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The effect of touch on the arterial blood oxygen saturation in agitated patients undergoing mechanical ventilation

Abouzar Souri Lakie[1], Masomeh Bolhasani[1*], Monir Nobahar[1], Ali Fakhr Movahedi[1], Hosein Mahmoudi[2].

[1.] Semnan University of Medical Sciences, Seman, Iran.

2. Baqiyatallah University of Medical Sciences, Nursing Faculty, Medical Surgical Department, Tehran , Iran.

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ABSTRACT

Aims: Patients under mechanical ventilation suffer agitation and lack of forbearance due to different reasons, which bring about changes in arterial oxygen saturation. Thus medicinal treatments are often used, which exact various complications. A touch could be an influential physiologic, non-medicinal stimulus in this procedure. Therefore this study conducted to determine the effect of touch on the level of arterial oxygen saturation in agitated patients under mechanical ventilation.

Methods: The present study is an Interventional study of an after-and-before design, which was conducted on 35 patients under mechanical ventilation, who were hospitalized in the intensive care unit (ICU). These patients aged from 35 to 60. Sampling was carried out based on simple sampling of patients hospitalized in general ICU at Day Hospital, Tehran. In the way that in the intervention group, the nurse touched the patient while standing by him/her. Then the level of arterial blood oxygen saturation was measured by pulse oximeter before and after intervention. The achieved results were assessed by using software SPSS-16 and statistical tests and a significant level of less than 0.05 was accepted.

Results: According to the data analyzing, the difference of the changes in the arterial oxygen saturation level was significant before and after intervention (along with touch) ($p< 0.001$) but while there wasn't any touch, this difference wasn't significant ($p= 0.071$

Conclusion: Touch improves the respiratory status and raises the level of arterial oxygen saturation in patients under mechanical ventilation. Thus it is recommended non- medicinal measures such as touch be taken in order to improve the respiratory status of the patients under mechanical ventilation.

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* Correspondence Author: Masomeh Bolhasani
Department of medical-surgical Nursing, Semnan University of Medical Sciences, Semnan, Iran.Tel:+989123093528
Email: mby2774@yahoo.com

1. Introduction

Mechanical ventilation is a staple element in taking care of critically ill and injured patients

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[1], which employs for different reasons such as bradypnea, apnea, lung injuries, adults respiratory distress syndrome, tacypnea, arterial blood gases change, respiratory muscle fatigue, neuromuscular disorders, change in consciousness level and other reasons [2]. Caring for patients under mechanical ventilation and taking them off the ventilation machine is one of the main problems of the nurses working in intensive care units (ICU) [3]. Mechanical ventilation used to provide better conditions for gas exchange that occur both in alveoli and tissue level, through facilitating and rectifying the entrance and exit of the air [4]. The analysis of blood gases provides useful information about ventilation, oxygenation and patient's acid-base balance status. It considers as a basic laboratory test in assessment of the patient's status under mechanical ventilation. Change in patient's oxygenation status and the assessment of the presence or absence of hypoxia or the decline in arterial blood oxygen level usually determine by the measurement of the patient's level of Pao2, oxygen hemoglobin saturation (O2Sat) in arterial blood, which is an index of the patient's clinical status and the outcome of his/her respiration [5]. Mechanical ventilation usually considers as a life-preserving intervention, however; it bears a high potentiality of producing various problems such as pneumotorax and pneumonia. In the meantime the patient under mechanical ventilation becomes agitated due to anxiety, physical stress, problem in tolerating breathing tube and insertion of a breathing tube. If she/he doesn't tolerate the mechanical ventilation machine, and thus the respiration rate will increases and does harm to the lungs and eventually will cause complications in mechanical ventilation [6].

Various reasons such as the conditions of ICU environment and problem in establishing relation can also cause the patient's agitation, which lead to complications such as long residency in ICU, prolongation of the time the patient uses mechanical ventilation, unpredicted removal of the breathing tube by the patient him/herself [7]. Besides, agitation which is one mode of strong and violent excitements with sudden and violent movements goes with risks such as the outflow of arterial or venous path, the extra need of oxygen and disorder in the treatment interventions. This agitation is determined through behaviors such as unpredicted and violent movements, lack of awareness of time and place, pulling clothes and sheets and removal of the connections [8].

