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ORIGINAL RESEARCH ARTICLE

THE EFFECT OF DIFFERENT DOSES OF DEXMEDETOMIDINE ON THE PATIENT COMFORT DURING AWAKE FIBREOPTIC NASOTRACHEAL INTUBATION

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Abstract

The first recorded fibreoptic nasotracheal intubation was performed in 1967 on a patient with Still's disease, using a flexible fibreoptic choledochoscope. Five years later, a fibreoptic bronchoscope (FOB) was used for nasotracheal intubation in patients with severe rheumatoid arthritis in whom conventional endotracheal intubation techniques were not possible. Thorough pre-anaesthetic evaluation was carried out and patients were informed about the study and a written informed consent obtained. Investigations included Complete blood count, Renal function test, Liver function test, Blood grouping and Rh typing, Random blood sugar, ECG, ECHO, Coagulation profile and Urine routine. Majority of patients were comfortable in Group I, with 7 patients having grade II (28%) and 2 patients having grade III. Whereas in Group II,only 8 patients experienced grade I while 10 patient experienced grade II, 5 patients experienced grade III and 2 patient experienced grade IV comfort with statistical significance (P = 0.0475).

Keywords: Dexmedetomidine, patient comfort, awake fibreoptic nasotracheal intubation

Introduction

The purpose of airway anaesthesia is to avoid airway reflexes and minimize pressor response to fibreoptic intubation and to provide patient comfort. The air passages starting from the nose and ending at the bronchioles are vital to the delivery of respiratory gas to and from the alveoli. During clinical anaesthesia, the anaesthesiologist uses these air passages to deliver the anaesthetic gases to the alveoli while, at the same time, maintaining vital respiratory gas transport. To accomplish proper airway management, anaesthesiologists often gain access to the airways by

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means of an endotracheal tube (ET) or other devices that are directly introduced into the patient's upper or lower air passages[1, 2].

The first recorded fibreoptic nasotracheal intubation was performed in 1967 on a patient with Still's disease, using a flexible fibreoptic choledochoscope. Five years later, a fibreoptic bronchoscope (FOB) was used for nasotracheal intubation in patients with severe rheumatoid arthritis in whom conventional endotracheal intubation techniques were not possible. The first series of 100 fibreoptic endotracheal intubations was reported by Stiles and colleagues in 1972. Intubations were performed both orally and nasally; four intubations failed because of copious secretions. Stiles and colleagues indicated that with experience, fibreoptic intubation could be performed in less than 1 minute[3].

In 1973 Davis mentioned the use of the FOB to check endotracheal tube (ET) position in relation to the carina. Raj and associates in 1974 were the first to report the use of the FOB to assist placement and positioning of a left-sided double-lumen endobronchial ET.[4]Ovassapian and Schrader described a new fibreoptic technique for positioning of right-sided double-lumen ETs in 1987.

The most significant adverse reactions associated with dexmedetomidine are hypotension and bradycardia, resulting from its sympatholytic activity. In clinical trials of adults, 28% of patients receiving dexmedetomidine experienced hypotension, compared to 13% of patients given placebo. Bradycardia was seen in 7% of treated patients versus 3% of controls. While a reduction in the infusion rate or administration of IV fluids is often adequate to alleviate these symptoms, administration of atropine may be necessary in cases of significant bradycardia. Transient hypertension has been reported with the administration of the loading dose due to initial peripheral vasoconstriction. In clinical trials, the rate of hypertension was similar in treated patients and controls (16% compared to 18%). Hypertension rarely requires intervention beyond slowing the infusion rate[5].

Other adverse reactions reported with dexmedetomidine during clinical trials included nausea (11%), fever (5%), vomiting (4%), hypoxia (4%), tachycardia (3%), and anaemia (3%). It is recommended that dexmedetomidine be used with caution in patients with advanced heart block or severe ventricular dysfunction, as well as in hypovolemic patients or those with chronic hypertension[6].

Methodology

Thorough pre-anaesthetic evaluation was carried out and patients were informed about the study and a written informed consent obtained. Investigations included Complete blood count, Renal function test, Liver function test, Blood grouping and Rh typing, Random blood sugar, ECG, ECHO, Coagulation profile and Urine routine.

Group 'I': Received IV. Dexmedetomidine (1µg/kg).

Group 'II': Received IV.Dexmedetomidine (0.5µg/kg).

Exclusion criteria-patients with Uncontrolled Hypertension, Heart block greater than grade I, Cardiac dysfunction, Severe hepatic and Renal disease.

- Night prior to surgery all patients received Tab. Pantoprazole 40 mg orally. All patients were advised to be nil by mouth after 10:00pm.
- On the day of surgery at 6:00am all patients received Tab. Pantoprazole 40 mg

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orally 1 hour prior to surgery with sips of water under the supervision of a nursing staff.

