Original Article

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Awake Prone Positioning In COVID Positive Patients: A Retrospective Study

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ABSTRACT

Background: While the advanced health care settings are struggling hard to handle the sudden surge of COVID-19 cases, resource poor settings in developing countries like Nepal can barely stand to fight the increasing number of severe cases. Easily available cost effective interventions would be great blessing for such settings. This study aimed to study if awake prone positioning can be used as such intervention in COVID 19.

Methods: The retrospective study involved 150 patients admitted between November 2020 and January 2021 at Nepal Armed Police Force Hospital and met specific inclusion criteria. Data was obtained at four different time points in relation to prone position and was analysed using International Business Machines Statistical Package for the Social Sciences (SPSS) version 23.

Results: It was found that among 150 patients, majority (109; 72.7%) were males and 60(40%) had some comorbidities. The mean oxygen saturation was found to increase significantly from 87.18 %(SD 3.531) to 91.08(SD 2.206) after fifteen minutes of prone positioning. One way ANOVA test showed that there was significant difference in oxygen saturation between at least two time points. (F (3,596) = [180.005], p=0.000). Games Howell Post Hoc test for multiple comparisons showed that the mean value of SPO_2 was significantly different across all four time points, at significance level 0.05.

Conclusions: This study found Awake Prone positioning as a promising cost effective and feasible intervention for improving oxygenation in COVID 19 and thus could be a blessing to the resource poor health care settings.

Keywords: Awake prone; COVID-19; oxygen saturation; resource-poor.

INTRODUCTION

COVID 19 pandemic has badly hit health systems all around the world. [1] While the advanced health care settings are succumbing to its challenges, it has been the worst nightmare to the health care system with limited resources. So, a simple and effective way without putting much strain to the health system would be the boon in todays' context.

Prone position has been an established maneuver with evidence in treating ARDS in non COVID intubated and mechanically ventilated patients but limited evidence exists in non-ventilated awake patients.[2] (!!! INVALID CITATION !!! [1, 2]) Evidence supporting awake prone positioning in COVID-19 is limited to those generated from case series and small observational studies. [2, 3] There are only a few such researches conducted in low resource health care settings.[1,2,3]

The objective of this study is to find out the effectiveness of prone positioning in improving oxygenation in awake non-intubated COVID positive pneumonia patients.

METHODS

This single centre retrospective study is based upon the data collected from COVID positive patients requiring

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supplemental oxygen, admitted between November 2020 and January 2021 at Nepal APF Hospital. Ethical approval was obtained from the Nepal Health Research Council (Reference number: 3027). Inclusion criteria consisted of given written or witnessed verbal consent for prone positioning, SARS COV2 positive status, age of eighteen to seventy five years and COVID related pneumonia requiring supplemental Oxygen. Exclusion criteria consisted of refusal to participate, hemodynamically unstable state, non-collaborative patient, having altered mental status and having history of chronic obstructive pulmonary disease requiring domiciliary oxygen therapy or non-invasive ventilation, having spine abnormalities and impending intubation on the basis of clinical judgement including clinical and physiological parameters. Out of 658 patients screened for, total of 178 patients admitted during the period met the inclusion criteria, out of which the procedure was unfeasible in 28 patients as they reported discomfort during prone session and chose to remain at supine/ lateral position. Thus, data could be obtained from 150 patients. For all of those patients, a diagnosis of COVID-19 was made with RT-PCR using nasopharyngeal swab. Initial data was collected at supine position (Time point sp1), including demographic data, baseline SPO_2 , blood pressure, respiratory rate and the interface of oxygen support. Subsequently, they were explained about the procedure and were helped into the prone position and data were collected after approximately fifteen minutes of prone position (time point pp1). Each patient was encouraged and instructed to maintain prone position for at least two hours, and were allowed to continue prone position exceeding two hours at their free will. Clinical data was recorded at the end of the first prone positioning session (before supination, time point pp2). If patients asked to reverse to the supine position before two hours, the prone position was considered unfeasible. Prone position was initiated at least one hour after last meal intake and total time in prone position was targeted to around ten to twelve hours per day with four to five prone sessions as feasible. Clinical data was again recorded after 15 minutes of supine position after the last prone session in 24 hours (Time point SS2). Data was retrospectively retrieved from the hospital's health record maintained at excel sheet at COVID ward duty station. The data was also traced until hospital discharge or death of the patients under study, also recording the occurrence of intubation, if any. SPO_2 was measured through standard fingertip pulse oximeters (Microlife OXY 200, Shenzhen Jumper Medical Equipment Co., Ltd. Welkang Ltd. Suite B.29 Harley street London, w1G9QR, U.K). The primary outcome was the change in SPO_2, and subsequently the oxygen requirement. The primary dependent variable was the SPO_2, which was normally distributed at point SS1 (P value=0.123, which is > 0.05 by Shapiro wilk test). For the clinical series, we analysed the data using descriptive techniques and variables were represented in terms of number and percentages. We then performed one way ANOVA test to compare the mean SPO_2 at four different time points SP1, PP1, PP2 and SP2, which was followed by Post Hoc test (Games Howell test) to make comparison within the various time points and positions. International Business Machines Statistical Package for the Social Sciences (SPSS) version 23 was used for the statistical analysis of the data.

