Original Research Article

Indian Journal of Anesthesia and Analgesia
March – April 2020; 7(2): 593–600
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.7220.22

Evaluation of Airway Blocks Vs General Anesthesia for Diagnostic Direct Laryngoscopy and Biopsy for Carcinoma Larynx: A Comparative Study

Gouthami M[1], Padmavathi Bodiga[2]

[1,2]Assistant Professor, Department of Anaesthesia, Gandhi Medical College, Padmarao Nagar, Secunderabad, Telangana 500003, India.

Abstract

Aims: Evaluation of airway blocks *vs* general anesthesia for diagnostic direct laryngoscopy & biopsy for carcinoma larynx it is a comparative study. *Materials and Methods:* A total of 60 patients between the age group 50–70 years were included in the study. They were ASA Grade 3 or 4 and scheduled for Laryngeal biopsy under anesthesia. Patients were randomized in two groups, Group A received airway blocks with 2% lignocaine and Group B received general anesthesia. Group A patients received bilateral superior laryngeal nerve block, glossopharyngeal nerve block and transtracheal block. Group B patients received general anesthesia. Patients were monitored during anesthesia using continuous ECG, NIBP and Pulseoximetry. Intraoperative IV fluids were given according to the protocols. Vital data was recorded preoperatively and during direct laryngoscopy at every 5 minutes interval. *Results:* Preoperative vitals were same in both groups and statistically there was no significant difference in the data. Mean arterial pressures were raised during postoperative period. The postop analgesia was significantly higher in Group A and lasted longer as compared to Group B and patients were less agitated and calm. In Group B patients, most of them required postop nebulization as compared to Group A where no patient needed nebulization. *Conclusion:* Laryngeal biopsies done under regional airway blocks have less of hemodynamic changes and good analgesia in postop period, compared to cases done under general anesthesia.

Keywords: Laryngoscopy; Biopsy; Carcinoma larynx; Glossopharyngeal nerve block.

How to cite this article:
Gouthami M., Padmavathi Bodiga. Evaluation of Airway Blocks Vs General Anesthesia for Diagnostic Direct Laryngoscopy and Biopsy for Carcinoma Larynx: A Comparative Study. Indian J Anesth Analg. 2020;7(2):593–600.

Introduction

Laryngoscopy and endotracheal intubation is the commonest method of securing a definitive airway for administering anesthesia in ENT procedures like direct laryngoscopy guided biopsy in suspected carcinoma glottis and subglottis patients.[1] However, it is associated with tachycardia and hypertension.[3] Transitory hypertension and tachycardia are of no consequence in healthy individuals, but either or both may be hazardous to the patients with hypertension, myocardial insufficiency or cerebrovascular disease.[2] The choice of anesthesia becomes more of a concern in such patients because most of them are old, frail and with one or more associated systemic illness like hypertension,

Corresponding Author: **Padmavathi Bodiga,** Assistant Professor, Department of Anaesthesia, Gandhi Medical College, Padmarao Nagar, Secunderabad, Telangana 500003, India.

E-mail: padmavathiboiga@gmail.com

Received on 06.01.2020, **Accepted on** 14.02.2020

diabetes, ischemic heart disease etc. Recent developments in regional anesthesia have resulted in a number of innovative and refined options to practitioners, often allowing regional techniques to be used for patients with presumed difficult airways. However, not every surgery can be performed under regional anesthesia. In addition, even in the hands of the most skilled regional anesthesiologist, blocks are subject to a certain rate of complications or failure.[3]

In addition, there are many situations in which the anesthesiologist is called on to secure an airway in less than ideal circumstances. Expertise with regional anesthesia of airway allows intubation in awake patients with suspected difficult intubation, upper airway trauma, or cervical spine fractures. Therefore, it is essential that every regional anesthesiologist be skilled in the administration of general anesthesia and especially in the management of the difficult airway.

