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Immediate Effect of Chair Sitting on Oxygen Saturation (SpO₂) in Patients with Open-Heart Surgery on Second Post-Operative Day (POD 2): A Case Series



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ABSTRACT

Globally all ages of people affecting by non-communicable diseases in which Cardiovascular disease is major factor. The invasive surgical procedures should be done to treat for these cardiovascular diseases which shows pulmonary complications in early post-operative periods. Cardiac rehabilitation used to improve post-operative pulmonary complications, nowadays new techniques are added in the cardiac rehabilitation program. Hence this study was to see immediate effect of Chair Sitting on SpO₂ in Patients with Open-Heart Surgery on POD 2. Patient received chair sitting on POD 2 and they showed significant improvement in SpO₂.



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INTRODUCTION

Globally people of all ages, urban as well as rural are affecting by Non-communicable Diseases (NCD's) like Cardiovascular Diseases (CVD), diabetes, stroke, hypertension, coronary artery diseases, obesity.¹ In 2018 WHO stated that due to NCD's every year 41 million people die due to NCD's and more contribution is from the CVD. Addition to this outlook from WHO about same said that, if proper treatment and care planning not applied till 2025,70% of people die due to NCD's.^{1,2}To treat this, patient need to undergo surgical intervention known as open-heart surgery. Worldwide 1 million people undergo open-heart surgery, among that 6 to 60% reported pulmonary complications in early postoperative days due to general anesthesia.³ Pulmonary complications like Pneumonia, Atelectasis, Pleural Effusion which reduces functional capacity lead to increase in length of hospital stay in post-operative phase.⁴To resolve pulmonary complications in this early post-operative phase Cardiac Rehabilitation (CR) plays crucial role. As day by day the cases of open-heart surgery with pulmonary complications in early post-operative phase increasing, the progression of Conventional Cardiac Rehabilitation (CCR) should be changing like adding aerobic exercises and resistance exercises.⁵ Hence aim of this study was "Immediate effect of Chair Sitting on Oxygen Saturation (SpO₂) in Patients with Open-Heart Surgery on Second Post-Operative Day (POD 2)".

MATERIALS AND METHODOLOGY

The present study was approved from Institutional Ethical Committee and conducted in Vikhe Patil Memorial Hospital's Cardiovascular and Thoracic Surgery Unit, Ahmednagar. Four post-operative open-heart surgery patients were included. Prior treatment informed consent was obtained and nature of treatment was explained to the patients.

Inclusion & Exclusion Criteria: Four open-heart surgery patients who undergo uncomplicated surgery with median sternotomy approach having stable haemodynamic in post-operative phase were included in the study while patients who developed complications in post-operative phase and patients with femoral line were excluded from the study. Patients who not maintained oxygen saturation above 90% without supplemental oxygen also excluded.

Intervention: Selected patients were received conventional cardiac rehabilitation treatment with chair sitting on the second post-operative day. Before initiation of treatment oxygen saturation

was measured and tapered to see how much saturation patients maintained. CCR included. Active range of motion exercises, Incentive spirometry, Coughing Technique, Thoracic mobility exercises. Addition to this chair sitting was given to each patient on post-operative day second for 30 mins shown in Fig. 1 & 2. During chair sitting patients were instructed to do deep breathing exercise with knee & ankle toe movements. Patient not received any supplemental oxygen during whole session of physiotherapy treatment and till 30 mins after treatment.



Figure No. 1 & 2: Chair Sitting

Outcome Measure: The SpO₂ were taken as outcome measures. SpO₂ was monitored before Chair Sitting, During Chair Sitting and After 30 Mins of Chair Sitting.

Statistical Analysis: Data were collected and analyse by using GraphPad software. Kruskal-Wallis Test was used and p-value <0.005 considered significant.

RESULT

Baseline Characteristics:

Parameters	Mean \pm SD
Heart Rate (bpm)	81.5 \pm 15.3
Respiratory Rate (cpm)	20 \pm 1.91
Oxygen Saturation (%)	98 \pm 2.00
Systolic BP (mmHg)	117.5 \pm 2.08
Diastolic BP (mmHg)	77 \pm 6.21

No statistically significant difference in baseline characteristics of both groups.

