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RESEARCH ARTICLE

OBESITY AND ANTICIPATED DIFFICULT AIRWAY- A COMPREHENSIVE APPROACH WITH VIDEOLARYNGOSCOPY, RAMP POSITION, SEVOFLURANE AND OPIOID FREE ANAESTHESIA

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Abstract

Background: Anaesthetic management of obese patient can be challenging because of altered anatomy and physiology. Safe apnea period is extremely short and videolaryngoscope is believed to reduce the number of failed intubation attempts. Slow emergence with fat-soluble volatile agents may be due to delayed release from adipose stores. Use of opioids in the presence of obesity increases the occurrence of obstructive sleep apnea, hypoxia and upper airway obstruction. The aim is to provide safe airway management in obesity by reducing the number of intubation attempts and the time taken for intubation with reduced post-operative respiratory depression.

Methods: 25 patients with the BMI of >30kg/m^2 were selected. Standard technique for induction of anaesthesia using Inj. Dexmedetomidine 1mcg/kg 10 mins before intubation with patient in RAMP position was done. HugeMed videolaryngoscope with appropriate sized blade was used and maintainance of anaesthesia with Sevoflurane and Inj. Dexmedetomidine 0.5mcg/kg/hr. Assessment consisted of number of intubation attempts, time required for intubation, visualisation of glottis, hemodynamic stress response to laryngoscopy and intubation and post-operative respiratory depression.

Results: Among 25 patients, 18 patients had intubation at the first attempt, the maximum attempts taken were three in 2 patients. In majority of the patients i.e, 10, time taken for intubation was 13-15 secs. The maximum time to intubate was 18-20 secs in 2 patients. The visualisation if glottic structures assessed by Percentage Of Glottic Opening (POGO) score was 80-100% in majority of 20 patients. Most of the patients had a saturation of 96-100% post-operatively. There was a significant fall in the above hemodynamic parameters from baseline to intubation and 5mins later. The mean reduction in HR was 28.42%, SBP- 28.72%, DBP- 38.85% and MAP- 34.69%.

Conclusion: This study emphasises on the use of advanced airway tools, standard intubation techniques and careful drug selection in order to prevent and minimise the risk of airway complication in obesity.

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Introduction:-

The World Health Organization (WHO) in 1997 declared obesity as a major public health problem and a global epidemic.[1] Based on this source, in 2016, approximately 13% of the world's population were labeled as obese.[2] WHO defines obesity as a condition with excess body fat to the extent that health and well-being are adversely affected. The definition of obesity includes the presence of excessive body weight for the patient's age, gender and height and is estimated on calculation of the following-

1. Lean Body Weight (LBW)
2. Predicted Body Weight (PBW)
3. Ideal Body Weight (IBW)
4. Body Mass Index (BMI)[3]

Obesity is an accepted risk factor for difficult airway and these patients are prone for respiratory depression induced by opioids. Laryngoscopy may be difficult in obese patients because of elevated chest diameter giving limited space for the laryngoscope positioning, limited neck mobility, and increased amount of adipose tissue in the upper airway, including a larger tongue. Because of these challenges, it is recommended to properly position obese patients for intubation. Although obesity alone is not a risk factor for difficult intubation, the use of videolaryngoscopes should improve laryngeal view in morbidly obese patients.[4]

Collins et al suggested placing morbidly obese patients in a ramped position rather than in the standard sniffing position. The ramped position is achieved by arranging blankets under the patient's upper body and head to obtain a horizontal alignment between the external auditory meatus and sternal notch. This position produces proper alignment of the oral, pharyngeal, and laryngeal axes (the three axes of intubation) in obese patients, similar to the sniffing position in lean patients.[11]