One major decision must be made with every procedure will the patient be intubated while under general anesthesia, or does the patient need to be awake during intubation, Intubation under general anesthesia (even with inhalational induction and spontaneous respiration) carries the inherent risk of losing control of the difficult airway.

For this reason, many anesthesiologists, on recognition of a difficult airway, elect to perform an awake intubation using either fiberoptic laryngobronchoscopy or awake direct laryngoscopy.

Direct laryngoscopy in an awake, unprepared patient can be extremely challenging. Excessive salivation and gag and cough reflexes can make intubation difficult, if not impossible, under awake conditions. In addition, the stress and discomfort may lead to undesirable elevations in the patient's sympathetic and parasympathetic outflow.[16] Several highly effective topical and regional anesthesia techniques have been developed to subdue these reflexes and facilitate intubation. Each of these techniques has the common goal of reducing sensation over the specific regions that will be encountered by the fiberoptic bronchoscope and endotracheal tube.

Materials and Methods

The present study, conducted in 60 patients aged between 50 and 70 yrs who are scheduled for elective Laryngeal Biopsy in a Carcinoma Larynx patients under Anesthesia in Government ENT Hospital, Koti attached to Osmania Medical College, Koti, Hyderabad.

After approval from the Departmental ethics committee and written informed consent from the patients, a randomized control study was conducted on 60 patients, planned for elective Direct Laryngoscopic Biopsy under anesthesia. Patients are selected between 50 and 70 years of age comprising both sexes. They are divided into 2 groups of each group containing 30 patients.

Inclusion Criteria

Patients in the age group 50 to 70 yrs, ASA Grade II, III or IV.

Exclusion Criteria

Allergic to Lignocaine, Emergency operative case, Therapeutic anticoagulation and Mouth opening less than 2 cms.

All patients were preoperatively evaluated for surgery. All investigations were conducted before the surgery. Basic Investigations conducted and all patients were asked to continue taking bronchodilators and nebulization with salbutamol, budecort the night before and in the morning before surgery. The patients were informed about the procedure in detail before commencing the operation.

On arrival in the operation theater, after confirming adequate starvation, patient's heart rate, Noninvasive blood pressure, oxygen saturation, respiratory rate and ECG were monitored. Intravenous access was secured with 20G cannula and Ringer's lactate solution at 2 ml kg^{-1} was started.

All the patients are allocated into 2 groups randomly. The patients in Group 'A' received Airway Blocks with Inj. 2% Lignocaine and without intubation. Patients in Group 'B' received general anesthesia with intubation and no airway blocks.

Group A patients were given premedication with Inj. glycopyrrolate 0.04 mcg/kg IV and Inj. midazolam 1 mg IV 2 % lignocaine viscous gargling was done for nasopharyngeal and oral block. Bilateral superior laryngeal nerve block was given with Inj. 2% lignocaine. Transtracheal block is given by puncturing the cricothyroid membrane with Inj. 4% lignocaine.

Group B patients received conventional general anesthesia. Premedication with Inj. glycopyrrolate 0.04 mcg/kg and Inj. fentanyl 2 μg/kg iv given after preoxygenation for 3 minutes and induction with Inj. propofol 2 mg/kg, Inj. suxamethonium 2 mg/kg, followed by intubation with smaller size no. 5ID MLS cuffed endotracheal tube. IPPV was given using circle absorbing system connected to anesthesia work station at a rate of 14 breaths/min and 8 ml/kg tidal volume.

Maintenance was done with 33% oxygen, 66% nitrous oxide and Inj. Inhalational agent sevoflurane 2% used. Intermittent suxamethonium IV was given. Patients were monitored during anesthesia using continuous 5 lead ECG, NIBP and Pulse oximetry. Intraoperative IV fluids were given according to the protocols.

Vital data was recorded at induction during laryngoscopy and every 5 minutes interval during intraop period. The parameters recorded were Pulse Rate, Systolic blood pressure, Diastolic blood pressure, Mean arterial pressures. In all patients the duration of surgery was around 20 ± 5 minutes.

