Original Article

Indian Journal of Anaesthesia and Analgesia
2017, 4 (3, Part-II), 857-863
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.4317.51

Efficacy of Dexmedetomidine on Blood Pressure in Patients Undergoing Laparoscopic Surgery

P.A. Nazar

Assistant Professor, Department of Anesthesiology, Kerala Medical College, Mangode, Palakkad, Kerala 679503, India.

Abstract

Introduction: Dexmedetomidine hydrochloride, an imidazole compound is the pharmacologically active s-enantiomer of medetomidine. It is described chemically as (+)-4-(s)[2, 3 – (dimethylphenyl) ethyl] – 11 H-imidazole monohydrochloride. *Methodology*: This study was carried out on 60 patients (30 in each group) belonging to American Society of Anesthesiologists (ASA) physical status I and II and scheduled for elective general surgical, urological and gynecological surgeries. *Results*: In group C (Control), the basal mean SBP was 123.97±11.44. 10 min after bolus drug administration the mean SBP was 125.40±10.97 which is not statistically significant (p=0.232). In group D (Dexmedetomidine), the basal mean SBP was 126.53±9.06. 10 min after bolus drug administration and after induction the mean SBP were 108.07±10.13 and 107.03±9.95 representing a significant fall in SBP (p=0.000). *Conclusion*: There was marked decrease in SBP, DBP and MAP 10 min after dexmedetomidine administration.

Keywords: Blood Pressure; Dexmedetomidine; Laroscopy.

Introduction

Laryngoscopy and tracheal intubation are frequently associated with sympathetic response. Diagnostic laryngoscopy under anaesthesia [1] and tracheal suctioning [2] are also associated with adverse circulatory changes. Severe hypertension, tachycardia, increase in intracranial pressure can also be seen. Supraglottic traction during laryngoscopy [3] or superficial stimulation of airway [4] or passage of tracheal tube into trachea [5] may be associated with reflex sympathetic changes.

Key areas that integrate cardiovascular system (CVS) responses and maintain CVS homeostasis are nucleus solitarius, dorsal vagal nucleus, nucleus ambiguus and parabranchial nucleus. The nucleus solitarius is the area of primary central synapse for baroreceptor mediated reflexes and relay station for peripheral information to hypothalamic sympathetic control centers. It projects directly to interomediolateral nucleus of the spinal cord, the common pathway for preganglionic sympathetic outflow. This along with nucleus ambiguus play an important role in control of secretion of vasopressin [6].

Dexmedetomidine hydrochloride, an imidazole compound is the pharmacologically active s-enantiomer of medetomidine. It is described chemically as (+)-4-(s)[2, 3 – (dimethylphenyl) ethyl] – 11 H-imidazole monohydrochloride. Its empirical formula is $C_{13}H_{16}N_2HC1$ and its molecular weight is 236.7 [7]. A white or almost white powder that is freely soluble in water with Pka of 7.1. Partition coefficient in octanol: water at pH 7.4 is 2.89.

Corresponding Author: P.A. Nazar, Assistant Professor, Department of Anesthesiology, Kerala Medical College, Mangode, Palakkad, Kerala 679503, India.
E-mail: hareeshsb95@gmail.com

Received on 13.06.2017, **Accepted on** 19.06.2017

A biphasic cardiovascular response has been described after the application of dexmedetomidine [8]. The administration of a bolus of 1 μg/kg body weight, initially results in a transient increase of the blood pressure and a reflex decrease in heart rate. The initial reaction can be explained by the peripheral alpha-2B adrenoceptors stimulation of vascular smooth muscles and can be attenuated by a slow infusion over 10 min. The initial response lasts for 5-10 min and is followed by a decrease in blood pressure of approximately 10%-20% below baseline values; both these effects are caused by the inhibition of the central sympathetic outflow overriding the direct stimulant effects [9].

The application of a single high dose of dexmedetomidine reduced norepinephrine and epinephrine release by as much as 92%. The baroreceptor reflex is well preserved in patients who received dexmedetomidine, and the reflex heart rate response to a pressor stimulus is augmented [10]. The incidence of postoperative bradycardia has been reported as high as 40% in healthy surgical patients who received dexmedetomidine, especially high doses [11].

