Peertechz

CLINICAL GROUP

ARCHIVES OF Pulmonology and Respiratory Care OPEN ACCESS JOURNAL

ISSN: 2581-3684 DOI: https://dx.doi.org/10.17352/aprc

Research Article

Awake prone positioning in COVID-19 pneumonia in India: A useful strategy in resource limited setting

Raja Dhar[1], Shubham Sharma[2], Praveen Kumar Shahi[2], Shyam Krishnan[2], Tarang Kulkarni[2] and Milind Sovani[3]*

[1]Director, Center of Excellence in Lung Care, Fortis Hospital, Kolkata, West Bengal, India

[2]Center of Excellence in Lung Care, Fortis Hospital, Kolkata, West Bengal, India

[3]Consultant, Nottingham University Hospitals NHS Trust, Nottingham, UK

Received: 29 March, 2021
Accepted: 19 April, 2021
Published: 20 April, 2021

***Corresponding author:** Dr. Milind Sovani, Department of Respiratory Medicine, Nottingham University Hospital, Nottingham, UK, Tel: +447590664902; E-mail: msovani5@gmail.com; Milind.Sovani@nuh.nhs.uk

Keywords: Awake prone positioning; COVID-19 pneumonia; Respiratory failure; India; Resource limitation; Oxygen shortage

https://www.peertechz.com

Abstract

Introduction: Awake prone positioning is being recently used in patients with COVID-19 respiratory failure. While the theory supporting it is strong, the evidence supporting it is lacking. Aim of our study was to assess the effect of awake prone positioning on oxygenation and PaO2/FiO2 in patients with COVID-19 pneumonia.

Methods: Retrospective observational cohort data from patients admitted to a tertiary care hospital was collected. Patients deemed suitable for admission to Intensive Care Unit (ICU) but did not need immediate ventilation were included. Patients fulfilling the inclusion criteria were subjected to cyclical prone positioning. pO2, pCO2 and PF ratio was recorded before and after awake prone positioning. Comparative data was analyzed using the SPSS software and student t-test was used for comparison of mean values.

Results: Awake Prone positioning was performed in 18 COVID-19 positive patients (16 men, mean age 55). Patients had severe respiratory failure with a mean partial pressure of oxygen (PaO2) of 51.2 mmHg (range 46 to 60) on an arterial blood gas (ABG) sample and a mean PaO2/FiO2 (P/F) ratio of 104. Proning times ranged from one episode of 2 hours to multiple sessions ranging from 30 minutes to a few hours at a time. Prone positioning led to a significant improvement in oxygenation with a mean PaO2 of 61 mmHg (mean change 8.2, 95% CI 7.3 to 12.3 mmHg, p<0.001) and mean PF ratio of 125.9 (mean improving of 21.7, 95% CI 13.6 to 29.7; p<0.001) two hours from start of proning manoeuver.

Conclusion: In our cohort, awake prone positing was well tolerated and led to a significant improvement in oxygenation and possibly reduced the need for mechanical ventilation. Whilst we await for definitive studies, its likely that awake proning is going to be used widely, particularly in countries with limited intensive care bed capacity.

Introduction

Since the World Health Organisation declared a pandemic, COVID-19 has accounted for nearly 140 million cases and nearly 3 million deaths. Fever, cough and dyspnoea are common presenting features followed by gastrointestinal upset and loss of sense of smell, whereas neurological and thromboembolic presentations are also reported [1,2]. Around 15% of patients with COVID-19 develop respiratory failure and some progress to Acute Respiratory Distress Syndrome (ARDS) requiring mechanical ventilation.[1] This has placed a severe strain on ICU beds, oxygen supplies and ventilators with demand outstripping capacity worldwide. A similar situation is now being seen in major cities in India. At the start of the pandemic, early intubation and mechanical ventilation was the preferred approach, particularly due to concerns regarding infection risk due to the aerosol generating nature of Non Invasive Ventilation (NIV) and High Flow Nasal Oxygen (HFNO) [2]. However, this was associated with high mortality.[1] Early reports from China suggested that awake prone positioning could be useful in avoiding mechanical ventilation in COVID pneumonia [3]. We decided to adopt awake proning in our hospital as a means to avoid ventilation.

