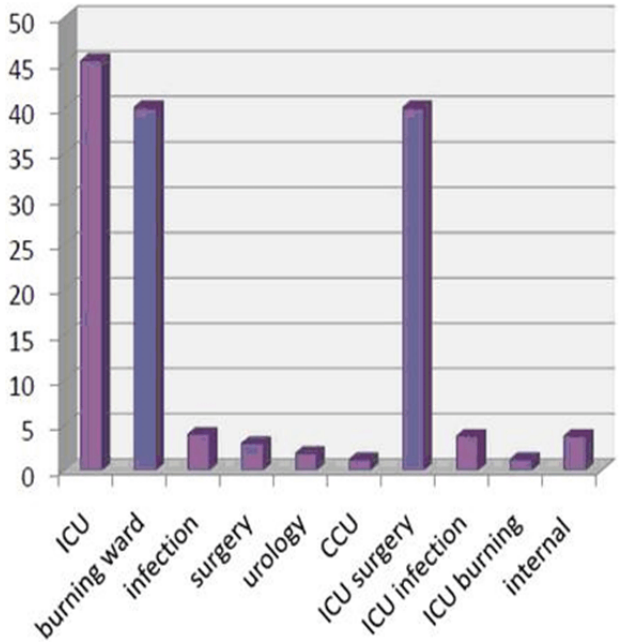

Fig. 1: Resistance prevalence in each bedridden ward.

Resistance to Imipenem and Meropenem:

Resistance to imipenem and meropenem in years 2005, 2007 and 2008 were 25%, 37.5% and 64.7%, respectively. There was no case of resistance to these antibiotics in year 2006. Death in acintobacters resistant

to imipenem and meropenem were seen in 35 cases that most of them were in ICU ward (25 cases, 71.4%). Isolation of acintobacters resistant to imipenem and meropenem were mostly from burn site (61 cases, 38.9%), upper airway discharges (42 cases, 26.8%) and blood (21 cases, 13.4%). Other sites were non burn ulcers (17 cases, 10.8%), urine or folly catheter (13 cases, 8.3%), and each of bile duct and gastrointestinal discharges and dialysis catheter in one case (0.6%).

Table 1: Resistance to different kinds of antibiotics in different years.

Year(s)	Quinolones	Cephalosporins (third generation)	Aminoglycosides
2000	4(28.5%)	10 (71.4%)	9 (64.2%)
2001	4 (50%)	6 (75%)	5 (62.5%)
2002	9 (28.1%)	13 (76.4%)	9 (52.9%)
2003	16 (50%)	26 (81.2%)	17 (53.1%)
2004	18 (64.2%)	28 (100%)	18 (64.2%)
2005	10 (83.3%)	11 (91.6%)	9 (75%)
2006	19 (90.4%)	20 (95.2%)	16 (76.1%)
2007	8 (100%)	8 (100%)	6 (75%)
2008	17 (100%)	17 (100%)	12 (70.5%)

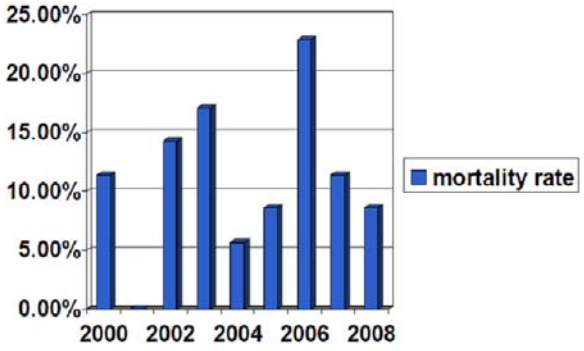

Fig. 2: Mortality rate in different years according to resistant acinetobacter in infection site.

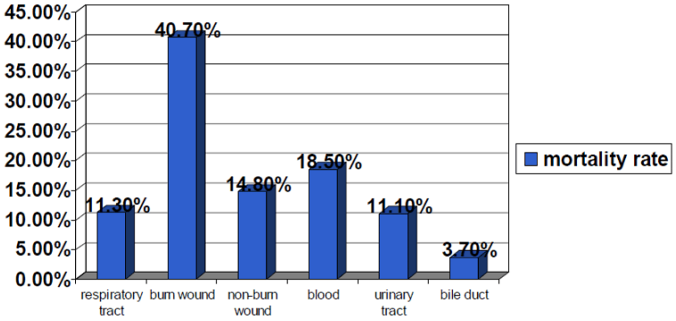

Fig. 3: Improvement rate in resistant isolates in different sites.

Discussion:

In our study, acinetobacter isolation was mostly from burn site, upper airway discharges, blood, non-burn ulcer and folly catheter. According to Abbo and coworkers (Abbo A, 2005) upper airway discharges and then burns were the most sites of infection and remain was as our study. Four main infection sites in Balci and Bayram study were respiratory tract, urinary tract, blood and surgical site infections (Bayram A, 2006).

