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Original Research Article

A Clinical Assessment of the Effect of Adding 1 Ug/Kg of Dexmedetomidine to Lignocaine 2% and Adrenaline during Ear Surgeries

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Conflict of interest: Nil

Abstract

Aim: The aim of the present study was aimed to evaluate the effect of adding 1 ug/kg of dexmedetomidine to lignocaine 2% and adrenaline during ear surgeries and assess the patients comparatively in terms of analgesia, hemodynamic stability and sedation.

Methods: The present study was single-center, prospective, randomized study, conducted in Department of Anaesthesia, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from Jan 2020 to December 2020.

Results: Both groups were comparable in terms of age, gender and type of surgery and no statistical significance was noted. The preoperative vitals were comparable in both the groups and were statistically significant. The present study found that for first 10 mins vital parameters i.e. pulse rate, systolic blood pressure, diastolic blood pressure etc. increased and from 15 mins it started decreasing whereas grade of bleeding and sedation score were increasing. As compared between group A and group D the parameters were at a higher range in group A as compared to group D, majority of parameters had statistical significance. Rescue analgesia was required among group A at mean 25.54±11.55 min. No rescue analgesia was used among group D. Effect of analgesia was more among group D (548.6 ± 64.72) as compared to group A (258.2 ± 56.54), statistical significance was seen.

Conclusion: In dexmedetomidine group pulse rate, systolic blood pressure, diastolic blood pressure, respiratory rate all the vital parameters were maintained at the lower range as compared to control group. In dexmedetomidine group, VAS score was also good, no rescue analgesia was needed, grade of bleeding and sedation score both were at lower range. The present study concluded that use of dexmedetomidine shows good results in terms of hemodynamic stability, analgesia, sedation and can be used in day to day ear surgeries.

Keywords: Dexmedetomidine, VAS, Rescue Analgesia Hemodynamic Stability, Analgesia, Sedation, Day Care Ear Surgeries.

Introduction

Pain is defined as "An unpleasant emotional experience usually initiated by noxious stimulus and transmitted over a specialized neural network to the central nervous system." [1] The invention of local anesthesia has made the oral minor surgical procedure to be accomplished successfully with no pain, but all surgical procedures whether minor or major are invariably associated with stress, anxiety, and minimal–moderate pain or discomfort. [2-4] Currently used local anesthetic agents are lidocaine, bupivacaine, tetracaine, benzocaine, and articaine etc. [5]

These local anesthetic agents have been used for surface anesthesia, spinal anesthesia, infiltration anesthesia, and conduction blocks. In the field of anesthesia, there has always been a continuous search for newer local anesthetic agents and adjuvants to improve efficacy, potency, and better handling properties. Dexmedetomidine is an imidazole compound, which is pharmacologically active dextro-isomer of medetomidine that shows specific and selective α2-adrenoceptor agonism. [6] These selective receptors are present in the brain and spinal cords. The mechanism of action of dexmedetomidine is unique and differs from currently used sedative agents. It binds to the alpha 2 receptor and sends a negative feedback to synaptic vesicles. This inhibits the release of nor-

epinephrine, causing blockade of transmission of pain stimulus.

Postsynaptic activation of α2 adrenoceptors in the central nervous system inhibits sympathetic activity causing decrease blood pressure (BP) and heart rate. When these effects are combined, they can produce analgesia, sedation, and anxiolysis. [7] It is also known to cause hypotension and bradycardia. Dexmedetomidine is used intravenously as a sedative in intensive care unit and for procedural sedation. Attention has recently been paid to dexmedetomidine as a possible additive to local anesthesia. [2,6] The addition of dexmedetomidine to local anesthetics has been carried out for spinal nerve blocks. Enhancing the effect of dexmedetomidine on local anesthetic action has been demonstrated including speeding up the onset of action and extending the duration of local anesthesia, reducing intraoperative bleeding, and providing a better surgeon's satisfaction score. [8-11]

The aim of the present study was aimed to evaluate the effect of adding 1 ug/kg of dexmedetomidine to lignocaine 2% and adrenaline during ear surgeries and assess the patients comparatively in terms of analgesia, hemodynamic stability and sedation.

Materials and Methods

The present study was single-center, prospective, randomized study, conducted in Department of Anaesthesia, Anugrah Narayan Magadh Medical College and Hospital, Gaya , Bihar, India from Jan 2020 to December 2020.

Inclusion Criteria: Age group 18-50 year, normal cardio respiratory status, ASA I/II, Patients undergoing ear surgeries under local anaesthesia, willing to participate.