- On arrival in the operating room, patient's parameters- heart rate, arterial blood pressure and oxygen saturation using pulse oximetry were recorded at baseline and then every 3 min thereafter. All patients were given oxygen via face mask at 5 litre/min.
- Intravenous access was established and an IV infusion started. Sterile fibreoptic scope with light source and appropriate sized endotracheal tubes were kept ready. 2 drops of nasal mucosal vasoconstrictor (Xylometazoline) were instilled into each nostril as decongestants.
- Patients in the dexmedetomidine group I received a loading dose of dexmedetomidine (1.0 μg/kg) infused over 10 min.
- Patient in the dexmedetomidine group II received a loading dose of dexmedetomidine (0.5μg/kg) infused over 10 min.
- The infusion was prepared by an independent nurse who added 100 μg (1 ml) of dexmedetomidine to 49 ml of 0.9% saline solution in a 50-ml syringe.
- While waiting for the desired level of sedation to be achieved, topical anaesthesia was applied to the airway. The tongue and hypopharynx were sprayed with lidocaine 10% (60 mg).
- Transtracheal block with 3ml of 2% lidocaine administered.
- Fibreoptic intubation was commenced once the dexmedetomidine infusion was given for ten min. Fibreoptic intubations were done by two qualified and experienced anaesthesiologists.
- After passing through the vocal cords, the fibrescope is advanced until the tracheal rings come into view. The carina is identified and the endotracheal tube is passed into the trachea using fibrescope as a guide. The scope is removed by holding endotracheal tube in place. Vecuronium 0.1mg/kg is given for neuromuscular block. The endotracheal tube is connected to the anaesthesia machine and assisted ventilation done. The endotracheal tube is secured after confirming placement by 5 point auscultation and capnography. Patient is maintained with isoflurane, oxygen and nitrous oxide to maintain 1 MAC.

Following observations were then made

1. **Ease of intubation:** Time taken to intubate from the time of insertion of fibrescope.
2. **The patient comfort:** Representing the patient`s response to fibreoptic bronchoscopy wasgraded as.

Grade I: No movement observed.
Grade II: Coughing observed.
Grade III: Extremity movement observed.
Grade IV: Violent movement observed.

Grade III and IV patients were sedated with incremental doses of propofol and fibreoptic bronchoscopy completed.
All the observed parameters, study parameters were entered in the master chart and tabulated individually and analyzed.

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Results

Table 1: Age distribution

Age group	**Group I**		**Group II**	
	No	**%**	**No**	**%**
Less than 40 years	7	28	6	24
40-49 years	14	56	13	52
50 and above	4	16	6	24
Total	25	100	25	100
Range	32-57 years		35-52 years	
Mean	43.1 years		44.9 years	
SD	5.9 years		5.3 years	
'p'	0.1521 Not significant			

Inference: Samples are age matched with p=0.1521, Kruskul Wallis chi-square test.

Table 2: Gender distribution

Gender	**Group I**		**Group II**	
	No	**%**	**No**	**%**
Male	18	72	17	68
Female	7	28	8	32
Total	25	100	25	100
P	0.7599 Not significant			

Inference: Samples are gender matched with p=0.7599, Kruskul Wallis chi-square test.

Table 3: Patient comfort

Patient comfort	**Group I**		**Group II**	
	No.	**%**	**No.**	**%**
Grade I-No movement observed	16	64	8	22
Grade II-Coughing observed	7	28	10	40
Grade III-Extremity movement observed	2	8	5	20
Grade IV-Violent movement observed	-	-	2	8
p	0.0475			

Inference: Majority of patients were comfortable in Group I, with 7 patients having grade II (28%) and 2 patients having grade III. Whereas in Group II,only 8 patients experienced grade I while 10 patient experienced grade II, 5 patients experienced grade III and 2 patient experienced grade IV comfort with statistical significance (P = 0.0475)

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Table 4: Use of Propofol

Use of Propofol	Group I		Group II	
	No	%	No	%
Yes	2	8	9	36
No	23	92	16	64
p	0.0405			

Inference: Patients requiring Propofol for additional sedation was higher in Group II (9 patients) compared to Group I (2 patients) with P = 0.0405.

Table 5: Time taken to intubate from the time of insertion of fibreoptic scope

Time taken to intubate	Group I		Group II	
	No	%	No	%
1 minute	-	-	-	-
2 minutes	17	68	9	36
3 minutes	6	24	9	36
4 minutes	2	8	6	24
5 minutes	-	-	1	4
Range	2-4 minutes		2-5 minutes	
Mean	2.4 minutes		2.96 minutes	
SD	0.65 minutes		0.89 minutes	
P	0.0016			

Inference

- All Fibreoptic endotracheal Intubations were possible within 5 minutes.
- Minimum time taken for endotracheal intubation was 2 minutes in both Groups.
- Maximum time taken for endotracheal intubation was 4 minutes IN Group I and 5 minutes IN Group II.
- Mean time taken for endotracheal intubation was 2.4 minutes in group I and 2.96 minutes in group II. Statistically they were significant P = .0016.

