Improvement Of Patient's Ventilation By Correcting The Slid Recumbent Position In The ICU

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Citation

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Abstract

Until today the proper positioning of the patient in bed was restricted in the elevation of the back of his bed. The fact of the patient's sliding requires to count in the newly acquired posture in bed while evaluating the respiratory capacity. There is a statistical correlation (r= 0.656) in the mean PO_2, (partial oxygen pressure), improvement (ΔPO_2= 16.15 +/- 4.8 mmHg) when the repositioning is greater than 14 cm. In case that the sliding is smaller, the overall effect on patient's respiration is negligible. On the contrary if there is overcorrection with the coccyx over the hinge of the bed, there is a negative result in PO_2 (ΔPO_2= -10.3 +/- 4.32 mmHg), extremely crucial for the patients of the Intensive Care Unit (ICU).

LNTRODUCTION

The correct positioning of the patient in bed is essential during the whole period of his hospitalization[1].

Regarding the rehabilitation of the respiratory system, the acquisition of proper position will help in the removal of the bronchial secretion, in the good functioning of the diaphragm and in better pulmonary aeration. In the past decades the medical literature has established some undeniable rules [2, 3].

In order that the patient in the ICU avoids the intubation or recover his own breathing capacity (after being on mechanical respiration), he has to maximize his tidal volume. According to the current bibliography the patient must be placed in supine position with the upper part of the body at 30 ^{o}– 45^{o} for optimal ventilation [4].

In current bibliography the missing element is the determination of the distance between patient's coccyx and the hinge of the bed that will permit full expansion of the thoracic cavity. The purpose of this study is to calculate this distance in the patients of the ICU.

MATERIAL AND METHODS

All patients who composed the study sample were ICU patients of "Attikon" University Hospital in Athens.

ELIGIBILITY CRITERIA

Their identification was based on their primary bed position. The distance between the hinge of the bed and patient's greater trochanter was obviously big. They had their own breathing capacity while they were supported by a mixture of air with 35 to 45% O_2. They had been stable without receiving any medical treatment for their respiratory system for the last 3 hours before the measurements. Blood PO_2 was collected from the radial artery and verified by a second measurement after 15 min. A Premium type 3000 analyzer was used.

EXCLUSION CRITERIA

In case that the measurements differed more than 5% between the first measurement and the second, the patient was considered respiratory instable and was excluded from the study.

After repositioning the patient and a lapse of 15min we repeated the procedure of blood collection-analysis.

The following parameters were studied:

 PO_2, S * PO_2 O_2, S

 = measurements while in the slid position

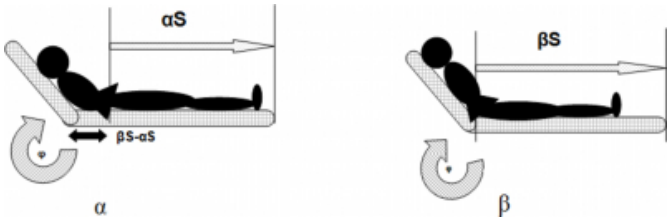
 *= verification of measurements while in the slid position

 = measurements in the corrected position

(Figure 1)

Figure 1

Figure 1. Correction of patient's slid position



47 patients were enrolled in the study. After the second measurement 40 were considered respiratory stable and preceded to next phase of the study.

RESULTS

According to their PO_2 improvement after the repositioning, they were placed in one of the following groups: (Table 1)

Group A Mean PO_2 improvement (ΔPO_2) of 16.15 +/- 4.8 mmHg. The repositioning was ΔS (β S- α S) = 17.7 +/- 3 cm (n = 19).

Group B PO_2 remained practically the same (ΔPO_2 = 0.09 +/- 0.94 mmHg) with ΔS= 11.63 +/- 3 cm (n= 10).

Apart from the abovementioned groups, a third one was created, Group C, which encompassed all cases in which after the repositioning, the greater trochanter was found in a higher place than the hinge of the bed. This newly aqcuired position was arbitrary called "overcorrection position". (Figure 2)

Group C Mean PO_2 negatively changed (ΔPO_2= -10.3 +/- 4.32 mmHg). The repositioning lead to overcorrection of the patients' position (n= 11).

Figure 2

Figure 2. The overcorrection of the patients' position.