Obesity leads to a restrictive lung disease, causing reduction in functional residual capacity and total lung compliance. Further, when an obese patient is supine and anaesthetized, the depressant effects of many anesthetic agents and analgesics, particularly opioids, further decrease the lung compliance, leading to increased hypoxemia. Opioid-based general anesthesia in these patients increases the incidence of post-operative respiratory depression, atelectasis, and pneumonia.[5]

Obesity related conditions including diabetes, cardiovascular disease, obstructed sleep apnea (OSA), non-alcoholic fatty liver disease, osteoarthriitis and some cancers are leading causes of morbidity and mortality. Surgery in this patient population is considered high risk but careful planning, pre-operative risk assessment, adequate anaesthetic management, thromboembolic prophylaxis and adequate post-operative analgesia can help reduce the risk. In order to prevent the above complications and to provide a safe anaesthesia the above study was conducted. The objective of this observational study was to-

1. Provide safe airway management in obese patients.
2. Reduce the number of intubation attempts and the time taken for intubation.
3. Reduce the incidence of post-operative respiratory depression.

Methods:-

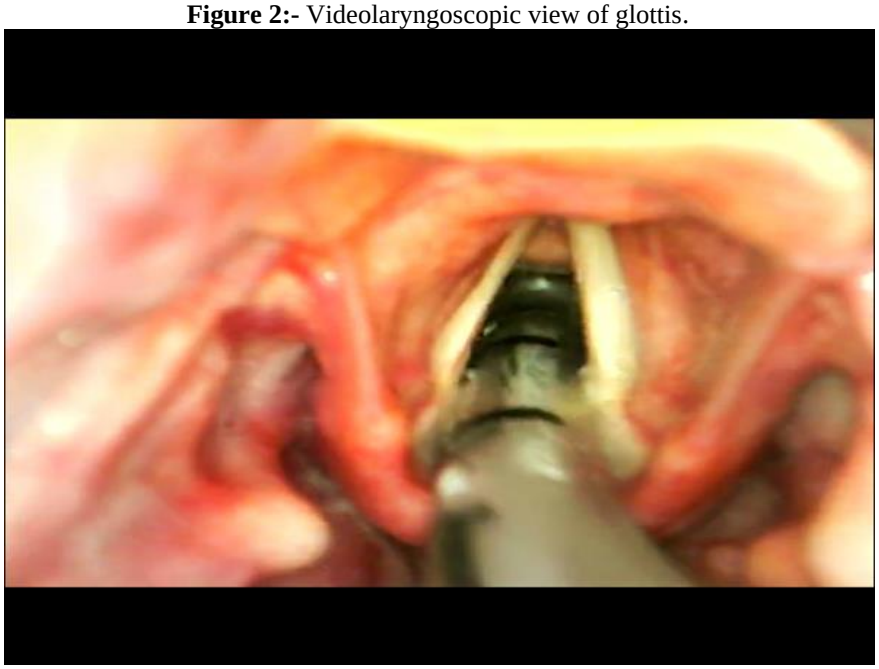
After obtaining approval and clearance from institutional ethical committee, 25 patients were included in the study with proper consent from patients and patient attenders. A detailed history, complete physical examination and routine investigations were done for all the patients. 18G intravenous (IV) line was secured and all cases were induced with standard technique.

Patients were pre-medicated with inj.Glycopyrolate 0.004mg/kg IV, inj.Midazolam 0.05mg/kg IV and inj.Dexmedetomidine 1mcg/kg IV started 10minutes before intubation with patient in Rapid Airway Management positioner (RAMP) position. Patients were induced with inj. Propofol 2-2.5mg/kg IV and intubation was facilitated by inj.Scoline 2mg/kg IV. HugeMed videolaryngoscope with appropriate size blade was used and after getting proper visualisation of glottis, an appropriate size cuffed Endotracheal Tube (ETT) was secured. Anaesthesia was maintained with oxygen, air and sevoflurane with intermittent Inj.Atracurium IV and inj.Dexmedetomidine 0.5mcg/kg/hr.

