e-ISSN: 0975-1556, p-ISSN:2820-2643
Available online on www.ijpcr.com
International Journal of Pharmaceutical and Clinical Research 2024; 16(1); 1451-1456

Original Research Article

Evaluation of Dexmedetomidine Nebulization as Adjuvant to Lignocaine During Awake Flexible Fiberoptic Bronchoscopy

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Received: 12-12-2023 / Revised: 05-01-2024 / Accepted: 25-01-2024
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Conflict of interest: Nil

Abstract:

Background: Awake Fiberoptic Intubation (AFOI) is considered as the gold standard for patients with difficult airway. Lidocaine may be accompanied with respiratory depression, seizure, and cardiac arrhythmias. On the other hand, Dexmedetomidine has favorable properties such as analgesia, sympatholysis, sedation and cardiovascular stability.

Aim and Objectives: To assess the efficacy of dexmedetomidine intranasally with lidocaine in AFOI in comparison to using lidocaine alone in terms of haemodynamic stability, sedation, ease of intubation and any complication with the procedure.

Materials and Methods: This observational hospital based study was conducted on 60 patients of either sex aged between 18-60 years with ASA status I or II scheduled for elective surgeries under general anaesthesia. The patients were randomly divided into two groups of 30 each .Group D (4ml of lignocaine 4%+dexmedetomidine 1 mcg/kg) Group L (4 ml of 4% lignocaine). Descriptive statistics was done and were reported in terms of mean, standard deviation and percentages.

Results: The mean heart rate during AFOI was 71.16±7.02 in Group D and 95.62±10.04 in Group L. The Mean Arterial Pressure (MAP) during AFOI was 74.4±6.2 in group D and 101.78±5.56 in group L. There was statistically significant (p-value <0.001) decrease in mean heart rate and MAP in group D as compared to group L. There was a significant difference (p-value <0.001) in time to intubation, intubation conditions, post intubation score between the two groups. There was no significant decrease in Saturation of Peripheral Oxygen (SpO2) or respiratory depression in both groups.

Conclusion: Intranasal dexmedetomidine with lidocaine provides better haemodynamic stability and improves the quality of intubation during AFOI.

Keywords: dexmedetomidine, lignocaine, awake fibreoptic

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Introduction

Awake Fiberoptic intubation (AFOI) is an effective and established technique for obtaining a secure airway access in patients having both anticipated and unanticipated difficult airway[1] it is considered as a gold standard, safe, and relatively simple method for intubating the trachea under direct vision.

The greatest challenge during AFOI is to provide adequate sedation and analgesia to the patients while maintaining a patent airway and ensuring spontaneous ventilation, as laryngospasm and coughing in response to intubation can increase the failure rate so it is necessary to obtain an optimal intubating conditions and patient comfort while preparing the patient for fiberoptic intubation [2] AFOI is done after attaining "conscious sedation". Conscious sedation is a state which causes minimal depressed level of consciousness where the patient airway and spontaneous respiration is intact, but the airway reflexes are blunted. It makes the procedure more tolerable and comfortable for patients and helps to ensure optimal intubating conditions.

A pre-requisite for awake fiber-optic intubation is an appropriate anesthesia of the nose, oropharynx, larynx, and trachea, so as to suppress airway reflexes and prevent any discomfort to the patient during bronchoscopy and intubation. Various techniques are used mostly in combinations for airway anesthesia which include topical, intravenous, or airway nerve blocks. To achieve this, various pharmacological agents alone or with combination with local anesthetics and nerve blocks are given. An ideal drug for AFOI should provide adequate anxiolysis, amnesia ,should have analgesic properties ,ensure spontaneous ventilation with a patent airway, adequate cooperation, able to

suppress the gag and cough, and be safe and easy to titrate with minimal respiratory and cardiovascular side effects.[3] Currently benzodiazepines, opioids, propofol are used alone or in combination. Though the combination of these drugs may provide better intubation conditions, however the incidence of hypoxemia is high.[4]

Local anesthetics such as Lidocaine Hydrochloride is usually used for reducing pain, decreasing the risk of Bradycardia, gag and cough reflex. Administration of Lidocaine by using nebulizer before performing the bronchoscopy has shown significantly effective in decreasing the serum levels of Lidocaine. Also using nebulized Lidocaine has similar effects as its injection[5].Dexmedetomidine is highly selective and specific alpha 2 adrenoreceptor agonist, it provide stable hemodynamic stability and has anxiolytic, decongestant, antisialagogue, antishivering, antiemetic and analgesic properties.[6]Dexmedetomidine show minimal respiratory depression even at higher doses and also decreases salivary secretions, which is desirable during AFOI. The present study was conducted to compare the efficacy of using dexmedetomidine intranasally with lidocaine in comparison to intranasal lidocaine alone during AFOI in terms of haemodynamic stability and ease of intubation.