After completion of surgery, extubation was done in Group B patients and they were transported to the postanesthesia care ward after confirming an adequate level of consciousness and intact reflexes. The patients were observed for 1 hour, in postoperative period for analgesia, hemodynamics and also pain was assessed by using VAS Score.

Statistical Analysis

The data thus collected was entered into an Excel sheet. It was further subjected to statistical analysis in MS Excel and SPSS v16. Data was expressed in frequencies and percentages when qualitative and in Mean ± SD when quantitative. Unpaired Student

t-test was used for comparing the trends for all parameters in the two groups. A 'p' value of < 0.05 was considered significant.

Results

There was no statistical difference in demographical details in either groups.

Pulse rate was compared at different time interval intraoperatively. It was observed that, mean pulse rate at 0 min, is the period during direct laryngoscopy in Group A was 88.12/min compared to Group B 97.68/min and there was statistical significant in mean pulse rates at 0 min ($p < 0.001$).

Mean pulse rate at 5 mins in Group A was 84.1/min compared to Group B 103.28/min there was statistical significant in mean pulse rates in at 5 mins ($p < 0.001$). Mean pulse rate at 10 mins was significantly lower in Group A 83.3/min compared to Group B 101.2/min ($p < 0.001$). Mean pulse rate at 15 mins was significantly lower in Group A 82.7/min compared to Group B 101.8/min ($p < 0.001$). Mean pulse rate at 20 mins was significantly lower in Group A 83.7/min compared to Group B 102.7/min ($p < 0.001$).

Table 1: Bio-Physical Profile and preop vitals of both groups

Parameter	Group A		Group B		*t*-value	*p* - value
	Mean	SD	Mean	SD		
Age (yrs)	59.4	5.38	61.36	5.36	1.291	0.102
Preop PR (/min)	83.24	5.6	82.4	4.96	0.562	0.577
Preop MAP (mm of Hg)	73.6	5.2	74.3	4.9	0.44	0.66

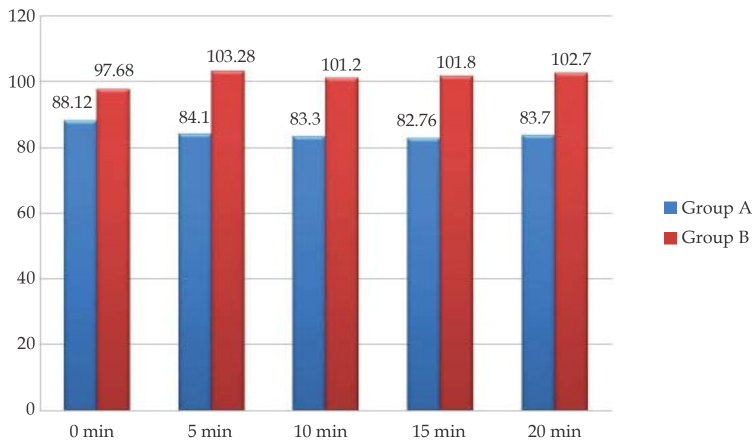

Fig. 1: Intraoperative mean Pulse rates.

Table 2: Vital data at the beginning of the procedure in both the groups

	Group A		Group B	
	PR	MAP	PR	MAP
After airway block	76	83	–	–
After intubation	–	–	82	90

Mean arterial pressure was compared at different time intervals intraoperatively. It was observed that, mean arterial pressure at 0 min in Group A was 71.72 mm Hg compare to Group B 82.7 mm Hg. There was statistical significant in MAP at 0 min ($p < 0.001$).

Mean arterial pressure at 5 mins in Group A was 70.16 mm Hg compare to Group B 80.44 mm Hg. There was statistical significant in MAP at 10 mins ($p < 0.001$). Mean arterial pressure at 10 mins was significantly lower in Group A 69.5 mm Hg compared to Group B 87.28 mm Hg ($p < 0.001$).