Here, assessment consisted of-
1. Number of intubation attempts.
2. Time required for intubation.
3. Visualisation of glottic structures.
4. Hemodynamic stress response to laryngoscopy and intubation.

Intraoperative analgesia supplemented with inj. Paracetamol 15mg/kg IV. Towards the end of the procedure, inj. Dexmedetomidine was stopped approximately 30min before extubation and after return of normal tone, power, reflexes and regular breathing, patient was extubated. Patients were then shifted to the SICU and assessed for post-operative respiratory depression by monitoring saturation and respiratory rate.

Figure 2:- Videolaryngoscopic view of glottis.



Inclusion criteria-
ASA I and II patients aged between 25-50 years of both gender with BMI>30kg/m^2 posted for elective surgeries under general anaesthesia (GA) were included.

Exclusion criteria-
Patients of ASA grade III, IV, V who denied consent and those posted for emergency surgeries under GA were excluded.

Results:-

This present observational study on obese patients using videolaryngoscope and opioid free anaesthesia to reduce the number and duration of intubation attempts and to reduce the incidence of post-operative respiratory depression was conducted in Gadag Institute of medical sciences.

Among 25 patients, 18 patients had intubation at the first attempt, the maximum attempts taken were three in 2 patients.

In majority of the patients i.e, 10, time taken for intubation was 13-15 secs. The maximum time to intubate was 18-20 secs in 2 patients.

The visualisation if glottic structures assessed by Percentage Of Glottic Opening (POGO) score was 80-100% in majority of 20 patients.

Most of the patients had a saturation of 96-100% post-operatively.

Table 1:- Number of intubation attempts.

No.Of intubations	1	2	3
No.Of patients	18	5	2

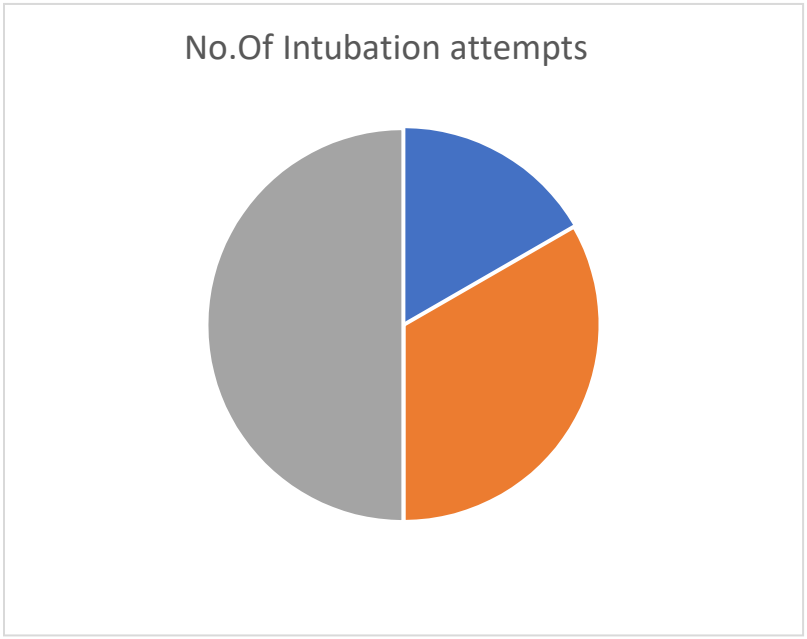


Figure 2:- Number of intubation attempts.

Table 2:-Time taken for intubation.