Citation: Dhar R, Sharma S, Shahi PK, Krishnan S, Sovani M, et al. (2021) Awake prone positioning in COVID-19 pneumonia in India: A useful strategy in resource limited setting. Arch Pulmonol Respir Care 7(1): 007-009. DOI: https://dx.doi.org/10.17352/aprc.000067

The rationale behind prone positioning in typical ARDS is to minimize ventilation-perfusion mismatch and shunting. By virtue of the gravitational effects on ventilation of the lungs, prone positioning is thought to improve ventilation in dorsal dependant areas of the lung, resulting in improved lung ventilation. As these areas ha thus improving ventilatory recruitment of these areas of the lungs and thereby improve ventilation perfusion coupling [3]. Positive airway pressure devices(PAP) like non invasive ventilation(NIV) also helps to improve the alveolar recruitment but may result in barotrauma due to over inflation of the already well ventilated lung units. Prone positioning, with or without use of PAP devices, is hypothesized to minimize the unfavorable outcomes to the lung parenchyma, partly by minimizing regional overinflation.

Methods

Retrospective observational cohort data from patients admitted to Fortis Hospital, Kolkata was collected. Patients deemed suitable for admission to Intensive Care Unit (ICU) but did not need immediate ventilation were included. Inclusion criteria were a) RT-PCR confirmed COVID-19 infection b) hypoxaemic respiratory failure (patients needed >4 L/min oxygen via nasal cannula or face mask to maintain oxygen saturation (SpO2) of >92%), c) RR ≥30/minute. Patients were excluded if they a) needed immediate intubation b) were confused or drowsy and c) unable/refusing to self-prone. Patients fulfilling the above inclusion criteria were subjected to cyclical prone positioning. pO2, pCO2 and PF ratio was recorded before and after awake prone positioning. Comparative data was analyzed using the SPSS software and student t-test was used for comparison of mean values.

Results

A total of 45 patients were admitted between 26th of March and 3rd June and were COVID-19 positive based on RT-PCR testing. Of these 24 patients developed respiratory failure and were admitted to ICU. Awake Proning was performed in 18 patients (16 men, mean age 55). 16 out of 18 patients were treated with empiric antibiotics. All patients had radiological changes.

Patients had severe respiratory failure with a mean partial pressure of oxygen (PaO2) of 51.2 mmHg (range 46 to 60) on an arterial blood gas (ABG) sample and a mean PaO2/FiO2 (P/F) ratio of 104. These patients had high a minute ventilation as evidenced by low mean PaCO2 of 29.9 mmHg. Proning times ranged from one episode of 2 hours to multiple sessions ranging from 30 minutes to a few hours at a time. Arterial blood gases two hours after patients were in prone position demonstrated a significant improvement in oxygenation with a mean PaO2 of 61 mmHg (mean change 8.2, 95% CI 7.3 to 12.3 mmHg, p<0.001) and mean PF ratio of 125.9 (mean improving of 21.7, 95% CI 13.6 to 29.7; p<0.001). Carbon dioxide values post proning were closer to normal (mean value 32.9 mmHg, mean difference 2.9, 95% CI 0.8 to 5.1, p=0.01) (Figure 1).

In 15 (83%) patients this led to a reduction in need for supplemental oxygen. Four patients experienced discomfort due to proning. No other adverse effects were noted. Patients were awake and free to return back to supine position to ensure comfort and facilitate oral intake and toileting needs. Each proning episode lasted on average for just under 2 hours (Range 1to 4 hours). Patients spent five to 12 hours per day in prone position over 3-5 sessions.

Overall five (27%) patients needed NIV after proning and four (22%) of these needed further escalation to mechanical ventilation of which two (11%) died. These were patients who did not respond to awake proning with either worsening of PaO2 or an improvement of less than 10%. Mean length of stay in hospital was 14 days (range 8-32 days).