Methodology

This study was carried out on 60 patients (30 in each group) belonging to American Society of Anesthesiologists (ASA) physical status I and II and scheduled for elective general surgical, urological and gynecological surgeries. Patients with cardiovascular or respiratory disorders, diabetes, hypertension, obesity, difficult airway, medications that effect heart rate (HR) or blood pressure (BP), pregnant, currently breast feeding women, history of sleep apnea and those for emergency procedures were excluded.

Institutional board approval was taken and written informed consent was taken from each patient. Pre-anesthetic check up was conducted and a detailed history and complete physical examination recorded. Routine investigations like complete blood picture, blood grouping/typing, blood urea and serum creatinine were done. Using computer generated random allocation, patients were divided into two groups (30 patients in each group). The enrolling investigator prepared the drug solution to be given before extubation and had no role in patient's assessment.

Routine anesthetic technique was used using propofol, fentanyl, vecuronium, nitrous oxide-oxygen and halothane. Standard monitoring with electrokardiography (EKG), pulse oximetry (SpO_2) and noninvasive BP was done. About 15 minutes before the estimated time of end of surgery, inhalation agent was cut off and patients in each group received the specified solution intravenously over 15 minutes.

Patients in group A received dexmedetomidine 0.75 mcg/kg intravenous (IV) in 100 ml normal saline (NS) over 15 minutes while in group B, patients received 100 ml NS over 15 minutes.

HR, systolic BP and diastolic BP were recorded at the start of bolus drug injection and thereafter at 1, 3, 5, 10 and 15 minutes. Residual neuromuscular blockade was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg IV. When patients' spontaneous respirations were considered sufficient and patients were able to obey simple commands, suction of throat was done and trachea was extubated. The anesthesiologist performing the extubation was blinded to the study drugs. HR, systolic BP and diastolic BP were recorded at the time of extubation and thereafter at 1, 3 and 5 minutes after extubation followed by every 5 minutes for 30 minutes. Occurrence of any event like laryngospasm, bronchospasm, desaturation, respiratory depression, vomiting, hypotension, bradycardia or undue sedation was noted.

Hypotension was defined as a decrease in systolic BP of more than 30 mmHg from baseline or a mean arterial pressure of less than 60 mmHg and was corrected with IV fluids and if required, with small dose of mephentermine 3 mg IV. Bradycardia was defined as a HR of less than 60/minute and was corrected, if associated with hemodynamic instability, with atropine 0.6 mg IV.

Results

In group C (Control), the basal mean SBP was 123.97±11.44. 10 min after bolus drug administration the mean SBP was 125.40±10.97 which is not statistically significant (p=0.232). After induction the mean SBP was 113.90±14.14 representing a significant fall in SBP (p=0.000).

The mean SBP after intubation at 1and 3 min remained significantly high compared to basal value (p=0.000) and by 5th min returned to near basal value. 10 min after pneumoperitoneum and subsequently the mean SBP was significantly high compared to basal value (p=0.000). The mean SBP after deflation of abdomen was not statistically significant compared to basal value (p=0.718).

Soon after extubation the mean SBP remained significantly high compared to basal value (p=0.001).

In group D (Dexmedetomidine), the basal mean SBP was 126.53±9.06. 10 min after bolus drug administration and after induction the mean SBP were 108.07±10.13 and 107.03±9.95 representing a significant fall in SBP (p=0.000). The mean SBP after intubation at 1, 3 and 5 min remained significantly low compared to basal value (p=0.000). The mean SBP 10 min after pneumoperitoneum was significantly low compared to basal value (p=0.000). Subsequently after pneumoperitoneum and after deflation of abdomen the mean SBP remained significantly low (p=0.000). Soon after extubation the mean SBP remained significantly low compared to basal value (p=0.000).

Mean SBP in group B (Control) increased significantly at 1 (M4) and 3 (M5) min after intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) when compared to basal value and group A (Dexmedetomidine) which is statistically highly significant (p=0.000) whereas in group A (Dexmedetomidine) there was a significant fall in mean SBP at 1 (M4), 3 (M5) and 5 (M6) min after intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) compared to basal value and group C (Control) (p=0.000).