Time taken for Intubation (secs)	10- 12	13- 15	118	>18
No.Of patients	5	10	8	2

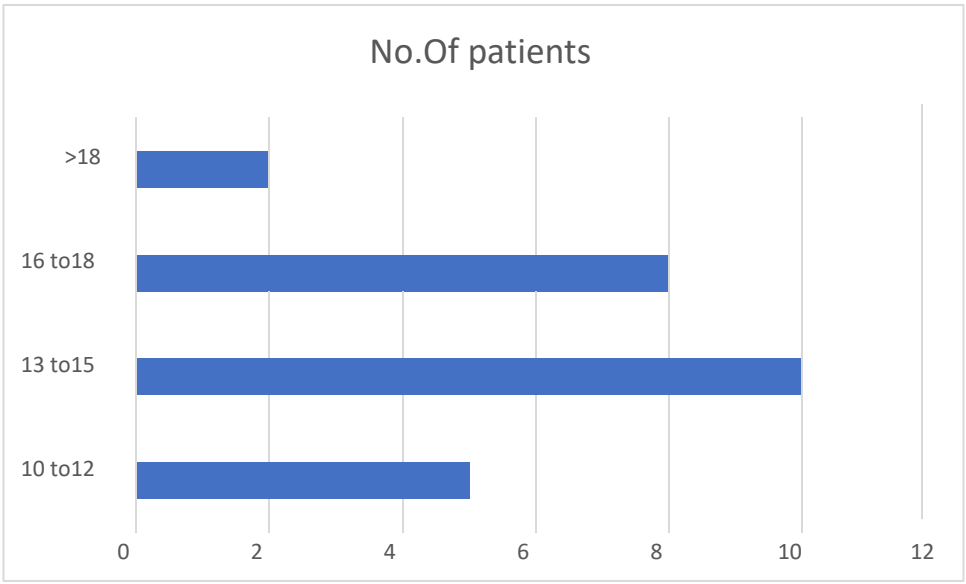


Figure 3:- Time taken for intubation.

Table 3:- Visualisation of glottic structures.

POGO score	0-30	30-50	50-80	80-100
No.Of patients	0	0	5	20

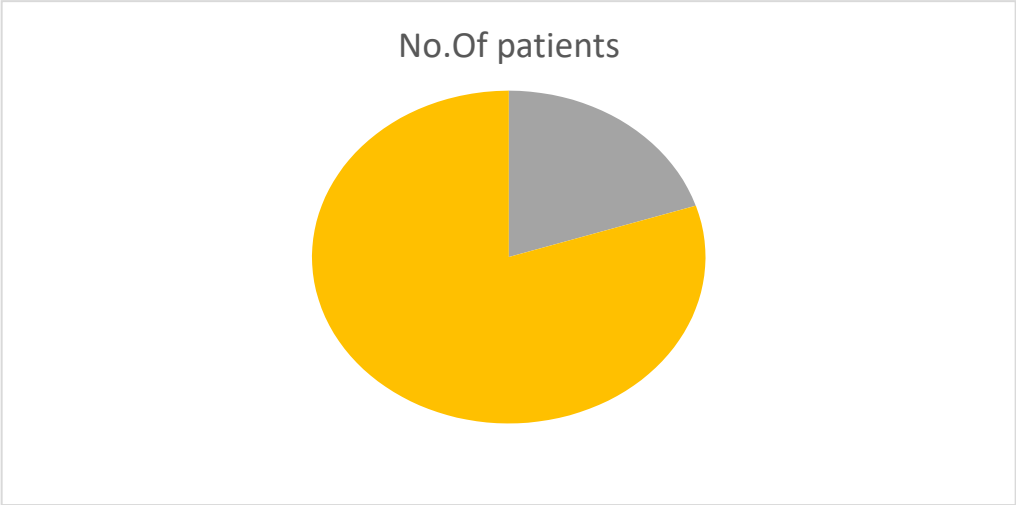


Figure 4:-Visualisation of glottic structures.

Table4:-Post-operative respiratory depression.