In our study, having folly catheter and admission in ICU and mechanical ventilation had better role in causing antibiotic resistance. Therefore, Jang and associates in ICUs observed that using central vein catheter, ventilator, cardiac and pulmonary failure and previous colonization of A. baumannii significantly were associated in acquiring this infection (Jang TN, 2009).

A. baumannii is one of important causes of nosocomial infection in most hospitals, which its management and treatment because of long life on environment and ability in making resistance to various antimicrobial agents is difficult (Cisneros, 2005; Bergogne-Berezin, 1986). Wide use of antimicrobial agents in hospitals leads to increase in number of acinetobacter species resistant to wide range of antibiotics, including wide-spectrum betalactams, aminoglycosides and fluoroquinolones (Zarrilli, 2004; Salazar de Vegas EZ, 2007).

Because of this multi drug resistance, physicians usually have therapeutic problems while controlling nosocomial infections of this organism.

In Unal and Garcia-Rodriguez study, acinetobacter had 32.4%, 34% and 47.6% sensitivity to ceftazidime, ciprofloxacin and gentamicin, respectively (Unal S, 2005). In evaluating 15 centers in unites states, acinetobacter resistance rate was 35-40% for ceftazidime/cefepim, 10-30% for aminoglycosides and 35-40% for ciprofloxacin/levofloxacin (Rhomberg, 2007). In one study, resistance rate between years 2001-2004 was exceeded more than 40% for ceftazidime and cefepim, 40% for ampicilin-sulbactam, 35% for amikacin and 45% for ciprofloxacin (Gales AC, 2006).

In a study in turkey in year 2005, A. baumannii was resistant to most of the antibiotics but meropenem, tubramicin and imipenem (Guducuoglu H, 2005). Other studies in 2000 and 2001 were indicator of high resistance of acinetobacter species to ceftazidime, Azteronam, pypracilin and aminoglycosides (Pfaller, 2000; Gales, 2001). In Adams-Haduch study, resistance to amikacin and ciprofloxacin was 36.7% and 95.9% (25). A. baumannii in Balci and Bayram study in year 2006 was resistant to pypracilin, ceftazidime and cefteriaxone in all cases (Bayram A, 2006).

In our study, highest resistance rate to aminoglycosides, third generation cephalosporins and quinolones was in years 2006, 2007 and then 2008. Results are indicator of increasing resistance of acinetobacters to cephalosporins and quinolones with higher rate and aminoglycosides with lower rate.

Recent results in United Kingdom show an increased resistance to carbapenems from 0.5% in 1990 to 24% in 2007. Resistance rate in one study between years 2001-2004 was exceeded 25% for imipenem and meropenem (Gales, 2006). Ashour and El-Sharif in 2009 observed a significant resistance (40.9%) to imipenem in acinetobacter (Ashour, 2009). In our study, acinetobacter resistance to carbapenems from 2005 to 2008 had an increasing procedure which at last reached 64.7% in 2008. Interestingly, although highest resistance to aminoglycosides, quinolones and cephalosporins was seen in 2006, but there was not any case of resistance to carbapenems.

Unlike our study, in different studies, resistance rate to carbapenems from year 2004 till now was 12% to 20%. However, in 2005 in turkey, A. baumannii had no resistance to meropenem, tubramicin and imipenem (Guducuoglu, 2005). Jang and coworkers in 2009 reported that imipenem and meropenem were most active antimicrobial agents with sensitivity of 95% (Jang TN, 2009).

In our study, burn and surgical ICU wards were the most prevalent place (40%) for acinetobacter. Isolation of acintobacters resistant to carbapenems was mostly from burn site, upper airway discharges and blood. Jang and coworkers observed that lower respiratory tract were the most prevalent infection site, and cut-down was in the second place (Jang TN, 2009). In Abbo and coworkers' study, general ICU and internal wards were the prevalent places that A. baumannii were isolated (Abbo A, 2005). Also, in Prashanth and Badrinath study, most infections were acquired from ICU (Prashanth, 2005).

Mortality rate related to acinetobacter species in different studies were 14-20% (Koprnova, 2001; Pfaller MA, 1999). However, Fagon reported 43% mortality rate with pneumonia due to ventilator related acinetobacter (Fagon, 1993). In our study, the most mortality rate was in acinetobacters isolated from upper airway discharges and bur ulcers. The most mortality due to acinetobacter infection was observed in ICU. Also, the most improvement rate was in burn site infections.

Conclusion:

According to multi drug resistance of acintobacters, physicians usually face problems in controlling the nosocomial infections due to this organism. Complete resistance of acinetobacter to third generation cephalosporins and quinolones and increasing resistance to aminoglycosides are indicative of inappropriate use of these types of antibiotics in this period. If we did not avoid administering antibiotics none principally, soon should expect complete resistance to other types of antibiotics certainly carbapenems.

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