Descriptive Statistics:

Group	Number of Patients	Mean	Standard Deviation
Before Chair Sitting	4	92.750	2.500
During Chair Sitting	4	98.750	1.893
After 30 Mins	4	98.500	2.380

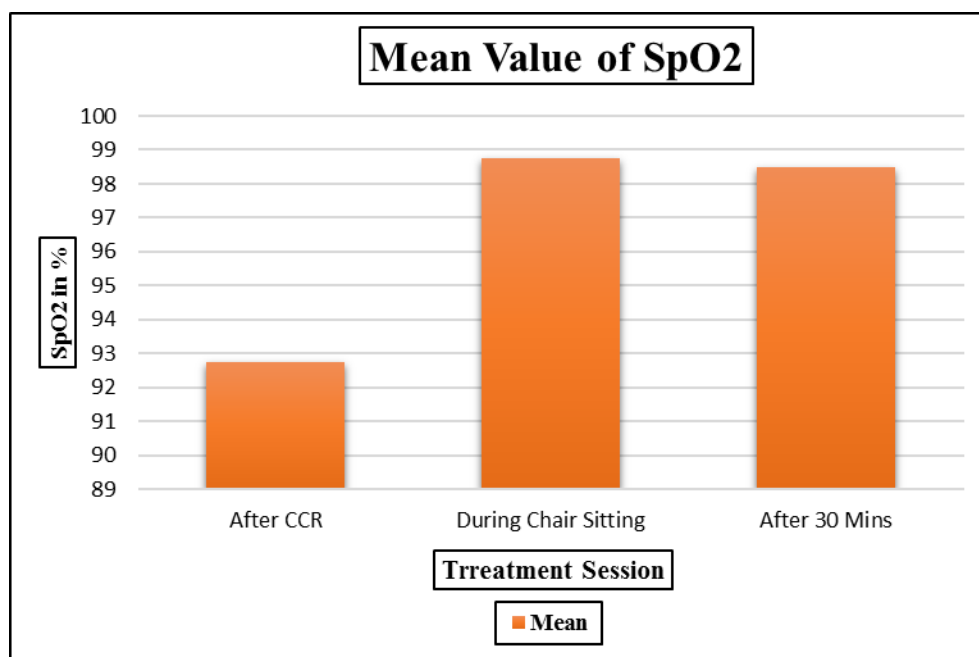
Shows the descriptive statistic of SpO₂, Kruskal-Wallis Test is used which shows extremely significant p-value i.e. (0.05>0.04).

Dunn Comparison Test:

Comparison	Mean Difference	p-value	Significance
After CCR vs During Chair Sitting	-5.625	p<0.04*	Significant
After CCR vs After 30 Mins	-5.250	p<0.04*	Significant
During Chair Sitting vs After 30 Mins	0.3750	p>0.05	Not Significant

(* - Significant)

After CCR vs During Chair Sitting and After CCR vs After 30 mins showed t-value greater than 2.933 that's why p-value for both the comparison is significant while during chair sitting vs after 30 mins is not significant.



DISCUSSION

Present study showed that after receiving chair sitting there was significant improvement in oxygen saturation compare to CCR. This improvement was seen because gravity exerts it's influence on oxygen transport. Patient who underwent open-heart surgery, breathing at low lung volume due to effect of general anesthesia and pain. This low lung breathing reverses normal intrapleural pressure i.e., intrapleural pressure become positive which leads to improper ventilation, less compliant bases and prone airway collapsed. The prolonged supine position favours this change. The upright sitting is associated with maximum FRC which results in reduced airway closure and maximum arterial oxygenation because in upright sitting vertical gradient is maximal, the anteroposterior diameter is greater and compression of heart and lung are reduce, shorten position of diaphragmatic fibres counted by an increase in the neural drive to breath, intrapleural pressure at bases are more negative due to suspended mass of lungs, high lung compliance, larger volume changes.⁶

Eric A. J. et al performed prospective interventional study in surgical, medical ICU and burn unit on ARDS patients. After receiving upright sitting for 12 hours there was significant improvement in PaO₂/FiO₂ ratio. This improvement was already seen after 1 hour of applying upright sitting. Author said that these changes seen because dorsal atelectasis of lung having major role in oxygen impairment.⁷

CONCLUSION

Chair sitting showed significant improvement in oxygen saturation in patients with open-heart surgery on POD 2.

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