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Original Research Article

A Hospital Based Clinical Assessment of Hemodynamic Responses to Nasotracheal Intubation under General Anesthesia

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Abstract

Aim: The aim of the present study was to observe hemodynamic response in nasotracheal intubation under general anesthesia.

Methods: The present study was conducted in the Department of Anesthesia, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India, and 50 patients of either gender aged 18 to 60 years belonging to ASA I and II scheduled to undergo elective surgery under general anesthesia requiring intubation were included.

Results: The mean age was 37.03 years and male to female ratio was 5:45 with mean weight being 59.08 Kg. Spo_2 was continuously monitored during intubation and it was found that patients maintained 100% saturation during induction, at the time of insertion of direct laryngoscope, at 3min, 5min and 10 min. 8 patients had lower reading immediately after intubation with mean SpO_2 of 99.96%. Mean time for intubation using laryngoscope was 18.2 sec. Epistaxis was seen in 2 of 50 patients. There was significant fall of all parameters after induction comparing with baseline ($p<0.0001$). At the time of insertion of DLS there was significant rise of heart rate ($p<0.005$), SBP, DBP & MAP ($p<0.0001$). HR, SBP, DBP & MAP remained high even after intubation and returned to baseline value at 3 min. HR, SBP, DBP & MAP continued to be below baseline at 5 min and 10 min.

Conclusion: Direct laryngoscope nasotracheal intubation causes significant increases in blood pressure and heart rate. Nasotracheal intubation under general anesthesia has significant Hemodynamic effect.

Keywords: Nasotracheal intubation, General Anesthesia, Hemodynamic Responses, Difficult Intubation

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Introduction

Laryngoscopy and endotracheal intubation is an integral part of general anesthesia for cardiac surgery. Direct laryngoscopy and passage of endotracheal tube through the larynx is a noxious stimulus, which can provoke untoward response in the cardiovascular, respiratory and other physiological systems. [1]

Significant tachycardia and hypertension can occur with tracheal intubation under light anesthesia. The magnitude of cardiovascular response is directly related to the force and duration of laryngoscopy. [2] The sympathetic response and the resulting hemodynamic response have been extensively studied and documented in different patient groups, both with and without cardiac illness. [3] In 1913, Chevalier Jackson was the first to report a high rate of success for the use of direct laryngoscopy as a means to intubate the trachea. [4] Since the popularization of endotracheal intubation by Magill in 1934, it remains till date an integral and indispensable feature of the conduct of general anesthesia. [5]

Laryngoscopy is used to facilitate tracheal intubation under vision. Successful laryngoscopy depends on achieving a line of sight from the maxillary teeth to the larynx. The tongue and epiglottis are the anatomic structures that intrude into the line of sight. Management of the tongue and epiglottis is therefore central to successful direct laryngoscopy. Before the laryngoscope is inserted, the patient is normally placed in the "sniff" position. The direct laryngoscope is then used to displace the tongue and epiglottis out of the line of sight. The tongue is displaced horizontally (normally to the left) from the line of sight, the hyoid bone and attached tissues are moved anteriorly, and the epiglottis is elevated to reveal the larynx. The force applied to the laryngoscope handle should lift the hyoid bone and attached tissues parallel to the line of sight. Adequate lifting force is a key factor in successful direct laryngoscopy. It is important to achieve the best possible view of the larynx without causing tissue trauma.

Nasotracheal intubation is indicated in patients undergoing oral, maxillofacial, or dental procedures or when orotracheal intubation is not feasible because of limited mouth opening, tumors of tongue, or oropharynx. [6,7] Progressive visualization of anatomic structures minimizes the risk of trauma. The epiglottis is the first key anatomic landmark. The tip of the laryngoscope is advanced into the vallecula, and the epiglottis is elevated indirectly by applying a force that tensions the Hy epiglottic ligament. Elevation of the epiglottis is optimized and a further lifting force is applied to the laryngoscope to achieve the best view of the larynx. It is very important not to lever on the maxillary teeth because this may cause dental damage and reduce the view of the larynx. When a good view of the larynx is achieved, the vocal cords, aryepiglottic folds, posterior cartilage, and interarytenoid notch can be identified. This technique has some hemodynamic effects. Introducing tube through nasal passage also has different effects as nasotracheal intubation can evoke the noncardiac reflex, which depresses the tachycardic response.

