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Selective Digestive Decontamination can be an Infection-Prevention Regimen for the Intoxicated Patients

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Abstract: Selective Digestive Decontamination (SDD) the risk factors for the respiratory tract of the intoxicated patients receiving have never been investigated. Thirty intoxicated patients who were admitted to the intensive care unit are included in this study. The three different methods of SDD were randomly studied: SDD, SDD with systemic Antibiotic Therapy (AT) and only systemic AT were applied to groups of ten patients each. On admission, samples were taken from the oropharynx and trachea before the first administration of SDD and then every three days. In cultures, Gram-negative bacilli (*Pseudomonas aeruginosa*, *Klebsiella pneumoniae*) and Gram-positive cocci (*Staphylococcus aureus*) colonizations were significantly higher in Group SDD+AT and Group AT than Group SDD ($p<0.005$, $p<0.05$). The pulmonary infection and pulmonary consolidation on chest X-rays were significantly more visible in Group SDD+AT and Group AT ($p<0.05$). As a conclusion, SDD is an effective method to prevent intoxicated patients from respiratory system infection. Moreover, SDD can be an infection-prevention regimen in a biological event.

Key words: Intoxicated patients, selective digestive decontamination, intensive care

INTRODUCTION

The use of gastrointestinal decontamination is a historical cornerstone in the management of intoxicated patients (Krenzelok and Vale, 2005). Vomiting, for most intoxicated patients, is induced as a first-aid measure before admission. However, the stomach is colonized with enteric Gram-negative bacteria during vomiting. In this manner, these patients can encounter the microbial agents of the stomach or bowel after the gastrointestinal decontamination. Furthermore, it is believed that the gastrointestinal tract plays an important role in pneumonia.

Selective Digestive Decontamination (SDD) was first used in critically ill patients by Stoutenbeek *et al*. (1984) and has been extensively studied to prevent the colonization of the respiratory tract. It is an infection prophylaxis regimen that employs enteral non-absorbable antimicrobials to prevent or eradicate, if initially present, oropharyngeal and gastrointestinal carriage of potentially pathogenic microorganisms (Silvestri *et al*., 2005). This regimen consists of topical non-absorbed antibiotics applied oropharyngeally and is associated with a short course of parenteral antibiotic (Kallet and Quinn *et al*., 2005; Leone *et al*., 2005).

We consider that SDD can be applied against microbiological agents carried in the throat and colonized in the upper respiratory system. The risk factors for colonization of the respiratory tract have never been investigated in intoxicated patients receiving SDD. In the present study, three different SDD methods were compared in intoxicated patients who were admitted to our intensive care unit. On the other hand, the SDD regimen can be an infection-prevention regime in a biological event because of its easy and simple method.

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MATERIALS AND METHODS

After approval by the ethical committee 30 intoxicated patients who received SDD were included in this study from 191 patients over a twelve-month time period (June 1997-1998) in Uludag University Hospital Intensive Care Unit. All patients were scored according to the APACHE II system.

The three different methods of SDD were randomly studied: SDD, SDD with systemic antibiotic therapy (AT) and only systemic antibiotic therapy were applied to groups of ten patients each (Group SDD, Group SDD+AT and Group AT) for three days. The SDD regimen consisted of 500 mg ciprofloxacin, 80 mg tobramycin and 100 mg flucanozole. A mixture of non-absorbable antibiotics paste was applied with a spatula to the oropharyngeal cavity and buccal mucosa twice a day. Two grams of cephotaxime per day were given to both Group SDD+AT and Group AT.

On admission, samples were taken from the oropharynx and trachea before the first administration of SDD and then every three days. The samples were then immediately sent to the Microbiology Laboratory for processing. Identification of pathogenic microorganisms and testing for antibiotic sensitivity were carried out according to standard laboratory techniques. Chest X-rays and arterial blood gases were examined for pulmonary function at the same time. More than 10^3 colony forming units (cfu) in mL in the culture of the oropharyngeal and tracheal samples and the infiltrate images of the chest X-rays were positive criteria for the diagnosis of nosocomial pneumonia. Chi-square test was used for statistical analysis.