Discussion

In a single center observational study, awake proning in

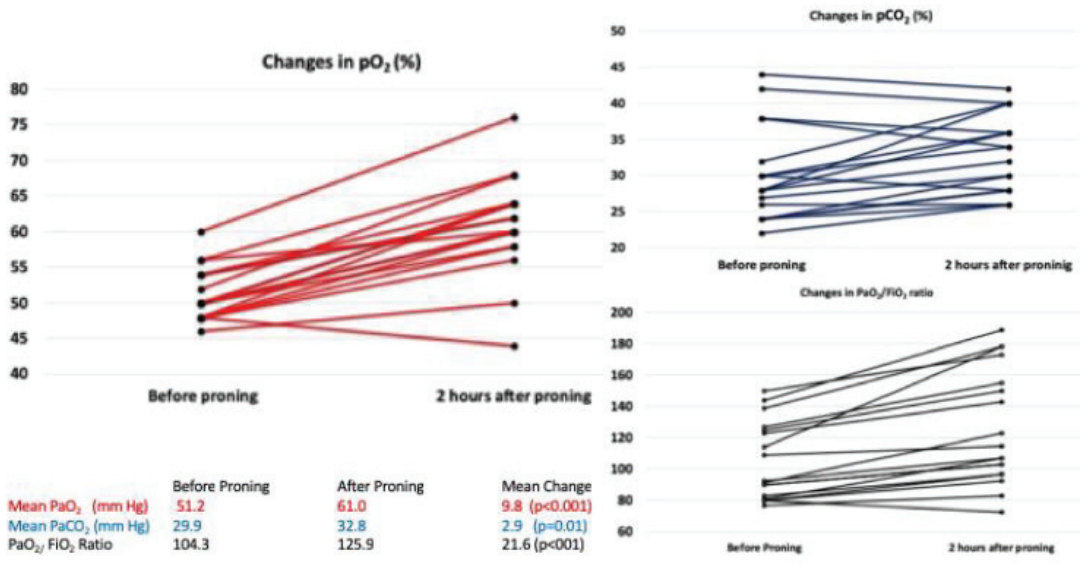

Figure 1: Carbondioxide Values.

Citation: Dhar R, Sharma S, Shahi PK, Krishnan S, Sovani M, et al. (2021) Awake prone positioning in COVID-19 pneumonia in India: A useful strategy in resource limited setting. Arch Pulmonol Respir Care 7(1): 007-009. DOI: https://dx.doi.org/10.17352/aprc.000067

patients with severe hypoxaemic respiratory failure, lead to nearly 20% improvement in PaO2 as well as P/F ratio. This in turn would have led to reduced work of breathing as evidenced by carbon dioxide values getting closer to normal. Despite being diagnosed with severe COVID-19 pneumonia (P/F ratio of 104), only 22% needed mechanical ventilation with a low mortality of 11%. This compares favourably to other large studies [1,4]. The main weakness of the study is that it is a small, non-randomised observational study with a potential for selection bias.

Prone positioning has been used to treat patients who suffer from severe ARDS and are mechanically ventilated. The PROSEVA trial reported that prone positioning reduced mortality from 32% to16% [5]. Prone mechanical ventilation has also been used in patients with COVID-19 with some Success . On prone positioning ventilation improves in the dorsal region and perfusion remains good dorsally, thereby improving V/Q mismatch [6].

Of all patients admitted with COVID pneumonia, about 2/3rd patients experience acute lung injury with high compliance and high (V/Q) mismatch, with approximately one third of cases progressing to ARDS. In patients with patchy infiltrates and high lung compliance, the application of positive pressure might even lead to worsening of lung injury [7].

Recently, several small observational studies have reported on the effectiveness of Awake Proning in patients with COVID-19 Pneumonia [8-10]. Our findings are consistent with these studies. Improvement in peripheral oxygen saturation starts within minutes of adopting prone position but this effect is lost after returning to supine position [10]. We performed arterial blood sampling two hours into prone positioning to ensure optimal data capture and demonstrated significant improvement in oxygenation and P/F ratio. Our study, like others in this field is a small observational study and therefore no conclusions can be drawn regarding effectiveness of awake prone positioning on hard outcomes such as reduction in need for mechanical ventilation or mortality.