Materials and Methods

This prospective and observational hospital based study was conducted on 60 patients at department of Anesthesia in Gandhi Medical College and associated hamidia Hospital, Bhopal, India. After approval by Institutional Ethics Committee, written informed consent was obtained from all the patients in their own vernacular language.

Inclusion criteria

Patients of either gender, aged between 18 to 60 years, belonging to ASA I or ASA II grade, mallampatti grade 3 or 4 and scheduled for various elective general surgeries under general anaesthesia were included.

Exclusion criteria:

Patients with ASA physical status >II, non-fasting patient, thrombocytopenia or coagulopathy, nasal polyps, history of previous nasal surgery/nasal trauma, mentally ill patients, pregnant females, allergic to the drugs involved in the study.

Procedure:

60 patients will be randomly divided in following two groups: Group L (n=30) and Group D (n=30)

After pre-anaesthesia checkup and routine investigations, a common standard anaesthetic regimen will be followed for all the patients which will include overnight fasting prior to surgery and lignocaine sensitivity test will be done.

Intravenous line was secured with 18 gauge i.v. cannula in the preoperative room. Patient's baseline vitals i.e., Heart Rate, Systolic Blood Pressure, Diastolic Blood Pressure, MAP, SpO2 were documented and nasal patency was assessed before administration of drug in both the groups. Intranasal drug administration was performed 15 minutes prior to shifting patient to operation theatre.

Group D: Patients here received 4 ml of lignocaine 4% + dexmedetomidine 1 mcg/kg

Group L: patients here received nebulisation with 4 ml of 4% lignocaine.

Once patient was shifted to operation theatre, the patency of the nostril was checked, and in the more patent nostril, 2 ml of 2% lignocaine gel was applied.

In all patients, fiberscope was introduced through the glottic opening entering the trachea visualising the tracheal rings and the carina and then suitable sized endotracheal tube railroaded through the fiberscope into the trachea. After successful passage of the tube through the vocal cords and after identification of the carina, position of the tube was reconfirmed by mainstream capnograph, then tube was secured and the cuff inflated.

After intubation, general anaesthesia was induced using injection propofol 2 mg/kg IV and atracurium 0.5 mg/kg IV with isoflurane and establish mechanical ventilation.

Parameters observed:

During this entire procedure that is, from the passage of the tube into the nares and the manipulation of the scope till placement of the tube in the trachea, the following observations will be made:

a) HR, MAP, SpO2 were monitored as follows- at baseline, then after 15 minutes on administration of drug. During AFOI procedure, vitals were taken every minute for first 5 minutes followed by every 5 minutes after AFOI for first 15 minutes.

b) Intubation time (i.e. time from introduction of the fiberscope till the first measurement of end-tidal carbon dioxide was recorded) and number of attempts.

c) Intubation condition was evaluated by cough score during bronchoscopy as Score 1 = no cough, 2 = slight cough (no more than two cough in sequence), 3 = moderate cough (3-5 cough in sequence), 4 = severe cough (>5 cough in sequence).

d) Tolerance to intubation was evaluated by post-intubation score after placement of tube in the trachea as: 1 = Co-operative, 2 = minimal resistance, 3 = severe resistance.

e) Any complications such as arrhythmias, bleeding or sore throat.Bradycardia (HR <60 beats/min) was treated with atropine 0.6 mg i.v.

Statistical Analysis

The data was analysed using Statistical Package for Social Sciences software (SPSS) version 22.0 and Microsoft excel. Descriptive statistics was done for all data and were reported in terms of mean, standard deviation and percentages. Appropriate statistical tests of comparison were applied. Categorical variables like age, gender were analysed with the help of Chi-square test . Continuous variables like HR, MAP, SpO2 , patient tolerance score, were analysed with Student's t-test and Mann Whitney U test. The p-value of <0.05 was taken as statistically significant and <0.001 was taken as highly significant.