The aim of the present study was to observe hemodynamic response in nasotracheal intubation under general anesthesia.

Methods

The present study was conducted in the Department of Anesthesia, Darbhanga Medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India from March 2023 to December 2023 and 50 patients of either gender aged 18 to 60 years belonging to ASA I and II scheduled to undergo elective surgery under general anesthesia requiring intubation were included.

Inclusion Criteria

- ASA I and II
- Age 18 to 60 yrs
- BMI of 30 or less
- No diagnosed chronic medical disease

Exclusion Criteria

- Patient's refusal
- Patients with an anticipated difficult airway
- Obesity
- Cardiovascular and Endocrine disease
- On drugs known to produce changes in heart rate and blood pressure like beta blockers, digitalis, calcium channel blockers, oral contraceptives.
- Bleeding disorders
- History of nasal surgery or trauma
- Nasal polyp

A written informed consent was obtained from each patient after explaining the technique prior to inclusion in this study in their own vernacular language. Preanesthetic checkup was done in every patient. All patients received Inj Glycopyrrolate (0.2mg) I.V, Inj Midazolam (2mg) iv + Inj Promethazine (25mg) IM as premedication 30 min before the elective surgery. Fifteen minutes before shifting the patient to the OT table, in both the nasal passages 0.1% Oxymetazoline nasal drops where instilled. All patients received Tab. Alprazolam 0.25 mg 1 HS and 6 am on the day of surgery.

After the patient is brought to operation table baseline measurements of heart rate, blood pressure and Spo2 were taken. Fentanyl in a dose of 1.5 µg/kg were administered intravenously 5 minutes before induction. Patients were preoxygenated with 100% O2 for 3 minutes. General anesthesia was induced with an intravenous injection of propofol, 2mg/kg and intubation was facilitated with the use of rocuronium 0.9 mg/kg intravenously. Then patient were ventilated with 100% oxygen. Intubation was commenced exactly after 90 seconds of giving inj. rocuronium. Nasotracheal intubation was carried out with the aid of laryngoscope. A 7.00 mm internal diameter, cuffed endotracheal tube (ETT) was used for female patients and 7.5 mm internal diameter cuffed ETT for male patients. The ETT was advanced into the trachea over the scope After introduction of ETT, anesthesia was maintained with O2:N2O:40:60 along with 0.8-1.5% isoflurane. The following parameters were observed: heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial blood pressure (MAP). These parameters were recorded at following time intervals: baseline value, after induction, at the time of insertion of laryngoscope, immediately after intubation and thereafter at 3, 5 and 10 minutes. ECG and SPO2 were monitored continuously as per the intervals mentioned above. The study was terminated at the end of 10 minutes after intubation. However, vitals were monitored throughout the surgery.

Results

Table 1: Demographics Data

Variables	Observations
Age [years]	37.03 +/- 21.09
Sex [M:F]	5:45
Weight [kg]	59.08 +/- 13.9
Time req for intub. [sec]	18.2 +/- 7.12
Epistaxis	2 (4%)
Spo_2	99.96 +/- 0.4

The mean age was 37.03 years and male to female ratio was 5:45 with mean weight being 59.08 Kg. Spo_2 was continuously monitored during intubation and it was found that patients maintained 100% saturation during induction, at the time of insertion of direct laryngoscope, at 3min, 5min and 10 min. 8 patients had lower reading immediately after intubation with mean SpO_2 of 99.96%. Mean time for intubation using laryngoscope was 18.2 sec. Epistaxis was seen in 2 of 50 patients i.e.4%.

Table 2: Hemodynamic changes

Parameter	Baseline	After induction	At Insertion	Immediately after intubation	3 min	5 min	10 min
HR (bpm)	82.72±16.84	76.12±13.88	88.56±21.99	85.8±20.39	82.28±13.4	80.52±12.65	79.4±12.62
P value		<.0001	0.0035	0.1020	0.6936	0.0085	0.0084
SBP (mmHg)	122.04±14.67	107.92±19.06	140±28.67	133.16±31.23	116.64±21.3	114.12±22.8	114.36±22.71
P value		< 0.0001	< 0.0001	0.0002	0.0017	0.0002	0.0025
DBP (bpm)	79.6±18.77	68.16±19.61	91.96±26.28	87.24±24.25	75.24±21.8	74.44±19.73	75.4±24.8
P value		< 0.0001	< 0.0001	0.0017	0.0507	0.0523	0.1095
MAP (bpm)	93.75±15.68	81.4±16.93	107.97±24.56	102.55±24.69	89.04±20.53	87.67±18.1	88.39±22.8
P value		< 0.0001	< 0.0001	0.0002	0.0088	0.0045	0.0260