We also note a male preponderance with 16 out of 18 patients being men. This could be related to the socioeconomic factors related to exposure as well as higher expression of ACE receptors in men [11].

In spite of its large population of 1·3 billion, India has only 1·9 million hospital beds, 100,000 Intensive Care Unit (ICU) beds with only 50,000 ventilators that are concentrated in seven (out of 37) states, mostly in the private sector [12]. A recent surge in COVID-19 cases, particularly in large cities like Mumbai and Kolkata have made critical care beds extremely scarce. With the pandemic predicted to surge further in Asia and a cure not likely to be available immediately any strategy to minimize the need for ICU beds and ventilators is worth considering.

Conclusion

In our cohort, awake prone positing was well tolerated and led to a significant improvement in oxygenation and possibly reduced the need for mechanical ventilation. Whilst we await for definitive studies, its likely that awake proning is going to be used widely, particularly in countries with limited intensive care bed capacity.

References

1. Docherty AB, Harrison EM, Green CA, Hardwick HE, Pius R , et al. (2020) Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. BMJ 369: m1985. Link: https://bit.ly/3ndTAhb
2. Mann R, Perisetti A, Gajendran M, Gandhi Z, Umapathy C, et al. (2020) Clinical Characteristics, Diagnosis, and Treatment of Major Coronavirus Outbreaks. Front Med 7: 581521. Link: https://bit.ly/32ruOjQ
3. Pelosi P, Brazzi L, Gattinoni L (2002) Prone position in acute respiratory distress syndrome. Eur Respir J 20: 1017-1028. Link: https://bit.ly/3gohR2p
4. Hui DS, Chow BK, Lo T, Tsang OTY, Ko FW, et al. (2019) Exhaled air dispersion during high flow nasal cannula therapy versus CPAP via different masks. Eur Respir J 53: 1802339. Link: https://bit.ly/3dAhPTw
5. Sun Q, Qiu H, Huang M, Yang Y (2020) Lower mortality of COVID-19 by early recognition and intervention: experience from Jiangsu Province. Ann Intensive Care 10: 33. Link: https://bit.ly/3ekyGIU
6. Guérin C, Reignier J, Richard JC, Beuret P, Gacouin A, et al. (2013) Prone Positioning in Severe Acute Respiratory Distress Syndrome. N Engl J Med 368: 2159-2168. Link: https://bit.ly/3uZ5YUA
7. Gattinoni L, Chiumello D, Caironi P, Busana M, Romitti F, et al. (2020) COVID-19 pneumonia: different respiratory treatments for different phenotypes? Intensive Care Med 46: 1099-1102. Link: https://bit.ly/3aogZqX
8. Thompson AE, Ranard BL, Wei Y, Jelic S (2020) Prone Positioning in Awake, Nonintubated Patients With COVID-19 Hypoxemic Respiratory Failure. JAMA Intern Med 180: 1537-1539. Link: https://bit.ly/3gBWWcz
9. Ng Z, Tay WC, Ho CHB (2020) Awake Prone Positioning for Non-intubated Oxygen Dependent COVID-19 Pneumonia Patients. Eur Respir J 56: 2001198. Link: https://bit.ly/3x9OEOM
10. Khanna A, Kurylec R, Sovani M (2021) Awake prone positioning in COVID pneumonitis: A useful physiology-based approach in resource-limited settings. Lung India 38: S121- S123. Link: https://bit.ly/3dxS4TB
11. Kopel J, Perisetti A, Roghani A, Aziz M, Gajendran M, et al. (2020) Racial and Gender-Based Differences in COVID-19. Front Public Health 8: 418. Link: https://bit.ly/3n13UZw
12. COVID-19 in India (2020) State-Wise Estimates of Current Hospital Beds, ICU Beds, and Ventilators. Center for Disease Dynamics, Economics & Policy (CDDEP). Link: https://bit.ly/2Q9a4ep

Citation: Dhar R, Sharma S, Shahi PK, Krishnan S, Sovani M, et al. (2021) Awake prone positioning in COVID-19 pneumonia in India: A useful strategy in resource limited setting. Arch Pulmonol Respir Care 7(1): 007-009. DOI: https://dx.doi.org/10.17352/aprc.000067