Results

Demographic parameters:

Demographic profile was comparable in terms of age, sex, weight, and ASA physical status in both Lignocaine and dexmedetomidine groups .Both the groups were comparable and statistically non-significant (p-value >0.05) [Table 1]

Table 1: Demographic profile

Patient characteristics	Group D N=30	Group L N=30	P-value
AGE (years)	44.42±10.88	45.9±12.32	0.623
SEX (M/F)	23/7	21/9	0.340
WEIGHT (kg)	65.12±9.89	68.2±10.7	0.253
ASA 1/2	25/5	26/4	0.3959

Haemodynamic parameters: The baseline HR, MAP and SpO2 were comparable between both the groups.

Comparison of mean HR showed highly significant (p-value <0.001) after administration of drug, during and after AFOI in group D as compared to group L [Fig-1]. Two patients experienced bradycardia (HR 50-59 bpm). The mean heart rate during AFOI was 71.16±7.02 in Group D and 95.62±10.04, in Group L.

Comparison of mean MAP showed statistically highly significant (p-value <0.001) after administration of drug, during and after AFOI in group D as compared to group L . The Mean Arterial Pressure (MAP) during AFOI was 74.4±6.2 in group D and 101.78±5.56, in group L [Fig-2].

There was no respiratory depression in both groups. Both groups maintained SpO2 above 95% throughout the study.

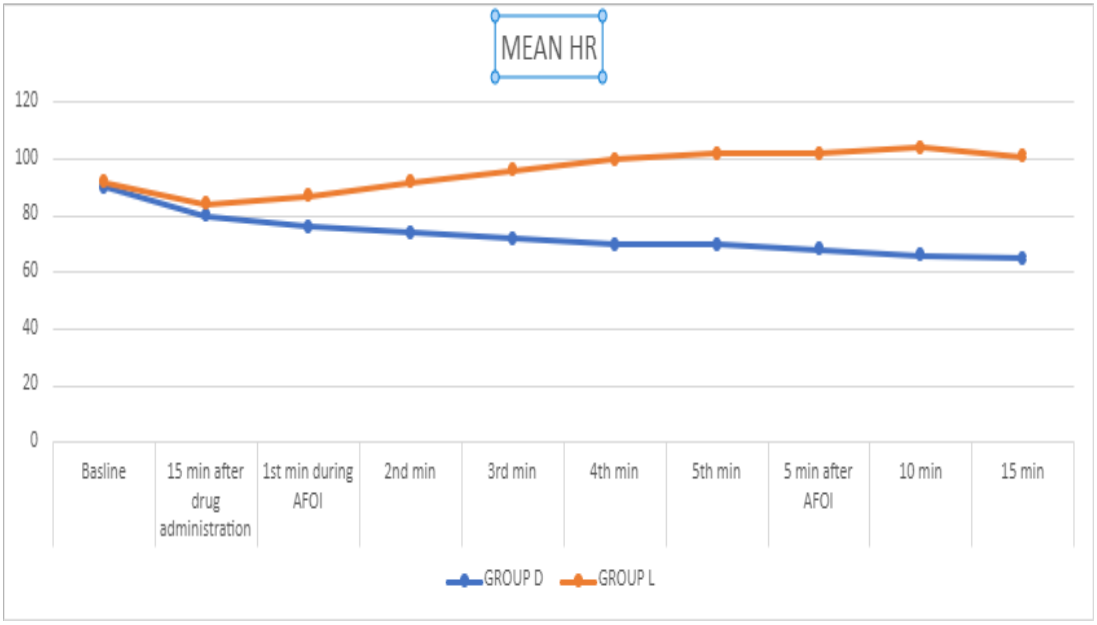

Figure 1: Mean Heart Rate

Comparison of mean heart rate between the two groups. (p-value is <0.001 after drug administration and thereafter.)