Table shows that Baseline HR, SBP, DBP and MAP were 82.72±16.83 bpm, 122.04±14.67 mmHg 79.6±18.77 mmHg and 93.75±15.68 mmHg (mean±2sd) respectively. Maximum readings of all parameters were noted at the time of insertion of DLS. There was significant fall of all parameters after induction comparing with baseline ($p<0.0001$). At the time of insertion of DLS there was significant rise of heart rate ($p<0.005$), SBP, DBP & MAP ($p<0.0001$). HR, SBP, DBP & MAP remained high even after intubation and returned to baseline value at 3 min. HR, SBP, DBP & MAP continued to be below baseline at 5 min and 10 min.

Discussion

The cardiovascular response to tracheal intubation, although transient, may be harmful to some patients, mainly those with myocardial or cerebrovascular disease. The Macintosh curved laryngoscope is radically different from the preexisting straight laryngoscopes. In particular, the long axis of the blade is curved, the cross section is a right-angled "Z" section, the web and flange are bulky, the tip is atraumatic, and the light bulb is shielded by the web. The three component steps of direct laryngoscopy are insertion of the laryngoscope, adjustment of its position and lifting force, and use of other maneuvers to optimize the view of the glottis. The "sniff" position is used. Full mouth opening facilitates insertion of the laryngoscope. It is inserted from the right side of mouth and to the right of the tongue while taking care to not trap the lips between the laryngoscope blade and the teeth. The laryngoscope is advanced and simultaneously moved into the midline to displace the tongue to the left. The epiglottis is the first key anatomic landmark. The tip of the laryngoscope is advanced into the vallecula, and the epiglottis is elevated indirectly by applying a force that tensions the hyoepiglottic ligament. Elevation of the epiglottis is optimized and a further lifting force is applied to the laryngoscope to achieve the best view of the larynx. It is very important not to lever on the maxillary teeth because this may cause dental damage and reduce the view of the larynx. When a good view of the larynx is achieved, the vocal cords, aryepiglottic folds, posterior cartilage, and interarytenoid notch can be identified. This technique has some hemodynamic effects. Introducing tube through nasal passage also has different effects as nasotracheal intubation can evoke the nasocardiac reflex, which depresses the tachycardic response.

SpO2 was continuously monitored during nasotracheal intubation technique and it was found that patients maintained 100% saturation during induction, at 3 min, 5 min and 10 min. The mean Spo2 of the patient was 99.96%. Mean time for intubation was 18.2 sec. Our findings were consistent with most of the studies conducted. On comparing with baseline ($p<0.0001$) in all patients, there was no significant difference. This is due to the effect of anesthetic agents used for induction. This finding is consistent with most of the studies conducted [8-12] At the time of insertion of DLS there was significant rise of HR, SBP, DBP & MAP. This increase is due to stress response to laryngoscopy. [10]

During conventional laryngoscopy, the maximum force transmitted by a laryngoscope blade onto the base of the tongue is said to be as high as approximately 40 Newtons, and this stimulation is considered to be exceptionally invasive. [13] HR, SBP, DBP & MAP remained high after intubation but didn't increase and returned to baseline value at 3min Maximum readings of all parameters were noted at the time of insertion of DLS In all patients HR, SBP, DBP and MAP was at baseline level at 3min. This finding is consistent with most studies. In all patients HR, SBP, DBP and MAP was below baseline at 5min and 10min. This is due to effect of anesthetic agents used for maintenance of anesthesia. This finding is consistent with most other studies. [14-17]

There was significant high Hemodynamic response to laryngoscopy at the time of intubation which may be due to sudden severe stress response to DLS during intubation and also due to oropharyngeal and nasopharyngeal structures stimulation. [8,9,13,15,16,19]

Conclusion

Direct laryngoscope nasotracheal intubation causes significant increases in blood pressure and heart rate. Nasotracheal intubation under general anesthesia has significant Hemodynamic effect.

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