Postop Spo2(%)	90-95	≥96
No.Of patients	3	22

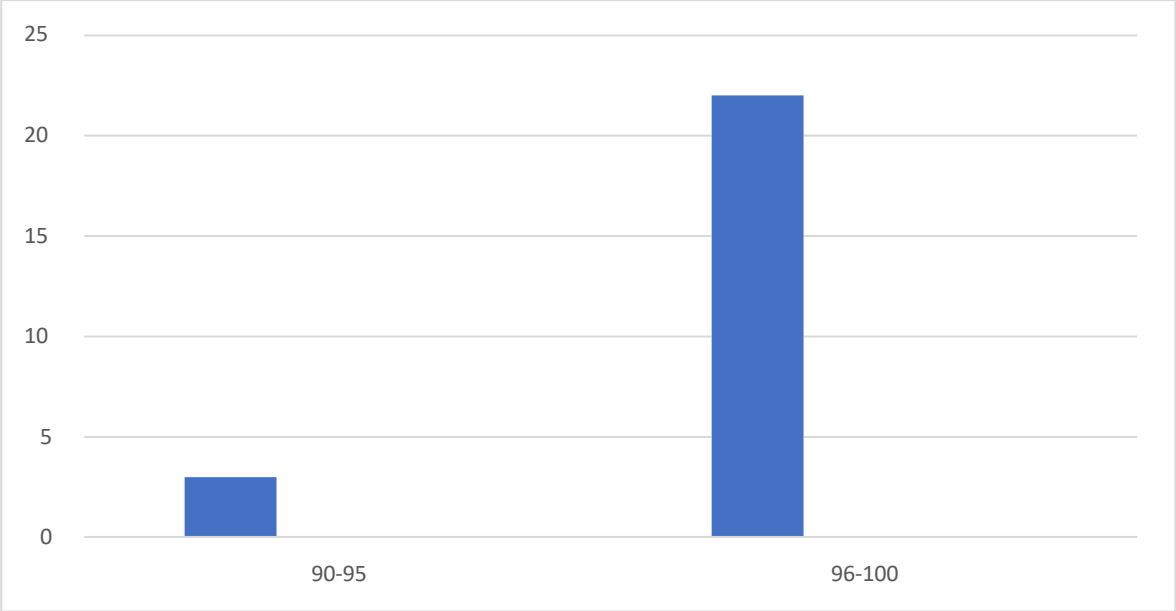


Figure 5:- Post-operative respiratory depression.

Table 5:- Hemodynamic responses to laryngoscopy and intubation.

PARAMETERS	HR	SBP	DBP	MAP
BASELINE	101.2	141.6	87.2	105.6
PREMEDICATION	82.6	146	90	108.8
INDUCTION	88	130.4	77.6	96
INTUBATION	93.6	124.8	72.4	89.8
1MIN	82.8	113.2	68.4	83.2
5MIN	78.8	110	62.8	78.4
ANOVA test value	33.13597	8.5891	12.87002	12.37116
pvalue	<0.00001	0.00008	<0.00001	0.00001
Significance	Significant	Significant	Significant	Significant

Hemodynamics was monitored and charted. Mean values of heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) at each event is calculated. There was a significant fall in the above hemodynamic parameters from baseline to intubation and 5mins later. The mean reduction in HR was 28.42%, SBP- 28.72%, DBP-38.85% and MAP- 34.69%.