RESULTS

The patients in the groups were fully comparable of age, gender, APACHE II scores and compromising factors (Table 1).

The distribution of the organisms did not differ between Group SDD+AT and Group AT. No changes were observed from admission to the final part of the therapy.

In Group SDD+AT, two patients sustained significant counts of pathogens throughout the study. In Group AT, in one patient, the cultures from oropharynx and trachea aspirates were positive for potentially pathogenic respiratory organisms. The cultures of the oropharynx and trachea aspirates remained positive in two patients in Group SDD+AT and one patient in Group AT.

SDD was very effective in reducing the colonization of oropharynx and trachea significantly in Group SDD.

In cultures, Gram-negative bacilli, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and Gram-positive cocci, *Staphylococcus aureus*, colonizations were significantly higher in Group SDD+AT and Group AT than Group SDD ($p<0.005$) (Table 2) (Fig. 1).

Pulmonary infection and pulmonary infiltration on the chest X-rays were significantly more visible in Group SDD+AT and Group AT ($p<0.05$) (Table 3).

Table 1: Clinical characteristics of the patients

	Group (n = 10)		
Clinical characteristics	SDD	SDD+AT	AT
Male/Female	5/5	5/5	5/5
APACHE II score	16(8-26)	15(7-27)	18(12-20)
Compromising factors			
Drug intoxication	7	6	5
CO intoxication	2	1	1
Organophosphate intoxication	1	1	3
Gasoline intoxication	0	1	0
Alcohol intoxication	0	0	1
Mushroom intoxication	0	1	0

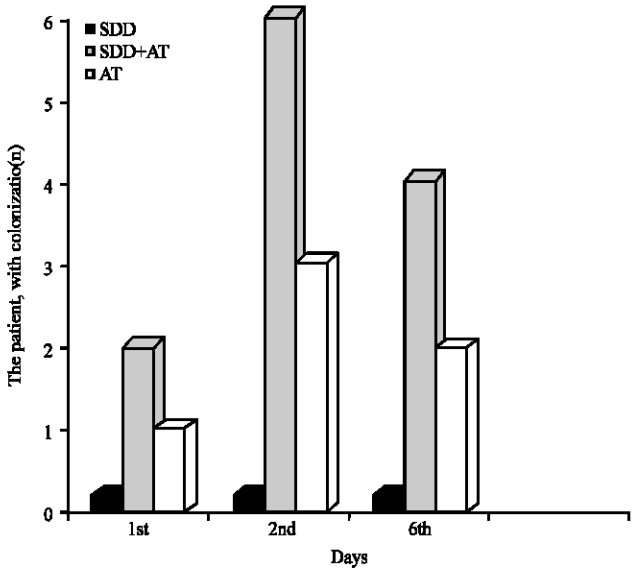

Fig. 1: Colonization of the patients

Table 2: Microorganisms isolated from the oropharyngeal and tracheobronchial culture

	Group								
	SDD			SDD+AT			AT		
Microorganisms	1	2	3	1	2	3	1	2	3
Staphylococcus aureus	0	0	0	1	0	0	0	1	0
Pseudomonas aeruginosa	0	0	0	0	1	1	0	4	3
Proteus mirabilis	0	0	0	0	0	0	1	0	0
Klebsiella pneumoniae	0	0	0	0	1	0	1	0	0
Acinetobacter baumannii	0	0	0	0	0	0	0	1	0
Serratia rubidaea	0	0	0	0	0	1	0	0	0
Candida albicans	0	0	0	0	1	0	0	1	0

Table 3: The infected patients' chest X-ray signs and mortality rate

	Group (n = 10)		
Infection signs and mortality (%)	SDD	SDD+AT	AT
Pulmonary infection	0	60	20
Chest X-ray signs	0	40	10
Mortality rate	0	60	0

On the other hand, there was no significant difference in arterial blood gases between the three groups.