Mean arterial pressure at 15 mins was significantly lower in Group A 67.96 mm Hg compared to Group B 86.68 mm Hg ($p < 0.001$). Mean arterial pressure at 20 mins was significantly lower in Group A 67.16 mm Hg compared to Group B 86.76 mm Hg ($p < 0.001$).

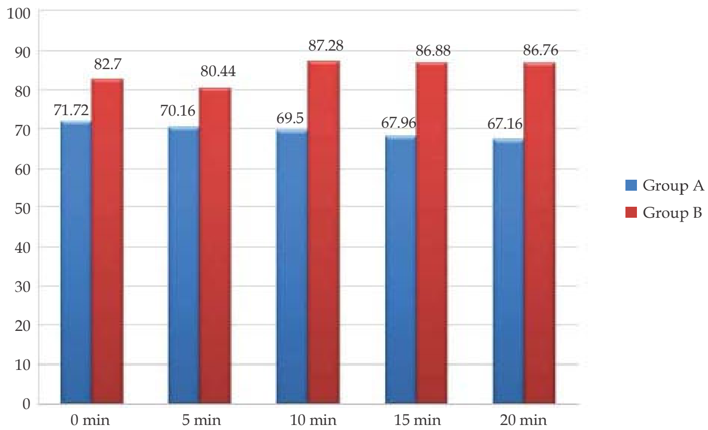

Fig. 2: MAP (in mm Hg) comparison in two groups at different time interval intraoperatively.

Pulse rate was compared at different time interval postoperatively. It was observed that, Mean pulse rate at 30 mins in Group A was 74.12 significantly lower when compared to Group B 80.44 ($p < 0.001$). At 40 mins Mean pulse rate in Group A was 72.28 significantly lower compared to Group B 80.48 ($p <$ 0.001).

Mean pulse rate at 50 mins in Group A was 69.84 significantly lower than the mean pulse rate in Group B 85.3 ($p < 0.001$). Mean pulse rate at 60 mins was 67.72 significantly lower than the mean pulse rate in Group B 85.48 ($p < 0.001$).

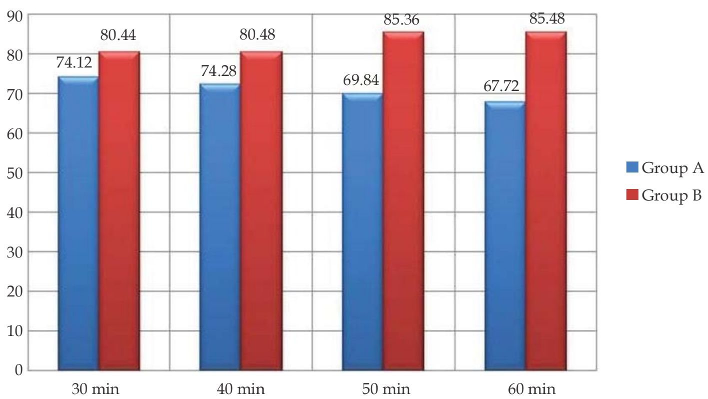

Fig. 3: Pulse rate (per min) comparison in two groups at different time interval postoperatively.

Mean Arterial pressure was compared at different time interval postoperatively. It was observed that, Mean arterial pressure at 30 mins in Group A was 67.08 significantly lower than the mean arterial pressure in Group B is 86.28 ($p < 0.001$). At 40 mins mean arterial pressure in Group A was 65.48 significantly lower than the mean arterial pressure in Group B is 86.16 ($p < 0.001$).

Mean arterial pressure at 50 mins in Group A was 64.88 significantly lower than the mean arterial pressure in Group B is 89.76 ($p < 0.001$). Mean arterial pressure at 60 mins in Group A was 64.32 significantly lower than the mean arterial pressure in Group B is 89.84 ($p < 0.001$).