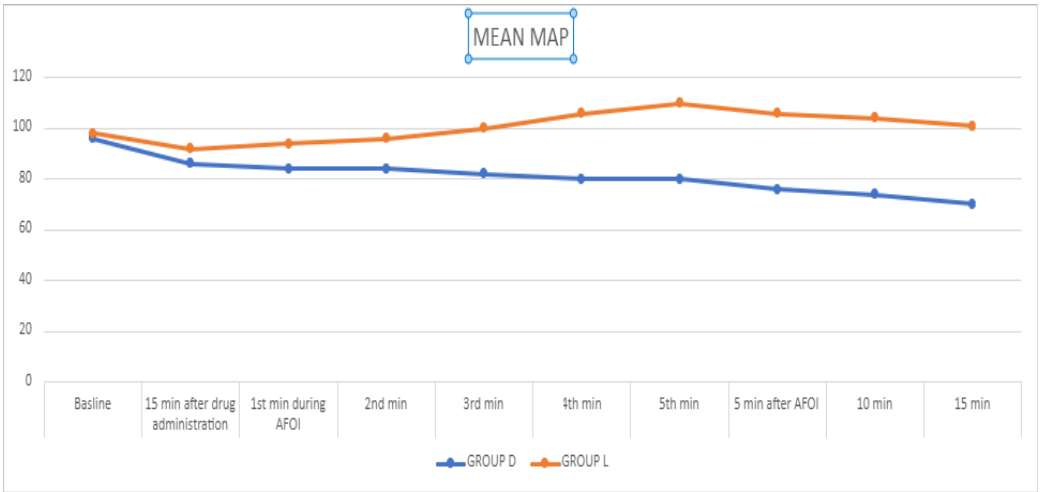

Figure 2 : Mean Arterial Pressure

Comparison of mean MAP between the two groups. (p-value is <0.001 after drug administration and thereafter)

Intubation Characteristics

The mean time to intubation was 3.22±0.48 minutes in group D and 3.58±0.70 minutes in group L (p-value 0.023)

Intubation conditions were analysed by cough score among the two groups. Cough score ≤2 was considered as favorable intubation condition, which was achieved in 25 out of 30 patients in Group D, but only in 3 out of 30 patients in Group L .In group-D (n=30) 7 patients had cough score 1 ,18 patients had cough score 2 and 5 patients had cough score 3. In group-L (n=30), no patient had cough score 1 ,3 patient had cough score 2 and 27 patient had cough score 3 .No patients from both the groups had severe cough (>5 cough in sequence).P value was 0.001 which is statistically significant.

Better post-intubation score (Score 1) was found in 20 patients of Group D and only five patients in Group L. This difference was also statistically significant (P < 0.0001).The data regarding post intubation scores in both groups were analyzed using the chi-square test .In group D (n=30), 20 patients had the best post intubation score 1 (co-operative) ,10 patients had the post intubation score 2 (minimal resistance) No patient had post intubation score 3 (severe resistance). In group L (n=30), 5 patients had the best post intubation score 1, 22 patients had the post intubation score 2 and 3 patients had the post intubation score 3 .Thus, the intubating conditions were significantly favorable in Group D than Group L [Table 2]

None of the patients had any adverse effects such as laryngospasm, bronchospasm, desaturation, or postoperative sore throat.

Table 2: Intubation Characteristics

INTUBATION CONDITION	GROUP D N=30	GROUP L N=30	P VALUE
INTUBATION TIME	3.22±0.48	3.58±0.70	0.023
COUGH SCORE			
1	7(23.33%)	0(0%)	
2	18(60%)	3(10%)	<0.001
3	5(16.66%)	27(90%)	
POST INTUBATION SCORE			
1	20	5	
2	10	22	<0.0001
3	0	3	

Discussion

The invention of the flexible FOB by Dr. ShigetoIkeda in 1996 and endotracheal intubation by Dr. Peter Murphy in 1967 made a great revolution in airway management.[7][8] Regional anesthesia along with i.v. sedation for airway management makes AFOI comfortable and acceptable for all patients but has also make a great challenge for anesthesiologists for better control over intubation conditions.[9]Dexmedetomidine is a highly selective, centrally acting α-2 agonist acts on presynaptic α-2 receptors and produces hypnosis, amnesia analgesia, anxiolysis, sympatholysis, and antisialagogue effects, all of which are desirable during AFOI and providing adequate sedation

without respiratory depression and has cardiovascular stabilising properties.[10]It also enhances the peripheral neural blockade due to its binding to (α2-AR), and produce surface analgesia .Nebulization of local anesthetics is another technique in which the airway is anesthetized completely without the need for multiple painful injections.[11]This technique has several advantages,requires less knowledge of anatomy, less specialist skills, and fewer experience; However, it has some disadvantages including the need for large doses of local anesthetic, chance of failure, and a delayed onset of action. The goals for the drug administration are patient comfort, cooperation, amnesia, hemodynamic stability, blunt airway reflexes and maintain a patent airway with spontaneous ventilation. The present study showed that intranasal dexmedetomidine 1 mcg/kg with 4% lidocaine was effective in attenuating haemodynamic response to AFOI.