Mean DBP in group B (Control) increased significantly at 1 (M4) and 3 (M5) min after intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) when compared to basal value and group A (Dexmedetomidine) which is statistically highly significant (p=0.000) whereas in group A (Dexmedetomidine) there was a significant fall in mean DBP at 1 (M4), 3 (M5) and 5 (M6) min after intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) compared to basal value and group C (Control) (p=0.000).

Mean MAP in group B (Control) increased significantly at 1 (M4) and 3 (M5) min after intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) when compared to basal value and group A (Dexmedetomidine) which is statistically highly significant (p=0.000) whereas in group A (Dexmedetomidine) there was a significant fall in mean MAP at 1 (M4), 3 (M5) and 5 (M6) min after

Table 1: Showing intraoperative comparison of mean systolic blood pressure (SBP in mm Hg) changes in response to laryngoscopy and intubation and pneumoperitoneum (PNP) in control group compared to basal SBP

Time Interval	SBP (mm Hg)	'p' value
Basal (M1)	123.97±11.44	
After bolus drug (M2)	125.40±10.97	0.232(NS)
After induction (M3)	113.90±14.14	0.000(HS)
1 min after intubation (M4)	147.77±13.01	0.000(HS)
3 min after intubation (M5)	131.60±11.36	0.000(HS)
5 min after intubation (M6)	120.47±12.04	0.159(NS)
Before PNP (M7)	115.10±11.35	0.000(HS)
10 min after PNP (M8)	148.63±11.81	0.000(HS)
20 min after PNP (M9)	136.70±10.90	0.000(HS)
30 min after PNP (M10)	134.20±10.49	0.000(HS)
After abdomen deflation (M11)	124.80±8.12	0.718(NS)
Vaginal part (M12)	121.30±6.00	0.248(NS)
After extubation (N1)	132.67±6.81	0.001(HS)
Post operative (N2)	122.27±8.32	0.484(NS)

Table 2: Showing intraoperative comparison of mean systolic blood pressure (SBP in mm Hg) changes in response to laryngoscopy and intubation and pneumoperitoneum (PNP) in dexmedetomidine group compared to basal SBP

Time interval	SBP (mm Hg)	'p' value
Basal (M1)	126.53±9.06	
After bolus drug (M2)	108.07±10.13	0.000(HS)
After induction (M3)	107.03±9.95	0.000(HS)
1 min after intubation (M4)	116.03±6.40	0.000(HS)
3 min after intubation (M5)	111.03±5.67	0.000(HS)
5 min after intubation (M6)	106.30±5.22	0.000(HS)
Before PNP (M7)	104.47±6.04	0.000(HS)

10 min after PNP (M8)	110.33±6.84	0.000(HS)
20 min after PNP (M9)	99.57±5.79	0.000(HS)
30 min after PNP (M10)	100.73±6.02	0.000(HS)
After abdomen deflation (M11)	100.53±5.75	0.000 (HS)
Vaginal part (M12)	102.63±7.75	0.000(HS)
After extubation (N1)	101.33±6.40	0.000(HS)
Post operative (N2)	119.53±6.45	0.000(HS)

intubation, 10 (M8), 20 (M9) and 30 (M10) min after pneumoperitoneum (M10) and after extubation (N1) compared to basal value and group C (Control) (p=0.000).

Discussion

Dexmedetomidine has been found by various authors to blunt the haemodynamic response for pneumoperitoneum. Dexmedetomidine is recently introduced in India (only in 2009) and available as 100 µg/ml ampoule (Dexem, Themis Medicare Limited) and not many studies have been done using dexmedetomidine for suppression of haemodynamic response in LAVH.

Hence, in our study we compared the efficacy of dexmedetomidine bolus and infusion on haemodynamic stability in patients undergoing LAVH.

Basal mean SBP were comparable in both control and dexmedetomidine groups.

Compared to the basal value, in the dexmedetomidine group there was a decrease of 18.46 mm Hg in SBP which is statistically significant (p=0.000).

Similar observation was made by Aho et al [12]. and Keniya et al [13]. Wherein they found a significant fall in mean SBP 10 min after drug administration.

In the control group there was a negligible increase of 1.43 mm Hg compared to basal which is not statistically significant (p=0.232).