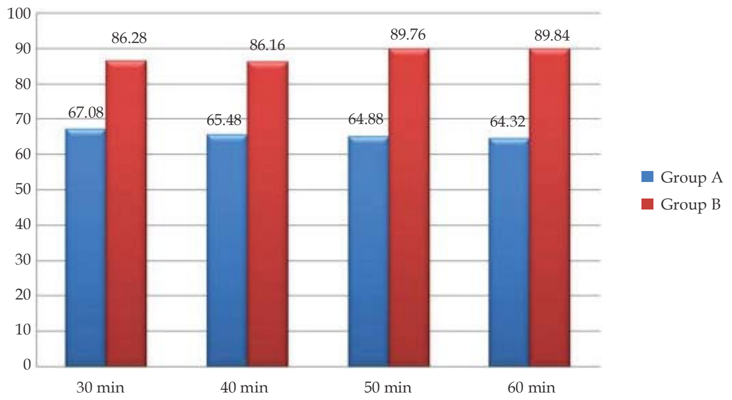

Fig. 4: Mean Arterial Pressure (mm Hg) comparison in two groups at different time interval postoperatively.

Pain scoring at different time interval postoperatively was measured using VAS score. It was observed that the mean VAS score at 30 mins in Group A was 1.16, significantly lower than Group B 2.0 ($p < 0.001$). The mean VAS score at 40 mins in Group A was 1.6, significantly lower than Group B 2.32 ($p < 0.001$).

The mean VAS score at 50 mins was significantly lower in Group A, 2.0 compared to Group B, 3.68 ($p < 0.001$). The mean VAS score at 60 mins was significantly lower in Group A, 2.4 compared to Group B, 3.76 ($p < 0.001$).

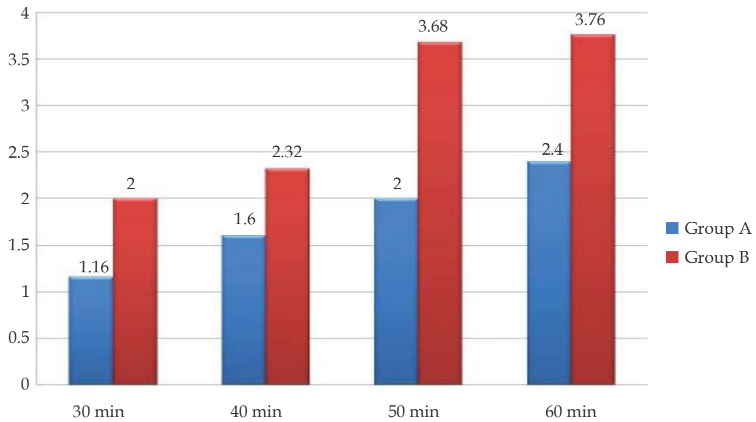

Fig. 5: Comparison of pain scoring according to VAS in two groups at different time interval postoperatively.

Discussion

There has always been a debate with regional *versus* general anesthesia in patients undergoing head and neck surgeries. It becomes a particular concern when the regional anesthesia becomes the best available option in cases like carcinoma larynx with unknown growth extent. General anesthesia with intubation may become highly difficult and challenging in face of fragile growth which may bleed at the time of tube insertion and may completely block the airway which may render even mask ventilation difficult. The difficult airway algorithm which includes call for help in such a scenario may not be applicable in this case as we don't have much time left after paralyzing the patient. Another way is to do awake intubation which can be highly stressful for these patients and will result in a fighting patient, which will deprive the surgical procedure and may raise the blood pressure to such an extent that it may lead to intracranial hemorrhage in old patients. So, we should expertise with the regional anesthetic techniques. As with other forms of regional anesthesia, airway blocks will provide the anesthetist with additional tools with which to better treat his/her patients. These tools will prove to be useful not only in the operating room setting, but also in emergency room and intensive care areas as well, and will add to the confidence and abilities of the practitioner. There has always been a debate with regional *versus* general anesthesia in patients undergoing head and neck surgeries. It becomes a particular concern when the regional anesthesia becomes the best available option in cases like carcinoma larynx with unknown growth extent.