RESULTS

Total of One hundred seventy eight patients admitted during November 2020 to January 2021 met the inclusion criteria, out of which the procedure was unfeasible in twenty eight patients. Thus, data was obtained from a total of 150 patients. Characteristics of the patients involved in this study are shown in Table 1.

Table 1. Participant characteristics in the study.

Basic demographics	
Male-n (%)	**109(72.7%)**
Female-n (%)	**41(28.3%)**
Age-Median, mean(SD)	**50,49.9(13.171)**
Duration of Symptoms-Median, mean(SD)	**5,4.97(1.428)**
Comorbidities	
HTN only-n (%)	**34(22.7%)**
COPD-n (%)	**9(6%)**
HTN and DM-n (%)	**12(8%)**
BPH and HTN-n (%)	**2(1.3%)**
Thyroid disorders-n (%)	**3(2%)**
No Comorbidities	**90(60%)**
Interface of oxygen support	
Facemask	**57(38%)**
Nasal Prongs	**84(56%)**
Reservoir mask	**9(6%)**

First prone session was initiated after one hour of meal and it was found that oxygenation rapidly improved at prone positioning, as after fifteen minutes of prone positioning, mean oxygen saturation had increased from 87.18% (SD 3.531) to 91.08 (SD 2.206). There were no any adverse events noted with prone positioning. However, twenty eight patients who had reported

significant discomfort during prone positioning had already been excluded from the study. There was also significant difference in

Table 2. Descriptive analysis of Oxygen saturation at different time points with relation to prone positioning.

SPO2 (%)

Different time points	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
before proning	150	87.18	3.531	.288	86.61	87.75	78	93
15 Minutes after proning	150	91.08	2.206	.180	90.72	91.44	87	95
At the end of first proning session	150	93.42	1.556	.127	93.17	93.67	87	96
After 15 minutes of supination(after 24 hours of intermittent proning sessions)	150	92.29	2.193	.179	91.93	92.64	84	95
Total		90.99	3.413	.139	90.72	91.27	78	96

mean oxygen saturation at four different time points as shown in table 2.

A one way ANOVA test was performed to compare the effect of prone position on oxygen saturation (SPO_2). It revealed that there was a statistically significant difference in SPO_2 between at least two time points. (F (3,596) = [180.005], p=0.000) as shown in table 3.

Table 3. One way ANOVA test.

SPO2 (%)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3316.565	3	1105.522	180.005	.000
Within Groups	3660.393	596	6.142		
Total	6976.958	599			

Further, Games Howell Post Hoc test for multiple comparisons found that the mean value of SPO_2 was significantly different across all four time points, at significance level 0.05 as shown in table 4.

