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Original article

Nasal care in intensive care unit patients

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ABSTRACT

Purpose: The aim of this study was to investigate nasal hygiene in intensive care patients and improve patient care using isotonic saline nasal spray.
Material and methods: In the study group, over a period of ten days saline nasal spray was administered four times daily. Nasal treatment was not given to the control group. Each patient was examined with a flexible nasopharyngoscope before and after the treatment and a nasal culture was taken.
Results: In the study group, the secretion score (1- absent; 2- serosal; 3- seropurulent and 4- purulent) mean value improved from 1.9 to 1.4. In the control group, the secretion score mean value had risen from 1.7 to 3.1. At the beginning of the study, there was no difference in secretion scores between the groups, but on the tenth day a statistically significant difference was found.
Conclusion: The use of saline nasal spray in this group of intensive care patients was found to be effective in achieving nasal hygiene.

Implications for clinical practice

- Saline nasal spray in this group of intensive care patients was found to be effective by humidifying the nasal cavity, dissolving secretions and activating mucociliary clearance.
- The use of saline sprays in ICU patients may provide an easy, painless and economical method to improve nasal hygiene.

Introduction

While healthcare staff routinely perform oral hygiene in hospitalised patients who cannot do this by themselves, nasal hygiene in these patients is often ignored. After invasive procedures in intensive care patients, such as nasotracheal intubation or nasoenteric feeding tube placement, rhinosinusitis is often observed (George DL et al., 1998). Stress factors such as hypotension, hypoxia or acidosis may lead to proteolysis of proteins secreted in the nasal mucosa causing antibacterial effects (Tsang et al., 2012). These patients are not able to clean their noses mechanically. In addition these patients are sedated, and sedation predispose to the development of nosocomial sinusitis (George DL et al., 1998). The literature is lacking studies addressing this issue.

Saline nasal sprays are commonly used in chronic rhinosinusitis, allergic and non-allergic rhinitis, septum perforation or after nasal surgery to prevent incrustation. They affect direct clearance (Karadag, 2002; Kurtaran et al., 2003), removal of inflammatory mediators (Georgitis, 1994; Ponikau et al., 2005) and an improved mucociliary clearance by means of increased ciliary beat frequency (Boek et al., 2002; Talbot et al., 1997).

The aim of this study is to examine the effect of saline nasal sprays on nasal hygiene in intensive care patients who are unable to clean their own nose mechanically.

Material and methods

The study included 46 patients (21 male, 25 female) who had been admitted to the Anaesthesia Intensive Care Unit (ICU) of

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Table 1
Underlying diseases of the patients.

Underlying Disease	Group 1 (Study)	Group 2 (Control)
	(Mean age: 43,7)	(Mean age: 46,1)
Cardiovascular diseases,	2	3
Respiratory insufficiency	4	1
Cerebrovascular diseases	3	3
Renal failure	1	1
Solid tumors	3	2
Trauma	3	2
Liver failure	0	2
Total	16	16

the tertiary referral hospital. Inclusion criteria: (1) Patient intubated and thought indwelling time >10 days Exclusion criteria: (1) patients who were unlikely to require intensive care for at least 10 days; (2) patients who had sinusitis at the time of ICU admission and (3) patients who will receive antibiotic therapy. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guidelines on human experimentation local ethics committee and with the Helsinki Declaration of 1975, as revised in 2008 (2014/26).

The patient was included into the study on the first day of admission to intensive care. An informed consent form was signed by each patients' relatives. All patients included in this study were orotracheally intubated and all had a nasogastric feeding tube. Patients were divided into a study group and a control group. We used computer-generated random numbers for simple randomization. There was no difference between these groups regarding age and gender distribution. Aetiology of being in the intensive care unit and age distribution is shown in Table 1. In the study group, over a period of ten days one puff of saline nasal spray was administered-four times daily into the nonintubated side and nasopharyngoscopy was performed for this nostril only. The duration of ICU stay prior to onset of sinusitis was 9.8 day in the study published by George et al. [(1)]. We therefore administered isotonic saline spray for ten days. In the control group no nasal treatment was given. Each patient was examined with a flexible nasopharyngoscope before and after the ten day treatment and a nasal culture obtained. The examination was completedby a single doctor who was blinded to the patients' assignment in the study or control groups. In the endoscopic examination, nasal and nasopharyngeal secretions, incrustation and the medial meatus and the inferior meatus were assessed. To evaluate the secretion load, the secretion score introduced by Slapak et al. was applied (Slapak et al., 2008) (1- absent; 2- serosal; 3- seropurulent and 4 - purulent). The culture was sent to the clinical microbiology laboratory in a Stuart medium. The swab was then removed from the Stuart medium, immersed in one ml saline, centrifuged for one minute and subsequently a quantitative culture was prepared after six times 1:10 dilution. For the culture, 5% sheep blood agar, chocolate agar and Eosin Methylen-blue Lactose Sucrose (EMB) agar were used. The cultures were incubated at 37 °C for 18–24 h and assessed the following day. Each colony produced in the culture was diagnosed using the VITEK®2 Compact (bioMérieux, USA) automated identification system.