Also, being in a forced environment in which the patient has no choice , lacking sustained access to his family members, confining to bed, being surrounded with instruments, devices, tubes and wires, being on breathing tube, using mechanical ventilation, having a sense of fear and dependency, having pain, losing control, losing memory, feeling dizzy, being deprived of sleep, lacking chemical balance, using drugs, environment temperature, noises, lights and alarms are among main sources of patient's agitation in intensive care units [9]. Considering the problems resulting from the agitation, when the treatment is interrupted and when ventilation condition encounters problems, it's imperative to use appropriate strategies to control that [6]. Physical and chemical restraints (drugs) are frequently used in the intensive care unit to handle agitated patients and to prevent them from doing harm to themselves and to preclude unplanned removal of the breathing tube [10]. To restrain anxiety, pain and agitation associated with using mechanical ventilation and also to observe patient's comfort, sedatives are usually used in the intensive care unit.

Although sedatives are used in %85 patients bedridden in ICU, considerable risks follow using sedatives in patients under mechanical ventilation. Excessive and inappropriate use of sedatives can end in changes in mechanical ventilation machine condition, inability in

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maintaining the path of air, instability of cardiovascular status, prolongation of reliance on mechanical ventilation and pneumonia resulting from mechanical ventilation. Moreover, consistent sedative infusion, though it relieves the patient pain and distress, increases the time of reliance on mechanical ventilation, the time of confinement to bed, inability in evaluating patient's mind, inability in knowing the patient, problems associated with the person accompanying the patient in the hospital, problems in diagnoses, lack of cooperation on the part of the patient in diagnosis and treatment procedures and eventually the rise of expenses [9]. Therefore regarding the fact that sedatives have potential side effects, non-medicinal intervention which is usually regarded in the nursing independent field can be considered as a complementary strategy in controlling patients' agitation under mechanical ventilation and as a ventilation condition ameliorant. These interventions include balancing physical and social environment (ward condition in terms of noises, commuting of the relatives, the relation to physicians and nurses…) to reduce agitation and reinforce positive behaviors. Obviation of the physical limitations is possible through playing their favorite music or sensory stimulations (touch), real or simulated social touch, massage therapy, or artistic activities, which sometime a combination of some of them is applied. Non-medicinal interventions reduce agitation and the importance of these measures can be perceived when their effects are compared to the drugs various side effects. That being so , it's required to conduct more studies to know and choose a more effective and economical and less limited way among these ways in a specific situation [12].

Touch is an intrinsic aspect of nursing interventions, which is accounted as the basis of caring in patient- nurse relation. It is also one of the basic concepts in nursing care and one of the complementary care methods and remedial ways which are received via stimulating touch receptors in the brain, and is a way of perceiving feelings of security, affection and tranquility. Thus implying that is of great importance as a careful method and remedial technique [14].

Therefore considering the importance of mechanical ventilation as an efficient and remedial method in ICU and the significance of the patient's tranquility during his use of the ventilator to reach desirable remedial outcomes and also regarding the side effects of medicinal factors which are the most common method in this field, the need for useful methods with minimum harmful side effects is obviously felt. Gratifying this need will provide tolerable conditions along with tranquility to control the patient under mechanical ventilation and to reach a better remedial effect. The studies on non-medicinal methods have been sparse and no study has been conducted to eliminate or reduce other remedial strategies, although these strategies are of great significance in the independent arena of nursing caries in ICUs. In different researches interesting effects of various non-medicinal implementations have been introduced.

However, the effect of touch on its own has not yet evaluated as an item which can induce a sense of security and tranquility based on physiologic principles and instinctive knowledge, without using remedial techniques, the improvement of the ventilation for the patients under mechanical ventilation and also how it affects the level of arterial oxygen saturation. Therefore considering the issue that touch is one of the basic concepts in nursing care and that mechanical ventilation is the intrinsic element in caring and supporting patients suffering respiration failure and that arterial oxygen saturation level is a symbol of patient's oxygenation status, this study was implemented to determine the effect of touch on arterial oxygen of the agitated patients under

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mechanical ventilation in the intensive care unit.

2. Methods

The present study is an Interventional study of before-and-after design which was implemented on 35 patients who were under mechanical ventilation in a general intensive dare unit of Day Hospital, Tehran, 1390, due to severe respiratory problems. The study was conducted in two phases and included pre-test and post-test. The research society comprised a group of patients who were hospitalized in the intensive care unit and put on mechanical ventilation for the first time due to severe respiratory problems. The sampling method employed was simple sampling and the intervention was chosen and allocated at random by tossing up. When the research unit became qualified for the second time to enter the study, the intervention which hadn't been implemented on him was employed.