Table 4. Post Hoc Test for Multiple Comparisons.						
Dependent Variable: SPO2 (%)						
Test: Games-Howell						
(I) Time and Position	(J) Time and Position	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
before proning	15 Minutes after proning	-3.900*	.340	.000	-4.78	-3.02
	At the end of first proning session	-6.240*	.315	.000	-7.06	-5.42
	After 15 minutes of supination(after 24 hours of intermittent proning sessions)	-5.107*	.339	.000	-5.98	-4.23
15 Minutes after proning	before proning	3.900*	.340	.000	3.02	4.78
	At the end of first proning session	-2.340*	.220	.000	-2.91	-1.77
	After 15 minutes of supination(after 24 hours of intermittent proning sessions)	-1.207*	.254	.000	-1.86	-.55
At the end of first proning session	before proning	6.240*	.315	.000	5.42	7.06
	15 Minutes after proning	2.340*	.220	.000	1.77	2.91
	After 15 minutes of supination(after 24 hours of intermittent proning sessions)	1.133*	.220	.000	.57	1.70
After 15 minutes of supination(after 24 hours of intermittent proning sessions)	before proning	5.107*	.339	.000	4.23	5.98
	15 Minutes after proning	1.207*	.254	.000	.55	1.86
	At the end of first proning session	-1.133*	.220	.000	-1.70	-.57

*

The mean SPO_2 that improved significantly on prone position, continued to improve in further prone sessions in twenty four hours and the overall improvement in oxygenation was sustained in supine position as well, but the mean SPO_2 in supine position was less than the mean SPO_2 obtained at the end of first proning session, as shown in Figure 1.

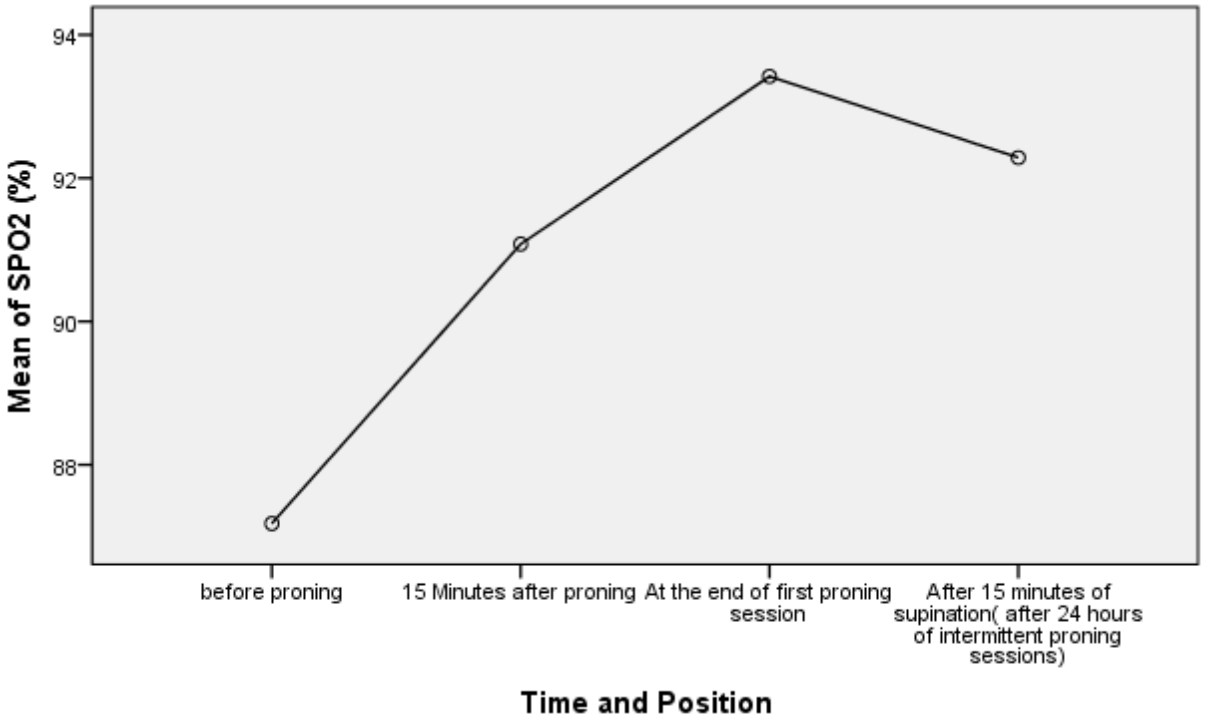

Figure 1. Means Plots showing mean SPO2 at four different time points.

