بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات:
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A Comparative Study between High Flow Nasal Oxygen Therapy and Venturi Mask Oxygen Therapy for Postoperative Laparoscopic Bariatric Surgery Patients with Atelectasis

Thesis

Submitted for Partial Fulfillment of M.D. Degree in Anesthesiology, Intensive Care and Pain Management

By

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Asmaa Ahmed Nabeeh Negmeldin Abdelrahman Allam

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List of Abbreviations

Abb.	Full term
2D	Two dimensional
ALI	Acute lung injury
ARDS	Acute respiratory distress syndrome
ASA	American Society of Anesthiologists
BLUE protocol	Bedside lung US in emergency
BMI	Body Mass Index
cmH_2O	Centimeter Water
CO_2	Carbon Dioxide
CPAP	Continuous positive airway pressure
CT scan	Computerized tomography
CXR	Chest X-ray
ERV	Expiratory reserve volume
FiO_2	Fraction of Inspired Oxygen
FRC	Functional Residual Capacity
GA	General Anaesthesia
$HFNO_2$	High Flow Nasal Oxygen
IAP	Intra-abdominal pressure
ICU	Intensive Care Unit
Kg/ m^2	Kilogram / meter square
L/Min	Liters / minute
LLL	Left lower lobe
LUL	Left upper lobe
Lung US	Lung Ultrasound
m RAS	modified radiological atelectasis
mm Hg	Millimeters Mercury
NIV	Non-invasive ventilation
OHS	Obesity hypoventilation syndrome

List of Abbreviations cont...

Abb.	Full term
OR	Operating room
OSA	Obstructive Sleep Apnea
$PaCO_2$	Partial Pressure of Carbon Dioxide in arterial blood
PaO_2	Partial Pressure of Oxygen in arterial blood
PaO_2/ FiO_2	Partial Pressure of Oxygen / Fraction of Inspired Oxygen
PEEP	Positive end-expiratory pressure
RLL	Right lower lobe
RML	Right middle lobe
RUL	Right upper lobe
VMO_2	Venturi Mask Oxygen

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INTRODUCTION

Obesity is expressed as Body Mass Index (BMI) which is the weight in Kilograms divided by the height in square meters (Kg/m^2) of more than 30. Obesity is associated with multiple comorbidities, one should pay attention to the respiratory complications. It affects lung volumes causing restrictive pattern and decreases the Functional Residual Capacity (FRC) to the point that is less than the closing volume resulting in atelectasis and hypoxemia. Obesity also increase the minute ventilation and hence work of breathing, decreases lung compliance and increases airway resistance. It can result in obstructive sleep apnea (OSA) ***(Hines et al., 2018).***

Obesity combined with postoperative respiratory muscle dysfunction may lead to respiratory failure. As a result, obesity is associated with a higher risk of postoperative hypoxemia ***(Stéphan et al., 2017).***

Baltieri et al. (2016) reported a 37 percent prevalence of atelectasis in obese patients after bariatric surgery in a retrospective observational study. Respiratory complications, on the other hand, are not uncommon in the general surgical population and have been demonstrated to lengthen hospital stays and increase death ***(Fulton et al., 2018).***

High Flow Nasal Oxygen ($HFNO_2$) therapy provides warmed humidified oxygen and low-level, flow-dependent positive airways pressure, and may be more tolerable than Continuous positive airway pressure (CPAP) or non-invasive

ventilation; also, $HFNO_2$ improves washout of nasopharyngeal dead space, resulting in improved oxygenation. In giving prophylactic support to preterm newborns after extubation, $HFNO_2$ has been demonstrated to be both safe and non-inferior to standard CPAP with lower incidence of nasal trauma than in the CPAP group. When compared with standard care, prophylactic postoperative high-flow nasal oxygen reduced hospital length of stay and intensive care unit re-admission ***(Zochios et al., 2018).***

$HFNO_2$ therapy involves the continuous delivery of up to 60 L/min with optimal heat and humidity through a nasal cannula. Interestingly, $HFNO_2$ improves oxygenation by increasing both end-expiratory lung volume and tidal volume and is most beneficial in patients with higher BMI (Body Mass Index) ***(Stéphan et al., 2017).***

The incidence of obesity (defined by a body mass index (BMI) 30 kg/m^2) is increasing worldwide. In selected individuals, bariatric surgery may offer a means of achieving long-term weight loss, improved health, and healthcare cost reduction. Physiological changes that occur because of obesity and general anesthesia predispose to respiratory complications following bariatric surgery ***(Fulton et al., 2018).***

According to ***Hernández et al. (2016)*** among high-risk adults who have undergone extubation, high flow conditioned oxygen therapy was not inferior to NIV for preventing re-intubation and post-extubation respiratory failure. High-flow conditioned oxygen therapy may offer advantages for these patients.

AIM OF THE WORK

The aim of this study is to compare the clinical outcome of treating postoperative laparoscopic sleeve gastrectomy surgery patients having atelectasis by using High Flow Nasal Oxygen Therapy versus Venturi Mask Oxygen Therapy.

OXYGEN DELIVERY SYSTEMS

They are classified into low-flow (or variable performance) and high-flow (or fixed performance) systems. Low-flow systems provide small amounts of 100 % oxygen as a supplement, with FiO_2 determined by the patient's pattern of breathing and minute ventilation. The greater portion of the inspired volume is obtained from room air. High-flow systems are designed to supply premixed oxygen in volumes that provide the patient's total ventilatory requirements. An advantage of high-flow systems is that the level of FiO_2 remains constant regardless of any changes that may occur in the ventilatory pattern ***(Villanueva et al., 2016)*.**

Low-Flow Systems

Low-flow oxygen devices are characterized by simplicity and ease of use, healthcare providers' familiarity with the system, low cost, and patient acceptance ***(Villanueva et al., 2016).***

Table 1: Flow rates and FiO_2 with low-flow oxygen delivery device, Predicted FiO_2 values for low-flow systems assume a normal and stable pattern of ventilation ***(Villanueva et al., 2016)***

Low-flow system	Oxygen flow rates (L)	FiO_2
Nasal cannula	1	0.24
	2	0.28
	3	0.32
	4	0.36
	5	0.40
	6	0.44
Simple face mask	5- 6	0.40
	6- 7	0.50
	7- 8	0.60
Partial re-breathing mask	6	0.60
	7	0.70
	8	0.80
	9	0.80 +
	10	0.80 +
Non-rebreathing mask	10	0.80 +
	15	0.90 +

Standard nasal oxygen cannula

It is the most frequently used low-flow oxygen delivery system consists of a pronged nasal cannula (Figure 1) to deliver 100 % oxygen at flow rates of 0.5–6 L/min, delivering a FiO_2 ranging from 0.24 to 0.40. Patients generally cannot tolerate an oxygen flow rate of more than 6 L/min from the nasal cannula because of nasal discomfort. If the oxygen flow rate exceeds 4