Compared to the basal values, in the control group there was a decrease of 10 mm Hg of SBP whereas in dexmedetomidine group there was a decrease of 20 mm Hg which is statistically highly significant. Similar observations were made by Kunisawa et al [14]. where in there was decrease in SBP by 12 mm Hg in dexmedetomidine group which concurs with our study.

Sl. No.	Author and year	Mean change in SBP (mm Hg) following intubation in control group			Mean change in SBP (mm Hg) following intubation in dexmedetomidine group		
		1 min	3 min	5 min	1 min	3 min	5 min
1.	Aho et al.[12]-1991	+48	-	-	+48	-	-
2.	Schenin et al.[15]-1992	-	-	-18	-	-	-22
3.	Jaakola et al.[16]-1992	-	-	+	-	-	-17
4.	Kunisawa et al.[14]-2009	+10	-	-	-15	-	-
5.	Keniya et al.[17] - 2011	+30	-	+10	-10	-	-20
6.	Present study	+23.8	+7.63	-3.5	-10.5	-15.5	-20.23

The sign (-) denotes decrease and (+) denotes increase in SBP. The spaces which have been left blank (' – '), are the parameters not studied by the authors.

Compared to preinduction values there was a fall of just 1 mm Hg in dexmedetomidine group and 11.5 mm Hg in control group.

Showing changes in SBP after tracheal intubation at various intervals in control and dexmedetomidine group

it is seen that dexmedetomidine blunts the increase in systolic blood pressure at 1, 3 and 5 min following laryngoscopy and intubation compared to control group (p=0.000) which is statistically highly significant.

In our study, following laryngoscopy and intubation at 1st and 3rd min, the mean SBP increased by 23.8 and 7.63 mm Hg respectively in the control group whereas in dexmedetomidine group the mean SBP decreased by 10.5 and 15.5 mm Hg respectively which is statistically highly significant (p=0.000).

Aho et al [12] noted a increase in SBP by 48 mm Hg and 18 mm Hg in control group and dexmedetomidine group respectively at 1 min after intubation which was statistically significant.

In dexmedetomidine group, at the 1st min, there is an increase of 9 mm Hg of SBP compared to the values immediately after induction, but compared to the basal value the reduction in SBP is 10.5 mm Hg. Even at 5th

min the SBP did not reach the basal value and it was 20 mm Hg lower than the basal value. In the control group, the increase in SBP was maximum at 1st min but reached the basal value by 5th min. This is probably due to the use of lignocaine before laryngoscopy and intubation in our study which was not used in above mentioned studies.

Scheinin et al [15] observed increase in SBP by 18 mm Hg immediately after intubation compared to the values after induction, but the SBP was less than the basal values. This compares with our study. They also observed an increase in SBP by 25 mm Hg in control group compared to basal value.

Jaakola et al [16] have observed a fall of 17 mm Hg in SBP 5 min after intubation in dexmedetomidine group and in control group an increase of SBP by 10 mm Hg, compared to the basal values.

Compared to basal values there was a significant fall in mean SBP in dexmedetomidine group 10, 20 and 30 min after pneumoperitoneum by 16, 27 and 26 mm Hg respectively which is statistically highly significant (p=0.000) whereas in the control group there was a significant rise in SBP 10, 20 and 30 min after pneumoperitoneum by 25, 13 and 10 mm Hg respectively which is statistically highly significant (p=0.000).

Rodrigues et al [18] observed that compared to control group there was significant fall in SBP in dexmedetomidine group by 13 and 19 mm Hg at 10 and 20 min respectively after pneumoperitoneum which concurs with our study.

In the present study, in dexmedetomidine group following deflation of abdomen and subsequently during the vaginal part there was not much change in SBP whereas in control group there was a fall in SBP by 10 mm Hg in control group which is statistically significant.

In the present study, following extubation the mean SBP increased by 8.7 mm Hg in the control group whereas in dexmedetomidine group the mean SBP decreased by 25.2 mm Hg which is statistically highly significant (p=0.000).

Guler et al [19] noted that SBP increased significantly during extubation in both dexmedetomidine and control group but SBP was significantly lower in dexmedetomidine than in control group after extubation which occurs in our study. Basal mean DBP were comparable in both control and dexmedetomidine groups.