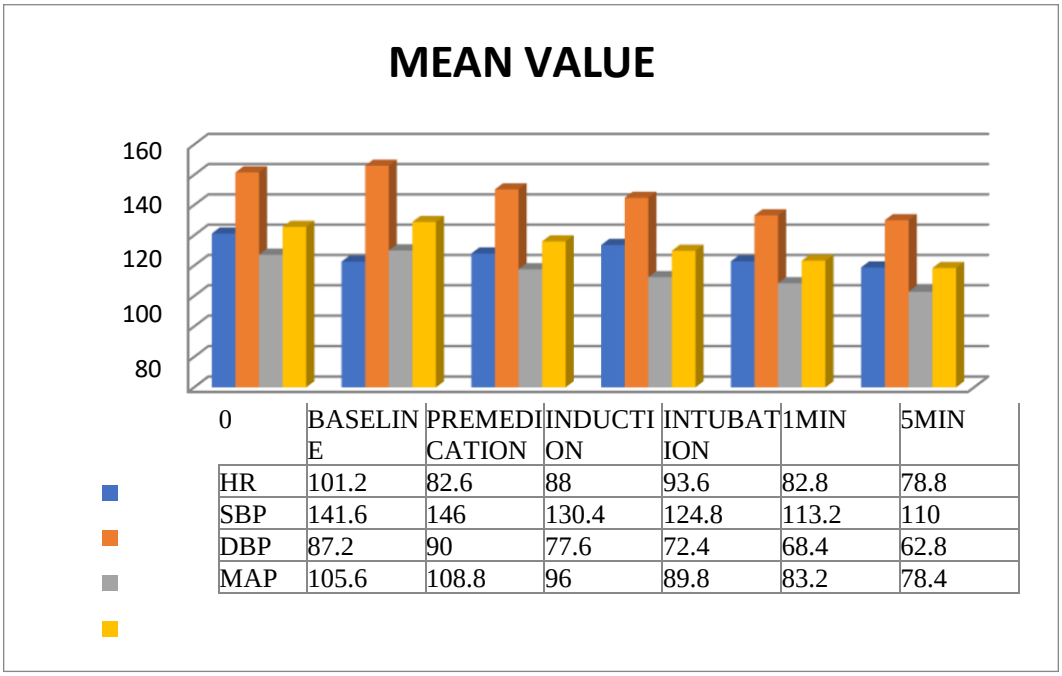


Figure6:-Hemodynamic responses to laryngoscopy and intubation.

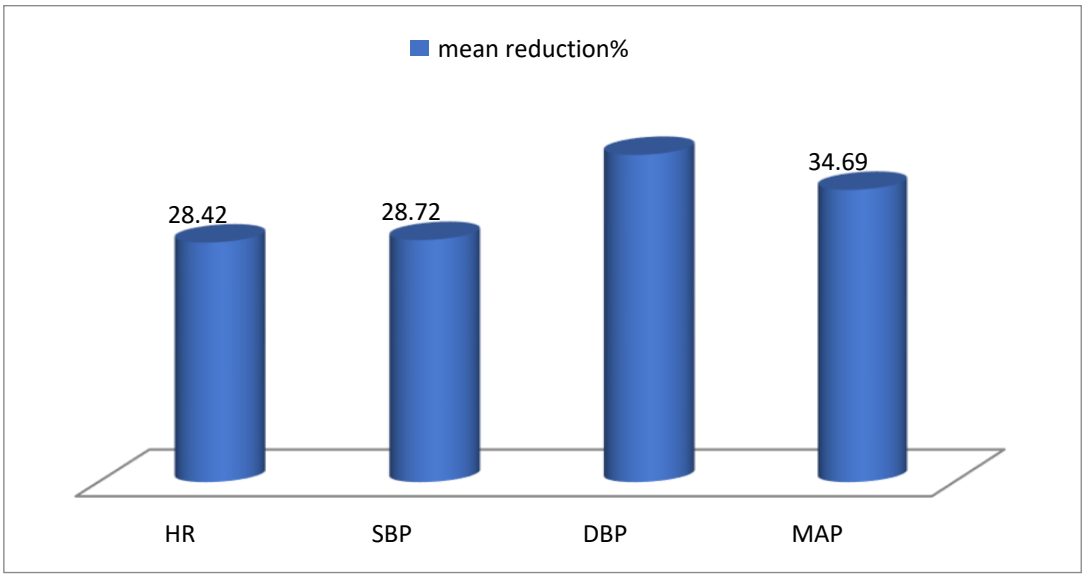


Figure7:-Mean reduction in hemodynamic parameters.