General anesthesia with intubation may become highly difficult and challenging in face of fragile growth which may bleed at the time of tube insertion and may completely block the airway which may render even mask ventilation difficult. The difficult airway algorithm which includes call for help in such a scenario may not be applicable in this case as we don't have much time left after paralyzing the patient.

This study was undertaken to observe the hemodynamic responses during direct laryngoscopy and biopsy in carcinoma larynx patients with airway blocks *vs* general anesthesia.

Patient with allergic to lignocaine drug, patients with coagulopathies and patients with less than 2 cms of mouth opening were excluded from study. Total 60 patients were taken and divided into two groups. Group A (n = 30) with airway blocks, Group B (n = 30) with general anesthesia. All patients received premedication 15 mins before the procedure with antisialogoguage preoperatively. In all patients average duration of surgery was around 20 ± 5 mins. Patients in Group A, didn't receive any analgesic drugs during intraoperative and postoperative period. Patients in Group B received Inj. Fentanyl 2 μ/kg intraoperatively.

Patients were selected between 50 yrs and 70 yrs of age. The Mean age was (Mean ± SD) 59.4 ± 5.38 in Group A and Mean age was 61.36 ± 5.36 in Group B. The difference was statistically insignificant (p > 0.05) i.e. (p = 0.102).

The difference in average preoperative pulse rate was statistically not significant (p = 0.577). Preoperative Mean pulse rate in Group A 83.24 ± 5.6 and in Group B 82.4 ± 4.96.

The Preoperative Mean Arterial Pressure (MAP) in Group A 73.6 ± 5.2 and in Group B 74.3 ± 4.9 and differences were observed that there are statistically insignificant (p > 0.05) i.e. (p = 0.66).

All patients were followed in the intraoperative period for hemodynamics (pulse rate & Mean arterial blood pressure). Recordings were done during direct laryngoscopy, at the intervals of 0, 5, 10, 15, & 20 mins intraoperatively and postoperatively at 10 mins interval up to 60mins.

In postoperative period pain was monitored by VAS score at the intervals of every 10 minutes. Statistical analysis of the derived parameters were carried out using unpaired "t" test and p - values less than 0.05 was considered significant.

In Group A immediately after airway block pulse rate was 76 per minute and Mean Arterial Pressure (MAP) was 83 and in Group B immediately after intubation pulse rate was 82 per minute and Mean Arterial Pressure was 90.

Intraoperatively Mean Pulse rate of Group A (88.12 ± 7.2, 84.1 ± 6.4, 83.3 ± 4.2, 82.76 ± 4.6, 83.7 ± 5.8) was compared with Group B (97.68 ± 6.7, 103.28 ± 5.5, 101.2 ± 8, 101.2 ± 7.7) at all points of time and found statistically significant (p < 0.001).

Intraoperatively Mean Arterial Pressure (MAP) levels were observed to be high in Group B than Group A. MAP intraoperatively for Group A (Mean ± SD) (71.72 ± 9.04, 70.16 ± 6.8, 69.5 ± 3.3, 67.96 ± 2.9, 67.16 ± 3.19) was compared with Group B (82.7 ± 5.7, 80.44 ± 4.6, 87.28 ± 4.54, 86.88 ± 4.3, 86.76 ± 3.5). The differences were statistically significant at all the points of time (p < 0.001).

Postoperatively Mean Pulse rate levels were observed to be lower among Group A than Group A. Mean Pulse rates for Group A (74.12 ± 4.5, 72.28 ± 3, 69.84 ± 3.03, 67.72 ± 4.08) were compared with Group B (80.44 ± 4.6, 80.48 ± 4.9, 85.36 ± 4.7, 85.48 ± 6.10) and difference was statistically significant at all intervals (p < 0.001).