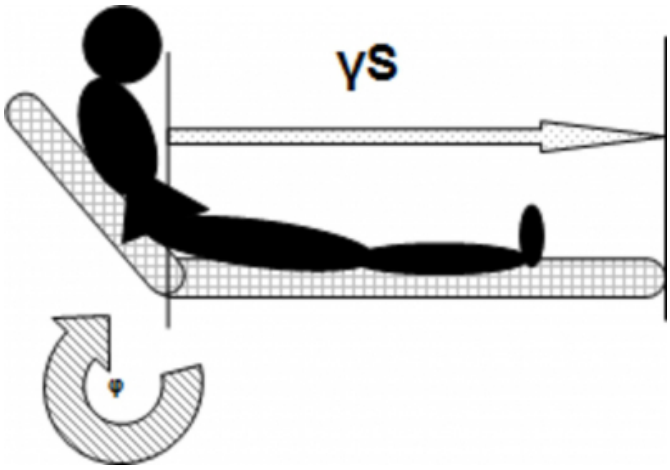


Figure 3

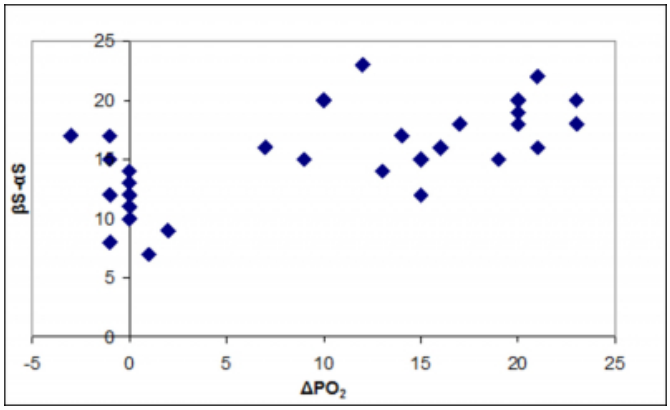
Table 1. Grouping of patients according to their ΔPO according to their PO after the repositioning .

	ΔPO_2 [MEAN(SD)]	ΔS [MEAN(SD)]	BS [MEAN(SD)]
Group A	16.15 ± 4.8 mmHg	17.7 ± 3 mmHg	113.31 ± 1.85 mmHg
Group B	0.09 ± 0.94mmHg	11.63 ± 2.26 mmHg	114.36 ± 2.8 mmHg
Group C	-10.3 ± 4.32 mmHg	14 ± 1.56 mmHg	125 ± 2.21 mmHg

On a scatter plot groups A and B present a possible correlation between ΔPO_2 and ΔS of the patient. The correlation coefficient r for these two groups of values is 0.656. This value demonstrates that these two parameters are highly correlated. (Graph 1)

Figure 4

Graph 1. This graph shows the PO improvement (ΔPO) in relation to the repositioning of the patients (β S- α S).



DISCUSSION

It is extremely important that the patient in the ICU keeps a high PO_2 during the whole period of his hospitalization. One way to achieve this is by correcting patient's slid on bed.

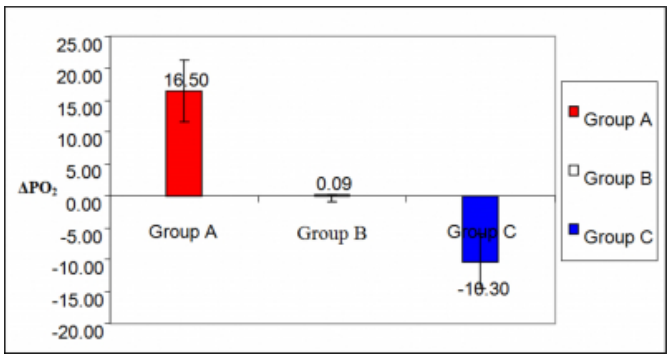
In our study patients of group A that had been repositioned ΔS= 17.7 +/- 3 cm, displayed an important improvement in their PO_2 (ΔPO_2 = 16.15 +/- 4.8 mmHg). This may be attributed to the correction of the thoracic kyphosis which leads to better lungs' expansion and occurs when the patient's body is better aligned with the two parts of the bed (ie. the hinge of the bed is in contact with patient's coccyx).

In patients of group B that the repositioning was ΔS= 11.63 +/- 3 cm, the overall effect on patient's respiration was negligible (ΔPO_2= 0.09 +/- 0.94 mmHg). In these patients the sliding didn't cause any important change in lung volume, so the repositioning didn't alter the blood gases.

Finally in patients of group C the negative change in PO_2 (ΔPO_2 = -10.3 +/- 4.32 mmHg) leads us to hypothesize that the newly acquired position makes it difficult for the lungs to expand. Probably the forward tilt of the pelvis increases the muscle tension of the abdominal muscles which in turn increases the work of the diaphragm and intercostal muscles during inspiration. This hypothesis needs further investigation in the future. (Graph 2)

Figure 5

Graph 2. The different values of ΔPO are depicted in the graph as well as their Standard Deviation.



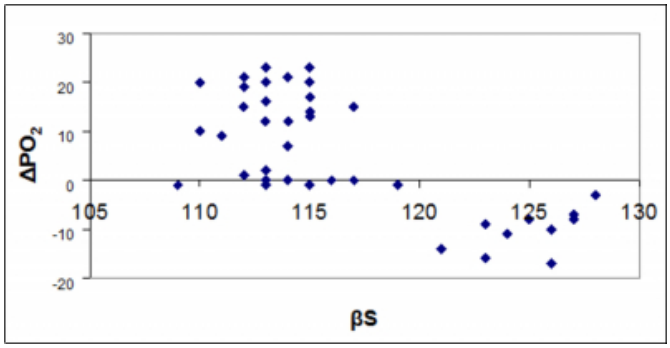
CONCLUSION

Our findings suggest that it is important to correct the position of patients in the ICU that had slid for a big distance. The profit in blood PO_2 from the repositioning is substantial. (In one patient it reached 21.3 mmHg.) This correction in PO_2 level is extremely crucial for the ICU patients especially for those trying to wean from mechanical respiration[5, 6].

On the other hand in case that the sliding is small (<14 cm), the repositioning doesn't have a great impact on patient's PO_2. (Graph 3)

Figure 6

Graph 3. All patients that their position was overcorrected had a negative ΔPO.



Finally, a third observation is that overcorrection of the patient's position, which will lead to the forward tilt of the pelvis, will have a negative impact on PO_2. This deterioration will probably lead to a new intubation.

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