In our study comparison of mean HR and mean MAP showed highly significant (p-value <0.001) after administration of drug, during and after AFOI in group D as compared to group L . The mean heart rate during AFOI was 71.16±7.02 in Group D and 95.62±10.04 in Group L.The Mean Arterial Pressure (MAP) during AFOI was 74.4±6.2 in group D and 101.78±5.56, in group L . Similar result shown in Study done by Jambure NP et al.[12] Here intranasal dexmedetomidine 2 mcg/kg caused statistically significant decrease in HR and MAP, after premedication and 15 min after intubation , thus it reduced the haemodynamic stress response to tracheal intubation .The study by Jayaraman L et al.[13] showed contrary findings, where there was no statistically significant attenuation of pressor response to tracheal intubation and there was no statistical difference in MAP by intranasal dexmedetomidine In the current study, two patients experienced bradycardia (HR 50- 59 bpm) after administration of dexmedetomidine and were easily managed with inj. atropine. There was no significant decrease in SpO2 or respiratory depression and no incidence of hypotension, hypertension, or arrhythmia in both groups. Peden et al.[14]observed bradycardia and sinus arrest in young volunteers following dexmedetomidine bolus and infusion and they suggested prevention with administration of glycopyrrolate prior to dexmedetomidine infusion.

In present study, time to intubation was significantly less in group D compared to group L.Similar results shown by study Mandeep Kaur et al [15]where The mean time to intubation was 3.18±0.48 minutes in group D and 3.56±0.70 minutes in group L.

In our study ,intubation conditions were analysed by cough score among the two groups.Cough score ≤2 , achieved in 25 out of 30 patients in Group D, but only in 3 out of 30 patients in Group L .In group-D (n=30) 7 patients had cough score 1 ,18 patients had cough score 2 and 5 patients had cough score 3. In group-L (n=30), no patient had cough score 1 ,3 patient had cough score 2 and 27 patient had cough score 3 .No patients from both the groups had severe cough (>5 cough in sequence). Similar results shown by study done by Mondal, et al. [16]which compared dexmedetomidine and fentanyl for AFOI and found that cough score <2 in 28 out of 30 patients in Group A, but only in 3 out of 30 patients in Group B . But in study by Sayeed et al.[17]observed that comfort scores were comparable in both the groups which differed from our results. Agrawal et al.[18]also found similar results in two groups.In this study Better post-intubation score (Score 1) was found in 20 patients of Group D and only five patients in Group L. .In group D (n=30), 20 patients had the best post intubation score 1 (co-operative) ,10 patients had the post intubation score 2 (minimal resistance) No patient had post intubation score 3 (severe resistance). In group L (n=30), 5 patients had the best post intubation score 1, 22 patients had the post intubation score 2 and 3 patients had the post intubation score 3 .Thus, the intubating conditions were significantly favorable in Group D than Group L. In study kumar et al[19] compare between fentanyl and dexmedetomidine and found that . In Group F (n = 30), five patients had the best intubating conditions score 1 (optimal condition), 23 patients had the intubating conditions score 2 (sub-optimal) two patients had intubating conditions score 3 (difficult conditions) In Group D (n = 30), 15 patients had the best intubating conditions score (score 1), 15 patients had intubating conditions (score 2), no patients had the intubating conditions (score 3), Thus, the intubating conditions were significantly favorable in Group D than Group F . In another study by Bergere et al[20] has observed that Dexmedetomidine in combination with low dose Midazolam is more effective than Midazolam alone for sedation in Awake Fiberoptic Intubation and that Dexmedetomidine at 1ug/kg bolus was safe and beneficial for patients undergoing Awake Fiberoptic intubation even without airway nerve block or topical Anaesthesia .

Conclusion

In conclusion, results of the present study showed that using nebulized Dexmedetomidine, in comparison with using nebulized Lidocaine, had better effects on the sedation level, hemodynamic and satisfactory intubation conditions and improves the quality of intubation during AFOI by decreasing time to intubation . Also using nebulized Dexmedetomidine is associated with fewer respiratory and hemodynamic complications in comparison with nebulized Lidocaine.

Limitation

To achieve desired results intranasal dexmedetomidine needs to be administered atlest 15 minutes prior to starting the procedure. Time to onset of action can sometimes be undesirable when there is long list of surgeries or when procedure needs to be started earlier.