On tracing the data of the patients, all of them were found to be successfully discharged from the hospital with median stay of 13 days (Interquartile range=7 days) at hospital. while 22 patients (14.6%) showed no improvement in oxygenation even after five sessions of proning, only three patients had to be shifted to the ICU and only one of them was intubated and was extubated at 6th day of intubation. All of them were successfully weaned off the oxygen and were discharged to home.

DISCUSSION

This is a single-center retrospective observational study of the COVID-19 patients who were admitted to the hospital and required supplemental oxygen. In our study, we found that despite probable variations in individual cycle duration, oxygenation improved during prone position period.

Our findings suggest that awake proning can lead to an improvement in oxygenation, and leads to potentially better overall outcomes, and can thus be used as a cost-effective and efficient intervention especially in healthcare settings with scarce resources.

The findings of our study are in line with some of the published studies of awake prone positioning in COVID-19 pneumonia. As per several case reports and small observational studies conducted in multiple settings (outside ICU, emergency department) with variations in respiratory support (non-invasive ventilation/high-flow nasal oxygen/standard face mask oxygen therapy) and with varying severity of hypoxemia, it has been found that awake prone positioning is associated with an increment in oxygenation and recovery without the need for intubation in most cases.[4-9]

In a case series involving fifty patients suffering from COVID-19 , the median peripheral oxygen saturation (SpO_2) was found to have increased from 80% while breathing room air to 84% after application of supplemental oxygen which improved significantly (to 94%) after five minutes of proning. However, In 13 patients (26%), the SpO_2 failed to improve and endotracheal intubation was required within 24 hours after their arrival in the emergency department. [10] In our study, while 22 patients (14.6%) showed no improvement in oxygenation even after five sessions of proning, only three patients had to be shifted to the ICU and only one of them was intubated and was later on weaned off oxygen and discharged to home. As majority of the patients enrolled in our study were under low flow oxygen support, and were of relatively younger age group, the overall outcome might have been relatively better.

In one study that involved ten patients with COVID-19 admitted to ICU, it was found that awake prone positioning was not a suitable intervention as it did not help reduce mortality rate or intubation rate. The study also showed that half of the patients were not able to tolerate more than two episodes of prone positioning and among those who tolerated, the improvement in oxygenation was transient and most likely in the first episode of prone positioning and not much beyond that.[1] But as the author mentioned, the study involved too sick patients who presented to hospital relatively late and requiring early intubation once admitted. Unlike that, our study involved participants who presented to hospital earlier, with milder form of illness and thus they better tolerated the prone positioning and showed overall promising outcome as well.

Another study involving 60 patients with acute hypoxic respiratory failure secondary to COVID-19 pneumonia concluded that it its feasible and safe to implement awake prone positioning in non-intubated patients with acute hypoxic respiratory failure. [11] Similar conclusion was drawn by several other studies.[2,3,7,12,13] Our study also came up with the similar finding.

This study has several limitations. This is a single-center, retrospective observational study limited to small number of COVID-19 patients admitted. Most of the patients were of young age, with a median age of 50 and were under low flow oxygen support via facemask and nasal prongs. These findings may not be generalized to the older group or patients or with patients requiring high flow oxygen. Additionally, the data was intensively recorded only for the first twenty four hours of initiation of prone positioning and thus this study cannot justify the sustained improvement in oxygenation due to the prone sessions. There was no randomization to a control group and as some patients who were comfortable in prone position for more than two hours per session were allowed to extend their prone position, there may have been some inconsistencies in total duration of prone position among the participants, which may have affected the finding.

CONCLUSIONS

Our study demonstrated that awake prone positioning is a feasible and effective intervention for improving oxygenation in patients suffering from COVID pneumonia and requiring supplemental oxygen. Thus, it could be a boon to the health care system with limited resources. However, more rigorous studies, especially the prospective and randomized controlled trials involving multiple centers could be more effective in exploring the efficacy of awake prone positioning in improving oxygenation in COVID-19 pneumonia.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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