Results

The study included 46 patients but three patients were withdrawn after the start of the study because of death. Nine patients were excluded because of initiation of broad-spectrum antibiotics. Thirty-two patients (16 patients in study group, 16 patients in control group) remained to complete the study.

In the study group, the secretion score mean value before therapy was 1.9. After saline treatment, statistically significant improvement was found with a mean value of 1.4 ($p = 0.021$). In the control group, the secretion score mean value was 1.7 at the beginning. On the tenth day, the score deteriorated significantly by increasing to 3.1 ($p = 0.001$). At the beginning, there was no difference in secretion scores between the groups, but on the tenth day, a statistically significant difference was found ($p < 0.001$) (Table 2).

Table 2
Comprasion of the secretion scores (between and within) before and after treatment.

Groups	Before Treatment	After Treatment	Wilcoxon test
Group 1 (Study)[a]	1.93 ± 0.77	1.43 ± 0.51	p = 0.021
Group 2 (Control)[a]	1.75 ± 0.77	3.12 ± 0.71	p = 0.001
Mann-Whitney U[¥] test	p = 0.480	p = 0.0001	

[a] Secretion scores: 1, absent; 2, serosal; 3, seropurulent; and 4, purulent.
[¥] For the comparison within group, the Wilcoxon test was applied. For the comparison between groups, the Mann-Whitney *U* test was applied. (*$p < 0.05$ was accepted as statistically significant*).

Culture results were examined regarding three different groups of microorganisms; non-fermenters, the Enterobacteriacea family and Gram positive cocci and bacilli. In the control group, the Enterobacteriacea, *Klebsiella* species proliferation in the first cultures continued in the second cultures. Whereas in the study group, seven patients had proliferated *Klebsiella* in the first cultures but after application of saline, only one patient was found to have proliferation of *Klebsiella* in the second culture. In addition, while *Klebsiella* proliferation was found in both nasal and blood cultures of two control patients, production was found in only two blood cultures of seven patients with nasal *Klebsiella* in the study group. In the non-fermenters (*Pseudomonas, Acinetobacter, Achromobacter, Stenotrophomonas spp.)* and Gram positive bacteria (*Staphylococci* and *Corynebacteria* spp.) no significant change was detected between the groups before and after therapy.

In the control group, four patients developed pneumonia at the end of the study. Nevertheless, by the end of the tenth day, pneumonia occurred in two patients in the study group.

Discussion

For patients who are hospitalised in an intensive care unit who are unable to clean their noses by themselves, the use of saline nasal spray as a very simple method can be beneficial for the patients. Nasal hygiene in these patients is often ignored.

There is no active mucociliary clearance in intensive care patients because of being under sedation (Grindlinger et al., 1987; Hansen et al., 1988; Humphrey et al., 1987). Due to concomitant stress factors such as hypotension, hypoxia and acidosis in most of these patients; proteolytic enzymes in the secretions increase. Normally, epithelial receptors in the nasopharynx are covered with cellulose nectin, thus, bacteria cannot attach themselves (Tsang et al., 2012). With the increased proteolysis in the presence of stress factors, this nectin separates from the receptor which then constitutes an environment suitable for bacterial colonisation. These patients are usually fed through a nasogastric tube. One study found that nosocomial sinusitis was highly correlated with nasoenteric intubation (George DL et al., 1998). The same study listed a Glasgow coma score below 7, non-application of steroid therapy and sedative therapy among the risk factors for nosocomial sinusitis. At the same time, the cough and swallow reflex were weakened and ciliary motility was impaired in the lower respiratory tract in these patients. Considering all these factors ICU patients are at risk for nosocomial sinusitis. While effective aspiration, meticulous sterilization, oral care and repositioning in the bed are part of routine care in wards dealing with serious medical problems like intensive care, but nasal hygiene of these patients is overlooked. In the literature search, no studies on this topic have been found. However, some studies found that pathogens causing ventilator-associated pneumonia in intensive care patients were

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