References

1. Collins SR, Blank RS. Fiberoptic intubation: An overview and update. Respir Care. 2014; 59(6):865-80.
2. Tsukamoto M, Hitosugi T, Yokoyama T. Awake fiberoptic nasotracheal intubation for patients with difficult airway. J Dent Anesth Pain Med. 2018;18(5):301-04
3. Guglielmi M, Urbaz L, Tedesco C, Pusceddu A, Sogni A, Ronzoni G. A structured training program for awake fiber optic intubation: Teaching the complete package. Minerva Anestesiol. 2010;76:699-706.
4. Rai MR, Parry TM, Dombrovskis A, Warner OJ. Remifentanil target-controlled infusion vs propofol target-controlled infusion for conscious sedation for awake fibreoptic intubation: A double-blinded randomized controlled trial. Br J Anaesth. 2008; 100:125-30.
5. Gjonaj ST, Lowenthal DB, Dozor AJ. Nebulized lidocaine administered to infants and children undergoing flexible bronchoscopy. Chest. 1997; 112: 1665-9.
6. Davoudi A, Movahedian Attar B, Shadmehr E. Risks and benefits of pre-operative dexmedetomidine in oral and maxillofacial surgeries: A systematic review. Expert Opin Drug Safe. 2017; 16: 711-720.
7. Ikeda S, Yanai N, Ishikawa S. Flexible bronchofiberscope. Keio J Med. 1968; 17:1-16.
8. Murphy P. A fibre-optic endoscope used for nasal intubation. Anaesthesia. 1967;22:489-91.
9. Dhasmana SC. Nasotracheal fiberoptic intubation: Patient comfort, intubating conditions and hemodynamic stability during conscious sedation with different doses of dexmedetomidine. J Maxillofac Oral Surg. 2014; 13:53-8.
10. Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. Anesth Analg. 2000;90:699-705
11. Webb AR, Fernando SS, Dalton HR, Arrowsmith JE, Woodhead MA, Cummin AR. Local anaesthesia for fibreoptic bronchoscopy: Transcricoid injection or the “spray as you go” technique? Thorax. 1990;45:474-7.
12. Jambure NP, Annachhatre AS, Belapurkar Y, Annachhatre S. Evaluation of intranasal dexmedetomidine as a premedicant in attenuating haemodynamic stress response to laryngoscopy and intubation. MedPulse Int. Jrnl of Anes. 2021;18(3):113-16
13. Jayaraman L, Sinha A, Punhani D. A comparative study to evaluate the effect of intranasal dexmedetomidine versus oral alprazolam as a premedication agent in morbidly obese patients undergoing bariatric surgery. J Anaesthesiol Clin Pharmacol. 2013;29(2):179.
14. Peden CJ, Cloote AH, Stratford N, Prys. Roberts C. The effect of Intravenous Dexmeditomidine premedication on the dose requirement of Propofol to include loss of consciousness in patients receiving alfentanyl. Anaesthesia. 2001; 56: 408-13.
15. Mandeep Kaur, Parmod Kumar, Balwinder Kaur Rekhi, K Priyaa Cathrine, Efficacy of Intranasal Dexmedetomidine with Lidocaine Versus Intranasal Lidocaine Alone in Awake Fiberoptic Nasotracheal IntubationA Randomised Clinical Study journal of Clinical and Diagnostic Research. 2022 Aug;16(8).
16. Sudeshna Mondal, Sarmila Ghosh, Susmita Bhattacharya, Brojen Choudhury, Suchismita Mallick, Anu Prasad Comparison between dexmedetomidine and fentanyl on intubation conditions during awake fiberoptic bronchoscopy: A randomized double-blind prospective study Journal of Anaesthesiology Clinical Pharmacology, April-June 2015; 31: 2.
17. Sayeed T, Shenoy A, Umesh G. Comparison of the safety and effectiveness of dexmedetomidine with a combination of midazolam and fentanyl for sedation during awake fiberoptic nasotracheal intubation. Indian J Respir Care. 2013;2:320-7.
18. Agrawal A, Jadon A, Parida SS, Chakraborty S, Sinha N, Chandra O. Comparative evaluation of dexmedetomidine and fentanyl – Midazolam combination as sedative adjunct to fibreoptic intubation under topical anaesthesia. Am J Adv Med Sci. 2014; 2:29-37.
19. Kumar MP, Patro M, Panigrahy S, Samal S, Kartheek BS. Comparison between intravenous dexmedetomidine and spray as you go with 4% lignocaine versus intravenous fentanyl and transtracheal injection of 4% lignocaine for awake nasotracheal intubation with flexible vedioscope – A randomized single-blind prospective study. Anesth Essays Res. 2021; 15:213-9.
20. Bergere SD, Patrick Bender S, Mc Sweeney TD, Fernandez S, Dzwonczzyk R, Sage K. A comparative study of Dexmeditomidine with Midazolam and Midazolam alone for sedation during elective Awake Fibre optic intubation J clinAnesth. 2010; 22: 35 – 40.