Compared to the basal value, in the dexmedetomidine group there was a decrease of 11 mm Hg in mean DBP which is statistically significant (p=0.000). In the control group the DBP was same as compared to basal which is not statistically significant (p=0.651).

Similar observations were found by Kunisawa et al [14] and Keniya et al [17] where there was a decrease in DBP in dexmedetomidine group and no change in control group.

Aho et al [12] observed a continuous decrease of DBP in dexmedetomidine group till induction which concurs with our study.

Compared to basal value, in the control group there was a reduction of 6 mm Hg of DBP and 11 mm Hg in dexmedetomidine group. Jaakola et al [16] found a decrease in DBP by 3 mm Hg in control group and 15 mm Hg in dexmedetomidine group which compares with the present study.

	Mean changes in DBP (mm Hg) following intubation		
	1 min	3 min	5 min
Control	+14.2	+6.27	Same as basal
Dexmedetomidine	-5	-9.26	-13.83
' p' value	0.000	0.000	0.000

The sign (-) denotes decrease and (+) denotes increase in DBP.

Compared to preinduction values there was a fall of 6 mm Hg in control group, whereas no change in dexmedetomidine group.

Showing comparison of mean DBP changes in control and dexmedetomidine group following intubation at various intervals.

From the above table, in our study there is a decrease in DBP by 5 mm Hg at 1st min and 13 mm Hg by 5th min in dexmedetomidine group, compared to basal values which is statistically highly significant (p=0.000). In control group there is an increase of DBP by 14 mm Hg which gradually decreased to near basal values by 5th min. This is probably due to the use of lignocaine before laryngoscopy and intubation in our study which was not used in other studies.

However, there is an increase of 19 mm Hg in control group compared with 6 mm Hg increase in the dexmedetomidine group in comparison with the values of DBP immediately after induction. This is also statistically highly significant.

Jaakola et al [16] observed a fall of DBP by 10 mm Hg in dexmedetomidine group at 1st min compared with an increase of 16 mm Hg in control group compared to basal values which concurs with our study. There is an increase of 5 mm Hg compared to postinduction value in dexmedetomidine group compared with 17 mm Hg of increase in control group which again compares with our study.

In the study done by Kunisawa et al [14] there is a fall of DBP by 5 mm Hg after intubation. Scheinin et al. [15], found an increase of 15 mm Hg after intubation compared with the postinduction value in dexmedetomidine group compared with an increase of 20 mm Hg in control group which is statistically significant and concurs with our study.

Compared to basal values there was a significant fall in mean DBP by 9, 19 and 17 mm Hg in dexmedetomidine group 10, 20 and 30 min after pneumoperitoneum respectively which is statistically highly significant (p=0.000) whereas in the control group there was a significant rise in mean DBP by 18, 12 and 10 mm Hg at 10, 20 and 30 min after pneumoperitoneum respectively which is statistically highly significant (p=0.000).

Rodrigues et al [18] observed that compared to control group there was significant fall in DBP in dexmedetomidine group at 10 and 20 min after pneumoperitoneum by 8 and 8 mm Hg respectively which concurs with our study. In the present study, in dexmedetomidine group following deflation of abdomen and subsequently during the vaginal part there was not much change in DBP whereas in control group there was a fall in DBP by 8 mm Hg in control group which is statistically significant.

In the present study, following extubation the mean DBP increased by 6 mm Hg in the control group whereas in dexmedetomidine group the mean DBP decreased by 17 mm Hg which is statistically highly significant (p=0.000). Guler et al [19] noted that DBP increased significantly during extubation in both dexmedetomidine and control group but DBP was significantly lower in dexmedetomidine than in control group after extubation which occurs in our study.

Conclusion

Dexmedetomidine as a single bolus dose of 0.6 μg/kg body weight and continuous infusion at a rate of 0.2 μg/kg/hr was seen to effectively attenuate the haemodynamic response to laryngoscopy and tracheal intubation and also to pneumoperitoneum.

