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ORIGINAL RESEARCH ARTICLE

EFFECTS OF DIFFERENT DOSES OF DEXMEDETOMIDINE ON HAEMODYNAMIC CHANGES HAEMODYNAMIC CHANGES AFTER ENDOTRACHEAL TUBE INSERTION

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Abstract

Direct laryngoscopy by McIntosh laryngoscope at times presents difficulty in intubation in conditions like limited jaw movement, micrognathia, morbid obesity, cervical spinal problems and limited mouth opening as in, intermaxillary fixation, temporomandibular joint trauma, rheumatoid arthritisand oral cancers. After obtaining written informed consent, 50 patients were randomly assigned to one of the two groups each containing 25.We recruited 50 consecutive adult patients of ASA physical status I, II and III scheduled to undergo elective surgery for treatment of head and neck cancer. Fibreoptic intubation using conscious sedation was planned for all patients because of difficult intubation arising from the cancer. Mean heart rate after endotracheal intubation was similar in both groups. With group I having a mean of 78.5 beats/min at 0min & 74.7 beats/min at 30 min, group II with 76.8 beats/min at 0 min & 76.8 beats/min at 30 min. Mean SBP after endotracheal intubation with group I was 113.5 mm of hg at 0 min & 98.7 mm of hg at 30 min, group II with 111.4 mm of hg at 0 min & 118.9 mm of hg at 30 min.

Keywords: Dexmedetomidine, haemodynamic changes, endotracheal tube

Introduction

The most common cause of mortality and morbidity due to anaesthesia is from airway problems. It is estimated that one third of all anaesthetic deaths are due to failure to ventilate and intubate. During routine anaesthesia the incidence of difficult tracheal intubation has been estimated at 3-18%.

Direct laryngoscopy by McIntosh laryngoscope at times presents difficulty in intubation in conditions like limited jaw movement, micrognathia, morbid obesity, cervical spinal problems and limited mouth opening as in, intermaxillary fixation, temporomandibular joint trauma, rheumatoid arthritisand oral cancers[1, 2].

The flexible fibreoptic endoscope is the single most valuable tool available for the anaesthesiologists to manage such conditions. The flexible fibreoptic intubation gives the competent practitioner an unparallel opportunity to secure almost any difficult airway encountered[3].

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Both optimal intubating conditions and patient comfort are paramount for fibreoptic intubation.

One challenge associated with this procedure is to provide adequate sedation while maintaining a patent airway and ensuring ventilation. An ideal sedation regimen would provide patient comfort, blunting of airway reflexes, patient cooperation, haemodynamic stability, amnesia and the maintenance of a patent airway with spontaneous ventilation[4].

Many agents have been reported to achieve conscious sedation for intubation including fentanyl, midazolam, ketamine, propofol, remifentanil and dexmedetomidine.

Intravenous dexmedetomidine, a more specific and selective alpha 2 agonist, is also used in varying doses to attenuate the cardiovascular stress response.Dexmedetomidine also provides good haemodynamic stability both during laryngoscopy and intubation as well as during the perioperative period.Dexmedetomidine, because of its sedative and analgesic properties can also be used as an adjunct to general anaesthetics[5].

Awake fibreoptic intubation under sedation is now an accepted technique for managing the difficult airway because[6]

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

Methodology

After obtaining written informed consent, 50 patients were randomly assigned to one of the two groups each containing 25.We recruited 50 consecutive adult patients of ASA physical status I, II and III scheduled to undergo elective surgery for treatment of head and neck cancer. Fibreoptic intubation using conscious sedation was planned for all patients because of difficult intubation arising from the cancer.

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 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

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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. Pt is maintained with isoflurane, oxygen and nitrous oxide to maintain 1 MAC.

Following observations were then made

Haemodynamic Patient's vitals-IBP, heart rate, ECG and oxygen saturation (SpO_2)monitored throughout the procedure and up to 30 minutes after intubation. The changes in Blood Pressure (SBP, DBP and MAP) and Heart Rate during different times of the procedure were noted.

All the observed parameters, study parameters were entered in the master chart and tabulated individually and analyzed.