Discussion

In our study, all patients were intubated with in a range of 2 to 5 minutes. The mean time taken for FOB introduction to endotracheal intubation was 2.4 and 2.96 in group I and group II respectively. Even though they were less than 3 minutes in both groups, they were statistically significant ($p= 0.0016$ and $p<0.05$).

So we concluded that dexmedetomidine 1.0μg/kg provides better ease of intubation than dexmedetomidine 0.5μg/kg during nasotracheal fibre optic intubation.

In various studies of nasotracheal fibreoptic intubation under regional anaesthesia, the average duration of 2 to 3 minutes for successful enotracheal intubation was observed.

C.J. Tsai, K.S. Chu, *et al*. (2010) studied Fibreoptic intubation is a valuable modality for airway management. This study aimed to compare the effectiveness of dexmedetomidine vs. target controlled propofol infusion in providing sedation during fibreoptic intubation. Forty patients with anticipated difficult airways and due to

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undergo tracheal intubation for elective surgery were enrolled and randomly allocated into the dexmedetomidine group (1.0 μg.kg) over 10 min (n = 20) or the propofol target controlled infusion group (n = 20). Intubating conditions and patient tolerance as graded by a scoring system were evaluated as primary outcomes. Dexmedetomidine allows better tolerance, more stable haemodynamic status and preserves a patent airway[7].

Our study results were consistent with result of C.J. Tsai, K.S. Chu, *et al*. (2010)[7],Koung Shing Chu, Fu-Yuan Wanga, Hung TeHsua, I Cheng Lu (2010)[35] and Lee LS, Chau SW, *et al*.(1990)[8]study. Dexmedetomidine preserves a patent airway and ease of intubation.

Patient comfort

Patient cooperation and immobility must always be ensured during Fibreoptic intubation. The advantages of awake Fibreoptic intubation are:

1. Safety is maximum as patient can sustain ventilation and oxygenation without assistance.
2. Under general anaesthesia, pharyngeal muscles relax, causing soft tissue obstruction that limits visualization.
3. Awake patient can swallow secretions and keep their pharynx clear.

However, explanation and use of adequate sedationcan ensure better patient compliance and cooperation and may also contribute to faster intubation times.

In our study, patient comfort was assessed in 4 grades-(Grade I-no movement, Grade II-coughing, Grade III-extremity movementand Grade IV-violent movement). Majority of the patients in our study group I (64%) had grade I during the procedure.7 patients experienced grade II, 2 patients with Grade III were successfully intubated through FOB under propofol sedation.

In group II (22%) had comfortable grades I during the procedure. 10 patients experienced grade II and 7 patients with grades (Grade III and Grade IV) were successfully intubated through FOB under propofol sedation. This was statistically significant. ($p<0.05$ and $p=0.0475$).

In our study, patients requirement of propofol for additional sedation was compared. In group I only 2 patients (8%) required additional propofol. In group II 9 patients (36%) required additional propofol. This was statistically significant. ($p<0.05$ and $p=0.0405$).

So we concluded that dexmedetomidine 1.0μg/kg provides better patient comfort during nasotracheal fibre optic intubation than dexmedetomidine 0.5μg/kg.

Ruari fanzca and Daryl fanzca*et al*. (2010) conducted a pilot trial to determine the feasibility of using dexmedetomidine as a sole agent for providing sedation during awake diagnostic flexible bronchoscopy. In addition to local anaesthetic topicalization of the airways, dexmedetomidine was infused at 0.5 μg/kg over 10 minutes followed by an infusion of 0.2 to 0.7 μg/kg/hr titrating to a Ramsay Sedation Scale score of 3. Haemodynamic parameters (heart rate, blood pressure), oxygenation status (pulse oximetry), adverse events, use of rescue sedation and patient and procedural satisfaction were recorded during the trial. 5 of 9 recruited patients required rescue sedation to allow the procedure to proceed. Dexmedetomidine as a sole agent at an infusion of 0.5 μg/kg over 10 minutes followed by an infusion of 0.2 to 0.7 μg/kg/hr is

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unable to provide adequate sedation for awake diagnostic flexible bronchoscopy without the need for rescue sedation in a large proportion of patients[9].

Our study results were consistent with result of C.J. Tsai, K.S. Chu, *et al*. (2010)[7]andKoung Shing Chu, Fu Yuan Wanga, Hung-TeHsua, I-Cheng Lu (2010)[10]study. Dexmedetomidine allows better tolerance.

Our study results were consistent with result of Ruari fanzca and Daryl fanzca*et al*. (2010)[9]. They found dexmedetomidine 0.5µg/kg is unable to provide adequate sedation for awake diagnostic flexible bronchoscopy without the need for rescue sedation in a large proportion of patients.

Conclusion

So we concluded that dexmedetomidine 1.0µg/kg provides better ease of intubation than dexmedetomidine 0.5µg/kg during nasotracheal fibre optic intubation.

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