In addition, the mortality rate was found to be high in Group SDD+AT ($p<0.05$). Six patients died in Group SDD+AT during the study period. Two deaths occurred due to acute respiratory distress syndrome and multiorgan failure was the cause of death in four patients.

DISCUSSION

Stoutenbeek *et al.* (1984) introduced a novel and controversial concept, which they termed selective decontamination of the digestive tract. After its first application in intensive care patients, SDD has been the subject of crucial debate between medical groups. However, there are many studies

demonstrating the effectiveness of SDD as a prophylaxis against nosocomial infection in the intensive care units (Van Saene *et al*., 2003; Rocha *et al*., 1992; Ramsay and Reidy, 1990; Abele-Horne *et al*., 1997). In that method, the physicians usually used non-absorbable antibiotics, which were applied topically, plus systemic antibiotics.

Van Saene *et al*. (2003) reviewed 53 randomized trials involving more than 8500 patients and 6 meta-analysis on SDD. They stated that SDD aims to control the three types of infection: primary, secondary endogenous and exogenous due to fifteen potential pathogens. These consist of the six community microorganisms: *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*, *Escherichia coli*, *S. aureus* and *Candida albicans* in previously healthy individuals and nine hospital bacteria carried by patients with an underlying acute condition, namely: *Klebsiella*, *Proteus*, *Morganella*, *Enterobacter*, *Citrobacter*, *Serratia*, *Pseudomonas*, *Acinetobacter* sp. and methicillin-resistant *S. aureus* (MRSA).

We compared SDD and systemic treatment by applying cefotaxime. At the end of the therapy, three patients were colonized by potential pathogens *P. aeruginosa* and one patient by *C. albicans* in Group SDD+AT; one patient was colonized by *P. aeruginosa* and one patient by *Serratia rubidaea* in Group AT. On the other hand, no colonization was found in Group SDD. According to the result of this study, SDD proved to be very effective in reducing bacterial colonization of the oropharynx and trachea.

In this study, the pulmonary infection rate, the number of patients with infiltration on the chest X-ray and the mortality rate are significantly higher in Group SDD+AT. We could not find any pulmonary infection, consolidation on the chest X-Ray or any mortality in Group SDD.

Korinek *et al*. (1993) are reported the reduction in bronchopneumonia rate in head trauma patients in an SDD group in their study. They also stated that SDD might be beneficial due to the reduced length of stay.

Rodriquez *et al*. (1990) are found that the infection rate in ICU stays was reduced from 81 to 16% in an SDD group of multiple trauma patients. Our results of intoxicated patients show the correlation with similar observations in the two previous studies by Korinek *et al*. (1993) and Rodriguez *et al*. (1990).

Abele-Horn *et al*. (1997) also are stated that SDD with amphotericin B, colistin sulphate (polimyxin E) and tobramycin significantly reduced the pneumonia rate. However, the use of parenteral prophylaxis alone failed to show any benefical effect in preventing infection, like in present study (Tettero *et al*., 1994). It is suggested that the *P. aeruginosa*, *K. pnuemoniae* and *Acinetobacter baumannii* were resistant to the cephotaxime used for systemic antibiotic therapy. Therefore, adding antibiotics to the therapy was considered as a factor to increase colonization in the Group SDD+AT and Group AT.

CONCLUSION

The results confirmed that SDD is a beneficial method to prevent respiratory system infection in intoxicated patients. It proved to have the effect of reducing the number of microorganisms, colonization rates, incidence of infection and mortality rate. Another result is that SDD alone or adding antibiotics to the SDD do not have any beneficial effect on reducing the rate of pneumonia. However, because of the small number of patients in the present study and the lack of demonstration of decreased overall mortality, further investigation in this field is needed.

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