The qualifications needed for choosing the samples included being hospitalized in ICU and using mechanical ventilation for the first time due to a severe respiratory problem, being between 35 and 60 years old, applying a consciousness level score of 7 or higher than the Glasgow coma table score, an agitation score of 2 and higher than Richmond scale and not being on sedatives or at least considering the lapse of time blood needs to be clear of drugs. If before entering the second phase the patient's breathing tube was removed or the requisite conditions for re-entering the study to carry out the second phase were not provided for any reasons, the sample would be omitted. Furthermore to minimize the impact of the factors which exert influence on changes in the results of the arterial blood gases test, the unit temperature was controlled and fixed during the study. The ventilation machine settings and patient's position as well as path of air in terms of secretions and openness of the passage were consistently checked and the patients had normal PH. The research units did not suffer hypothermia or hyperthermia and the hand temperature of the person who implemented intervention was in control in all interventions and was kept as much as that of the environment. Since the pre-test post-test method was employed and the changes were considered for statistical conclusions, relatively identical conditions were dominant in each time of intervention. The research units were assessed two times and each time before and after the intervention. Data collection instruments included a questionnaire for collecting demographic data and The Richmond Agitation – Sedation Scale. The stability and reliability of the instruments were approved by Sessler in 2002 [15] and in Iran in 1388 [16]. These instruments, considering the temper and the extent of the patient's aggressiveness, evaluated the amount and kind of the body movements in terms of being purposeful and doing orders, the extent to which they cause danger to themselves and others, consciousness and drowsiness status and the way they answered the patient's orders. One pulse oximeter with the same caliberation was used to assess the arterial oxygen saturation level.

Table 1: The age distribution of research units hospitalized in the intensive care unit of Day hospital in summer 1390.

Percent	Number	Age
14.3	5	<40
11.4	4	40-49
17.1	6	50-59
57.1	20	<60
100	35	Total

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Table 2: the mean and the standard deviation of the research units' level of arterial oxygen saturation before and after intervention in both investigation modes.

P value	The level of arterial oxygen saturation after intervention		The level of arterial oxygen saturation before intervention		Investigation mode
	Standard deviation	Mean	Standard deviation	Mean	
0/070	6/87609	85/03143	5/21278	87/0571	Nurse's standing by the patient without touch
0/0	6/66762	89/3143	7/02158	86/8571	Nurse's standing by the patient with the touch
0/0			0/733		P value

Table 3: the changes in arterial blood oxygen level of the patients in both investigation modes

Investigation mode	Mean Values of the Change in Arterial blood Oxygen	Standard deviation of the Change in Arterial Blood Oxygen	P value
Standing by the patient without touch	-1/7429	5/5287	0/00
Standing by the patient with the touch	2/4571	2/72616	

When the agitation behaviors broke out based on Richmond scale, all primary nursing cares such as setting the bed sheets, providing comfortable and proper condition, checking the path of air and tubes of mechanical ventilation machine to ascertain the correct passage of the air, sucking the secretions, alleviating pains, checking diet, letting the patient have excretion, and checking the settings of the mechanical ventilation machine) are employed to manage the probable source of agitation. If agitation behavior went on based on the assessing nurse's opinion and the score of +2 to +4 based on Richmond scale was acquired [with the outbreak of behaviors such as irascibility, aggressive, violent behaviors, hostility, lack of toleration and removing the connections (urinary catheter, tracheotomy tube, drainage tubes,…) fear and anxiety, apprehension, excessive and unpredictable movements] the samples would be chosen and thus simple sampling would be employed. Then the patients' demographic data collected and recorded. Afterwards, the existing sample was put randomly and by tossing a coin in one of the lists of two different interventions. The control group standing by the patient without touching his/her hand, and the treatment group standing by the patient while nurse implementing intervention touches back of the patient's wrest by her/his hand. To induce the sense of presence and security in a way that the nurse's fingers got close to each other in front of the sufferer's forearms and no pressure was applied. Once again when the very same patient found the qualifications to enter the study the other kind of intervention was implemented for him/her. Each time the same pulse oximeter was used to evaluate and record the arterial oxygen saturation level before and after the intervention. Touch in this study suggested putting the interventionist nurse's palms on the back of the patient's wrest for five minutes. This time span enough to transfer the sense of