Results

Table 1: Changes in heart rate after Endotracheal Tube Insertion

HR after ETI at	Group I		Group II		'p'
	Mean	SD	Mean	SD	
0 minute	78.5	7.9	76.8	11.4	0.465
1 minute	76.9	7.8	76.7	11.3	0.7928
5 minutes	75.3	8.2	74.3	10.7	0.8005
10 minutes	75.5	10.0	73.5	10.5	0.5927
20 minutes	74.4	10.3	74.2	11.8	0.9225
30 minutes	74.7	7.7	76.8	12.8	0.999

Inference: No significant changes in Heart Rate between the groups.

Table 2: Changes in Systolic Blood Pressure after Endotracheal Tube Insertion

SBP after ETI at	Group I		Group II		'p'
	Mean	SD	Mean	SD	
0 minute	113.5	13.6	111.4	8.6	0.6616
1 minute	105.7	13.0	105.8	9.9	0.7613
5 minutes	98.9	9.6	103.7	9.9	0.0514
10 minutes	96.6	11.8	105.6	12.0	0.0081
20 minutes	101.5	12.3	115.4	13.5	0.0005
30 minutes	98.7	10.0	118.9	17.4	0.0001

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Inference: Changes in Systolic Blood Pressure lower in group I compared to group II. Between groups Systolic Blood Pressure was significant at 10min (p=0.0081), at 20min (p=0.0005) and at 30min (p=0.0001).

Table 3: Changes in Diastolic Blood Pressure after Endotracheal Tube Insertion

DBP after ETI at	Group I		Group II		'p'
	Mean	SD	Mean	SD	
0 minute	70.4	11.3	71.7	9.5	0.8003
1 minute	67.6	10.6	67.9	9.2	0.9224
5 minutes	61.1	7.7	69.1	8.4	0.0002
10 minutes	58.6	10.1	68.8	10.5	0.001
20 minutes	62.7	8.2	72.2	12.3	0.0053
30 minutes	60.7	7.5	72.9	14.8	0.002

Inference: Changes in Diastolic Blood Pressure lower in group I compared to group II. Between groups Diastolic Blood Pressure was significant at 5min (p=0.0002), at 10min (p=0.001), at 20min (p=0.0053) and at 30min (p=0.002).

Table 4: Changes in Mean Arterial Pressure after Endotracheal Tube Insertion

MAP after ETI at	Group I		Group II		'p'
	Mean	SD	Mean	SD	
0 minute	86.1	15.1	80.8	9.8	0.203
1 minute	79.1	10.0	78.6	7.9	0.8535
5 minutes	73.4	9.3	79.1	7.2	0.0559
10 minutes	72.3	7.2	78.0	9.3	0.0532
20 minutes	77.0	6.8	82.4	11.3	0.062
30 minutes	74.9	5.1	84.5	13.8	0.0131

Inference: Changes in Mean Arterial Pressure lower in group I compared to group II. Between the groups Mean Arterial Pressure significant only at 30min (p=0.0131).

Table 5: Changes in Saturation after Endotracheal Tube Insertion

SPO2 after ETI at	Group I		Group II		'p'
	Mean	SD	Mean	SD	
0 minute	99.9	0.3	99.6	0.6	0.0912
1 minute	99.9	0.3	99.8	0.4	0.1266
5 minutes	99.96	0.2	99.92	0.28	0.5555
10 minutes	100	-	100	-	-
20 minutes	99.96	0.2	100	-	0.3173
30 minutes	99.88	0.33	100	-	0.077

Inference: No significant changes in Saturation between groups.

Discussion

In this study, the base line HR was comparable between two groups. There was a gradual decrease in heart rate in both groups during infusion. There was no significant increase in HR after introduction of fibreoptic scope and intubation.

Heart rate-the baseline values mean rates were comparable in both groups group I had 81.5 beats/min & group 2 had 76 beats/min. Mean heart rate during infusion decreased

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from 79.2 beats/min to 75.5 beats/min in group I while in group II it decreased from 82.8 beats/min to 77.5 beats/min. Mean heart rate after endotracheal intubation was similar in both groups. With group I having a mean of 78.5 beats/min at 0min & 74.7 beats/min at 30 min, group II with 76.8 beats/min at 0 min & 76.8 beats/min at 30 min. The mean heart rate showed no significant changes between both groups.