Postoperatively Mean Arterial Pressure (MAP) values were observed at all times among Group B than Group A. Mean MAP values in Group A (67.08 ± 2.9, 65.48 ± 2.6, 64.88 ± 2.4, 64.32 ± 2.6) were compared with Group B (86.28 ± 2.59, 86.16 ± 2.13, 89.76 ± 3.7, 89.84 ± 5.5) throughout the intervals postoperatively and found to be that statistically significant ($p < 0.001$).

Subjective assessment of pain was studied postoperatively by 10 cm Visual Analog Score scale. Mean Pain scores in by VAS at all points of time were less in Group A than Group B. Mean Pain scores in Group A (1.16 ± 0.68, 1.6 ± 0.81, 2 ±., 2.4 ± 0.7) were compared with Group B (2 ± 0.57, 2.32 ± 0.47, 3.68 ± 1.3, 3.76 ± 0.7) and difference was found statistically significant at all intervals of time ($p < 0.001$).

V Trivedi, B Patil studied on 100 patients divided into two groups to compare the effects of regional airway blocks *vs* general anesthesia.[4] Baseline preoperative values of pulse and blood pressure were noted and were recorded at 0, 5, 7, 9, 10 and 15 mins. Postoperative sedation and VAS scores were recorded at 0, 5, 15, 30 mins initially and then hourly. Their study showed significant hemodynamic changes in Group II with significant raise in MAP and PR during perioperative period. Whereas in Group I, there was a stability in MAP and PR perioperatively. The postop analgesia was significantly higher in Group I and lasted longer as compared to Group II, and patients were less agitated and calm as assessed by the sedation score. In Group II most of the patients required postop nebulization as compared to Group I where no patient needed nebulization.

Rastogi A et al. conducted a comparison of general anesthesia *versus* regional anesthesia with sedation in selected maxillofacial surgery concluded that regional block with sedation is a safe alternative technique for patients undergoing surgery for mandible fracture or TMJ ankylosis, with clear advantages over general anesthesia.[5]

Babitha Gupta et al. studied, topical airway anesthesia for awake fiberoptic intubation: comparison between airway nerve blocks and nebulized lignocaine by ultrasonic nebulizer.[6] Awake Fiberoptic Bronchoscope (FOB) guided intubation is the fold standard of airway management in patients with cervical spine injury concluded that the time taken for intubation was significantly lower in Group NB compared to Group L. Group L had increased number of cough/gaging episodes as compared to Group NB. Vocal cord visibility and ease of intubation were better in patients who received airway blocks and patient comfort was better in Group NB. They also concluded that Upper airway blocks provide better quality of anesthesia with lignocaine nebulization as assessed by patient recall of procedure, coughing/gagging episodes, ease of intubation, vocal cord visibility and time taken to intubate.

Abeer Ahmed studied to evaluate the effect of bilateral block of the internal branch of Superior Laryngeal Nerve (SLN) as an adjuvant to general anesthesia during endoscopic laryngeal surgery when smaller dose of muscle relaxant is used.[7] Seventy-six patients required endoscopic laryngosurgery in whom general anesthesia was preceded by bilateral superior laryngeal nerve block either with 2% lidocaine (L-Group) or with saline (C-Group). The reaction to endotracheal tube insertion was better in L-Group as less frequent cough occurred in L-Group (one patient) compared to (8 patients) C-Group (p value < 0.05).

The maximum pressor response was observed immediately after intubation, at which the increase in MAP from baseline in C-Group (24.4%) was significantly higher than in L-Group (6.4%) ($p < 0.05$) and the increase in HR from baseline in C-Group (29.5%) was significantly higher than in L-Group (14.8%) ($p < 0.05$). The MAP and HR remain significantly higher in C-Group than that of the L-Group all through the intraoperative period. The incidence of severe cough was significantly higher in C-Group just before extubation (bucking), 5 min and 30 min postextubation. Incidence and severity of postoperative sore throat was significantly higher in C-Group in the first 4 h postoperatively.