Discussion:-

The incidence of difficult laryngoscopy in morbidly obese patients is 8.1%–31%.[7] Oxygenation maintenance is the cornerstone of airway management in the obese patient related to anatomic and pathophysiologic issues.[6] Obesity is a multisystem disease affecting all organs, there are a number of implications relevant to the conduct of anaesthesia.

Fat accumulation on the thorax and abdominal wall leads to reduced compliance reduction in functional residual capacity (FRC), vital capacity (VC) and total lung capacity (TLC). Increased metabolic rate with increased oxygen consumption leads to chronic hypoxaemia. Worsening of the above respiratory problems with the use of opioids results in hypoxia. They are also more susceptible to cardiovascular diseases including systemic hypertension, biventricular failure and myocardial ischaemia.[3]

Our study showed that, in anticipated difficult airways, using videolaryngoscope as the first tool for intubation significantly reduced the number of intubation attempts and the time taken for intubation which reduces the risk of hypoxia and desaturation during laryngoscopy and intubation. Also, the hemodynamic stress response to laryngoscopy and intubation was reduced preventing intra-operative major acute cardiac events. Our results were similar to the systematic review and metanalysis done by Hiroshima Hoshijimaetal[10] on videolaryngoscope versus Macintosh laryngoscope for tracheal intubation in obese patients where eleven articles were reviewed. They extracted data on success rate, intubation time and glottic visualisation and concluded that videolaryngoscopes were superior to macintosch laryngoscope for tracheal intubation in patients with obesity. Seongheon Lee et al[11] conducted a prospective randomized study in patients with morbid obesity to compare ramped versus sniffing position in videolaryngoscopy-guided tracheal intubation. They found that compared with the sniffing position, the ramped position reduced intubation time inmorbidly obese patients and effectively facilitated both mask ventilation and tracheal intubation using videolaryngoscopy which was similar to our study.

There was a significant fall in the hemodynamic parameters from baseline to intubation and 5mins later. The mean reduction in HR was 28.42%, SBP- 28.72%, DBP-38.85% and MAP- 34.69%. The hemodynamic parameters of our study was comparable to the study done by Tomas Gaszynski et al[12] on 42 morbidly obese patients between dexmedetomidine and fentanyl for attenuating hemodynamic response to intubation stimuli in low-opioid technique showed no significant difference between the groups. But, dexmedetomidine group demonstrated lesser degree of variation in hemodynamic parameters providing a greater degree of hemodynamic stability on exposure to painful stimulus during laryngoscopy with dexmedetomidine.

The use of opioid free anaesthesia significantly reduced post-operative respiratory depression thus reducing the need of post-operative ventilator support. Roger E Hofer et al[13] reported a 433kg morbidly obese patient using dexmedetomidine without narcotics. It was observed that dexmedetomidine had narcotic sparing effects and is useful for patients who are susceptible to narcotic induced respiratory depression. Tomasz Gaszynski et al[4], observed in super obese patients with suspected difficult intubation that Dexmedetomidine for awake intubation and an opioid free general anesthesia helped to reduce or eliminate intra-operative use of opioids and recommended the use of videolaryngoscope and awake intubation in morbidly obese patients. In a Cochrane systematic review By S R Lewis et al[9] on videolaryngoscopy versus direct laryngoscopy for adult patients requiring tracheal intubation concluded that videolaryngoscopes reduced the number of failed intubations, particularly among patients presenting with a difficult airway. They improve the glottic view and may reduce laryngeal/ airway trauma. Insufficient sample size for statistical measurements was the limitation in our study.

Conclusion:-

In conclusion, use of videolaryngoscope with RAMP position reduced the intubation time and intubation attempts in obese patients and dexmedetomidine is a useful anaesthetic adjunct for patients susceptible to opioid induced respiratory depression. This study emphasises the use of advanced airway tools, standard intubation techniques and careful drug selection in order to prevent and minimise the risk of airway complication in obesity.

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