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affection and security [17] in a way that the nurse's fingers got close to each other in front of the sufferer's forearms but no pressure was applied. The purpose of this intervention was inducing the sense of peace and security. Regarding the issue that no specific place on the patients' body was assigned for touch, in this study for the observance of the religious guidelines suggesting the touch of the patient's hands or forehead while meeting him/her [18], the patient's wrest was chosen as the place of touch. In control group all the conditions were the same as those of intervention group except for the touch. In this group there was no touch and the nurse just stood by the patient. Finally the results in both kinds of interventions for each patient were statistically investigated before and after the intervention and the achieved results were analyzed by means of statistical software SPSS-16 and statistical tests in significant level of %5.

3. Result

In this study 35 patients under mechanical ventilation, aged between 35 and 60, hospitalized in general intensive care unit, were investigated. The intervention was implemented in a way that the nurse touched the patient while standing by him/her and then the level of arterial blood oxygen was determined by pulse oximeter before and after the intervention. In the other mode the nurse stood by the patient without touching him/her and again the patient's status was investigated by the same instrument before and after the intervention. 21 (% 60) out of 35 patients were men and 14 (%40) patients were women. The average age of the patients was 47/3±11/4. The lowest age was 35 and the highest age was 60 (Table 1).

The mean ± standard deviation of the changes in arterial oxygen saturation level, while using touch has been 2/457±2/72616 and without touch has been - 1/7429±5/5287. Therefore the difference between the changes in arterial oxygen saturation level after intervention compared to that before the intervention was significant ($p<0/001$) (table 3).

4. Discussion:

according to the achieved results of the present research, simultaneous with the control of the patients' agitation under mechanical ventilation, their respiration pattern has also been improved and significant changes were observed while assessing arterial blood gases by a pulse oximeter. At the end, the mean percent of arterial oxygen saturation in agitated patients under mechanical ventilation during touch intervention revealed a significant difference compared to the time when touch was not applied. The achieved results of the present study corroborate the effect of touch on the improvement of the respiratory status and the rise in arterial oxygen saturation level in patients under mechanical ventilation as a result of relative control of their anxiety and agitation. Various studies have been conducted on this issue which had results worthy of consideration. Among conducted researches, only the research by Harrison et al, regarding the effect of parents' touch on premature infants' vital signs, demonstrated various changes in arterial oxygen saturation, which on the whole did not show the effect of touch on premature infants as anything positive [19]. However, considering the research society he worked with, not only do we need to study more to corroborate the claim, but also we should not disregard the physiologic and specific status of the research society. Kahrari (he, in his research, investigated the effect of foot sole massage as a non-medicinal technique on the rise of arterial bold oxygen level in the patients hospitalized in intensive care unit) contended that this method would improve oxygenation and increase the level of arterial blood oxygen [20]. The result of his research corroborated the achieved results of the present study and is an approval of the occurrence of the research hypothesis. Baghcheghi et al also

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studied the effect of touch on the percentage of arterial oxygen saturation in the infants suffering respiratory distress syndrome and employed touch as a complimentary medicine in infants suffering respiratory distress syndrome to determine its effect on these infants' arterial oxygen saturation. The results revealed that there is a significant relation between touch and the rise in the level of oxygen saturation of arterial blood gases to the effect that after touch arterial oxygen saturation increased more than before [14]. Taylor too studied the efficiency of non-medicinal treatment in handling respiration failure on the last days of life and declared his research results as follows: since fear and anxiety are seriously influential in the outbreak of respiratory failure and non-medicinal measures had an effective role in controlling these problems, employing these measures can be useful in handling respiration failure [21]. Silver et al also mentioned in the result of their research that non-medicinal interventions can be effective in improvement of respiration pattern and management of respiration failure in patients suffering cancer.

The effect of touch on the improvement of respiratory status and on the rise in the level of the arterial oxygen saturation in the patients under mechanical ventilation was subsequent to the partial control of the patient's anxiety and agitation.

5. Conclusion

Considering the achieved results of the present study and in regard to the fact that non-medicinal techniques of the complementary medicine induce no complications, it is helpful to accentuate their use in clinical measures. There should be more studies though, to gain more cogent results for reference and clinical application. Along with that, touch as a physiologic instigator can reduce stress and anxiety by inducing a sense of security and trust and effectively control physiologic patterns. The above-mentioned findings could also be regarded as noteworthy vents through which one can look at the advancement of the independent arena of nursing.

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