In this study, mean SBP, DBP and MAP were comparable with respect to the base line, during study drug infusion. There were statistically significant changes in mean SBP, DBP and MAP after endotracheal intubation.

Systolic blood pressure-the baseline values were comparable in both groups. SBP during infusion decreased from a mean of 122.2 mm of hg to 110.8 mm of hg in group I while in group II it decreased from 125.6 mm of hg to 114.6 mm of hg. Mean SBP after endotracheal intubation with group I was 113.5 mm of hg at 0 min & 98.7 mm of hg at 30 min, group II with 111.4 mm of hg at 0 min & 118.9 mm of hg at 30 min. The Mean SBP decreased gradually from 0 min to 30 min in group I due to better sedation and suppression of stress response. The lower systolic BP was desirable during tumour resection.

At 10, 20 and 30 minutes after intubation mean SBP was significantly less in group I when compared to group II with $p<0.05$. So we concluded that dexmedetomidine 1.0µg/kg attenuates the rise in systolic blood pressure due to fibreoptic scopy and intubation longer than dexmedetomidine 0.5µg/kg.

Diastolic blood pressure-the baseline values were comparable in both groups. DBP during infusion decreased from a mean of 75.5 mm of hg to 69.6 mm of hg in group I while in group II it decreased from 81.8 mm of hg to 71.3 mm of hg. Mean DBP after endotracheal intubation with group I was 70.4 mm of hg at 0 min & 60.7 mm of hg at 30 min, group II with 71.7 mm of hg at 0 min & 72.9 mm of hg at 30 min. The mean DBP decreased gradually from 0 min to 30 min in group I due to better sedation and suppression of stress response.

At 5, 10, 20 and 30 minutes after intubation mean DBP was significantly less in group I when compared to group II with $p<0.05$. So we concluded that dexmedetomidine 1.0µg/kg attenuates the rise in diastolic blood pressure due to fibreoptic scopy and intubation longer than dexmedetomidine 0.5µg/kg.

Mean arterial pressure-the baseline values were comparable in both groups. MAP during infusion changed from a mean of 90.7 mm of hg to 82.1 mm of hg in group I while in group II it changed from 93.6 mm of hg to 84.0 mm of hg. MAP after endotracheal intubation with group I was 86.1 mm of hg at 0 min & 74.0 mm of hg at 30 min, group II with 80.8 mm of hg at 0 min & 84.5 mm of hg at 30 min. The mean arterial pressure was significant only in the first 30 min post intubation. The mean arterial pressure was comparable throughout in both the groups. Even though the systolic and diastolic pressure decreased in group I, the mean arterial pressure was maintained. Thus the haemodynamics were not significantly altered.

When mean arterial pressures were compared, both groups were comparable except at 30 minutes after intubation where the difference was statistically significant ($p<0.05$ and $p= 0.0131$).

In this study, all patients of both groups-maintained oxygen saturation (SPO2) throughout the procedure ($p > 0.05$)

So we concluded that dexmedetomidine 1.0µg/kg and dexmedetomidine 0.5µg/kg suppress haemodynamic response during nasotracheal fibreoptic intubation. Dexmedetomidine 1.0µg/kg providing a longer and better suppression of haemodynamic response.

Our study results were consistent with results of study conducted by C.-J. Tsai, K.-S. Chu, *et al.* (2010)[9] andKoung-Shing Chu, Fu-Yuan Wanga, Hung-TeHsua, I-Cheng Lu (2010)[7]. Dexmedetomidine allows better tolerance, more stable haemodynamic status and preserves a patent airway.

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Our study results were consistent with result of Sagıroglu AE and Celik M *et al*. (2010)[8]. They found dexmedetomidine 1μg/kg was more effective than 0.5μg/kg in controlling haemodynamic responses to tracheal intubation.

Conclusion

From the present study on 50 patients posted for elective surgeries under general anaesthesia, we conclude that use of flexible fibreoptic bronchoscopy for awake nasotracheal intubation under dexmedetomidine 1.0μg/kg when compared with dexmedetomidine 0.5μg/kg is associated with:

1. Ideal conditions for intubation.
2. Better haemodynamic stability.
3. Better patient comfort and acceptance.

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