References

1. Nandita S, Kodadia MM, Geeta A. Cardiovascular changes during diagnostic laryngoscopy under general anaesthesia. Ind J Anaesth 1988;36(5):270-73.
2. Shuji Dohi, Toshiaki Nishikawa, Yashito Ujike, Takashisa Mayumi. Circulatory responses to airway stimulation and cervical epidural blockade. Anesthesiology 1982;57:359.
3. Pernerstorfer T, Krafft F, Fitzgerald RP, Krenn CG, Chiari A, Wagner O, et al. Stress response to tracheal intubation; direct laryngoscopy compared with blind oral intubation. Anaesthesia 1995;50:17-22.
4. Smith JE, Mackenzie AA, VCE Scott- Knight. Comparison of two methods of fibroscope guided tracheal intubation. Br J Anaesthesiology 1991;66:546-50.
5. Singh S and Smith JE. Cardiovascular changes after three stages of nasotracheal intubation. Br J Anaesth 2003; 91:667-71.
6. Ronald D. Miller, Anesthesia, 5th edition. Vol. 2, 2005.
7. Abramov D, Nogid B, Nogid A. Drug forecast. P&T 2005 Mar;30(3):158.
8. Hall JE, Toni D. Uhrich, Jill A. Barney, Shahbaz R. Arain, Thomas J. Ebert. Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. Anesth Analg 2000;90:699–705.
9. Aanta R, Kanto J, Scheinin H, Kallio A. Dexmedetomidine alpha-2 adrenoceptor agonist reduces anaesthetic requirements for patients undergoing minor gynecological surgeries. Anaesthesiology 1990;73:230-5.
10. Kallio A, Scheinin M, Koulu M, Ponkilainen R, Ruskoaho H, Viinamaki O, et al. Effects of Dexmedetomidine, a selective alpha-2 adrenoceptor agonist, on haemodynamic control mechanism. Clin Pharmacol Ther 1989;46:33-42.
11. Jalonen J, Hynyne M, Kuitunen A, Heikkila H, Perttilla J, Salmenpema M, et al. Dexmedetomidine as an anaesthetic adjunt in coronary artery bypass grafting. Anaesthesiology 1997;86:331-45.
12. Aho M, Erkola O, Kallio A, Scheinin H, Korttila K. Dexmedetomidine infusion for maintenance of anesthesia in patients undergoing abdominal hysterectomy. Anesth Analg 1992;75:940-6.
13. Pekka Talke, Richard Chen, Brian Thomas, Anil Aggarwall, Alexandru Gottlieb, Per Thorborg, et al. Hemodynamic and Adrenergic effects of perioperative Dexmedetomidine infusion after vascular surgery. Anesth Analg 2000;90: 834–9.
14. Kunisawa T, Nagata O, Nagashima M. Dexmedetomidine suppresses the decrease in blood pressure during anaesthetic induction and blunts the cardiovascular responses to tracheal intubation. Journal of Clin Anaes 2009;21:194-9.
15. Scheinin B, Lindgren L, Randell T, Scheinin H, Scheinin M. Dexmedetomidine attenuates sympathoadrenal responses to tracheal intubation and reduces the need for thiopentone and perioperative fentanyl. Br J Anaesth 1992;68:570-5.
16. Jakola ML, Ali-Melkkila T, Kanto J, Kallio A, Scheinin H, Scheinin M. Dexmedetomidine reduces intraocular pressure, intubation response and anaesthetic requirements in patients undergoing ophthalmic surgery. Br J of Anaesthes 1992;68:570-5.

17. Varshali M Keniya, Sushma Ladi, Nahpade R. Dexmedetomidine attenuates sympatho-adrenal response to tracheal intubation and reduces perioperative anaesthetic requirement. Indian Journal of Anaesthesia 2011 Jul-Aug;55(4).
18. Rogean Rodrigues Nunes, Sara Lúcia Cavalcante. Influence of Dexmedetomidine upon Sevoflurane End-Expiratory concentration. Evaluation by Bispectral Index, Suppression rate and Electroencephalographic power spectral analysis.
19. Guler G, Akin A, Tosun Z, Eskitascoglu E, Miarak A, Boyaci A. Single dose dexmedetomidine attenuates airway and circulatory reflexes during extubation. Acta Anesthesiol Scand 2005;49:1086-91.