U Bissinger, H Guggenberger et al. undertook a study to assess the practicality, success, and complication rate of Retrograde-Guided Fiberoptic Intubation (RGFI) in a larger series of patients with laryngeal carcinoma.[8] The investigation was performed prospectively with 93 consecutive patients scheduled for laryngectomy. The RGFI technique was performed with the patient under continuous mask ventilation.[9]

Such airway blocks may be highly useful in the era of fiberotic intubation now for better operating conditions and postop analgesia for the patients. Glossopharyngeal nerve block, with radiological control, was used to relieve severe pain due to oropharyngeal carcinoma by monogmery et al.[10] park et al. evaluate the glossopharyngeal nerve block for posttonsillectomy pain. But its use should be advanced to anesthesia procedures also. On the basis of above results, we advise airway blocks for ENT procedures like direct laryngoscpic biopsy for a better inraoperative hemodynamic stability and postop analgesia and securing a safe airway in predicting difficult airway patients and less complications related to general anesthesia. But still more randomized control trials should be done.[11]

Conclusion

The study shows that laryngeal biopsies done under regional airway blocks have less of hemodynamic changes and good analgesia in postop period, compared to cases done under general anesthesia.

Hence, suggesting that regional airway blocks for anesthesia in short procedure of upper airways and also in cases of predicting difficult airway cases for securing the safe airway can be very useful alternate to the general anesthesia.

References

1. Donlon, DJ Doyle, MA Feldman. Anesthesia for eye, ear, nose and throat surgery. Miller's anesthesia, RD Miller, 6th edition., 2005, Church Hill Livingstone, USA; pp. 2542–43.
2. Faccenda KA, Finucane BT. Complications of regional anesthesia: Incidence and prevention. Drug Saf 2001;24:413–42.
3. Auroy Y, Narchi P, Messiah A. Serious complications related to regional anesthesia: Results of a prospective survey in France. Anesthesiology 1997;87:479–86.
4. V Trivedi, B Patil. Evaluation of airway blocks *versus* general anesthesia for diagnostic direct laryngoscopy and biopsy for carcinoma of the larynx: A study of 100 patients. The Internet Journal of Anesthesiology 2009; 26(1):1–8.
5. Rastogi A, Gyanesh P, Agarwal A, et al. Comparison of general anesthesia *vs* regional anesthesia with sedation in selected maxillofacial surgeries. A randomized controled study. EPUB 2013 Apr;42(3):250–54.
6. Gupta B, Kohli S, Farooque K. Topical airway anesthesia for awake fiberoptic intubation: Comparison between airway nerve blocks and nebulized lignocaine by ultrasonic nebulizer. Saudi J Anesth 2014;8(Suppl 1):S15–19.
7. Abeer Ahmed Dalia Saad Abdel Rahman Youness. Superior laryngeal nerve block as an adjuvant to General Anesthesia during endoscopic laryngeal surgeries: A randomized controlled trial. Egyptian Journal of Anesthesia 2015 April;31(2): 167–74.
8. Bissinger U. Retrograde-guided fiberoptic intubation in patients with laryngeal carcinoma. Anesth and Analg 1995;81:408–10.
9. Kundra P, Kutralam S, Ravishankar M. Local anesthesia for awake fiberoptic nasotracheal intubation. Acta Anesthesiol Scand 2000;44:511–16.
10. Montogmery W. Aspects of the management of chronic pain illustrated by ninth nerve block. British Journal of Anesthesia 1972;44(4):383–85.
11. Hee-Pyoung Park, Jung-won Hwang, Sang-Hyun Park. The effects of glossopharyngeal nerve block on postoperative pain relief after tonsillectomy: The importance of the extent of obtunded gag reflex as a clinical indicator. Anesth Analg 2007 Jul;105(1):267–71.