Exclusion Criteria: Patient with ASA III, IV. History of bleeding disorders. Allergy to dexmedetomidine and local anaesthetics. Patient with heart disease. Pregnancy. Deranged kidney function test. Advanced liver disease. History of chronic use of sedatives, narcotics and alcohol. Patients with Bronchial asthma. Patients on Beta Blocker drugs. Extremes of ages. Patients undergoing mastoid surgeries under GA.

Patients attending and getting admitted under ENT department for surgical procedure were counselled and written informed consent was taken from the participants. Predesigned questionnaire schedule consisting of standard questions related to socio demographic factors, addiction, clinical profile etc. were interviewed. In addition, questionnaire also included questions on past and present medical history and health seeking behaviour. At the time of registration the baseline information was taken especially with respect to socio demographic factors, clinical findings and other investigations.

200 patients, were randomly allocated into two groups each of 100 participants

Group A - Received inj. Lignocaine 2% + Adrenaline

Group D - Received inj. Dexmedetomidine 1ug/kg + Lignocaine 2% + Adrenaline

In operation theater, monitors were attached and baseline parameters were noted. Preoperatively intravenous ranitidine 50 mg was administered after setting up an intravenous line. Monitoring included oxygen saturation, systolic and diastolic blood pressure, heart rate, respiratory rate, onset and total duration of analgesia, sedation score and grade of bleeding.

After preparing the part under aseptic precautions local infiltration was given by the surgeon with the above prepared solutions. In order to provide reliable distribution of local anaesthetic and eliminate operator bias, we chose a standardized technique of local infiltration administered by same surgeon, who is performing ear surgery. Patient's blood pressure, pulse rate, oxygen saturation was monitored at 5 min, 10 min, 15 min, 25 min, 30 min, 45 min, 60 min, 120 min, 180 min, 240 min, 480 min. Time of onset of analgesia and total duration of analgesia (by Visual analogue scale), sedation score (by Ramsay sedation scale) and grade of bleeding (by Boezaart grading scale) was noted.

All data was collected and complied in microsoft excel. All statistical analyses were performed by using IBM SPSS statistics version 21.0 (SPSS Inc., Chicago, IL, USA) and openepi version 2.3.1. A p value of <0.05 was regarded as statistically significant.

Results

Table 1: General characteristics

Variable	Group A (n=100)	Group D (n=100)	P value
Age in years			
18-25	24	28	0.90
25-35	40	42	
35-45	34	22	
>45	2	8	
Mean ± SD	31.92±7.53	31.9±8.2	

Gender			
Male	50	44	0.27
Female	50	56	
Type of surgery			
Grommet insertion	2	0	0.27
Mastoidectomy	48	56	
Stapedectomy	2	2	
Tympanoplasty	48	42	

Both groups were comparable in terms of age, gender and type of surgery and no statistical significance was noted.

Table 2: Preoperative vitals

Preoperative vitals	Group A	Group D	P value
PR	81.85±7.04	83.57±7.8	0.01
SBP	118±5.73	122.64±7.05	0.0004
DBP	75.4±4.65	78.56±4.45	0.0007
RR	15±1	15.12±1.14	0.5
SpO2	97.82±3.18	99.28±0.8	0.002

The preoperative vitals were comparable in both the groups and were statistically significant.

Table 3: Intra-operative and post-operative vitals

	At 5 min		P value	At 10 min		P value	At 15 min		P value
	Group A	Group D		Group A	Group D		Group A	Group D	
PR	86.08± 6.41	82.8±7.16	0.007	90.72± 7.21	80.92± 6.84	<0.000 01	85.88± 8.31	78.72± 7.02	<0.000 01
SBP	122.6± 5.32	119.24± 6.42	0.005	123.88± 5.64	116.28± 6.41	<0.000 01	118±9.4	112.72± 5.99	0.001
DBP	78.6± 4.44	75.64± 4.86	0.001	75.9±9.8	73.76± 4.72	0.16	73.88± 6.88	72±3.53	0.08
SpO2	100±0	100±0	-	100±0	100±0	-	100±0	100±0	0
RR	14.92± 0.99	14.92±1.1	<0.000 1	14.88± 0.99	14.76± 1.04	0.55	14.72± 0.96	14.8± 1.05	0.5
Analgesia	2.79± 0.85	3.36±1.06	0.003	6±0	6.33± 0.47	<0.000 01			
VAS	0.12± 0.47	0	0.07	1.68± 0.86	0	<0.000 01	0.72± 1.58	0	0
Grade of	0.93± 0.24	0.97±0.16	0.005	1.08± 0.27	0.98± 0.14	<0.000 01	1.36± 0.62	0.98± 0.14	<0.000 01
bleeding									
Sedation	1±0	1.38±0.48	<0.000 1	1±0	3.34± 0.88	<0.000 01	1.78± 1.43	4.58± 0.87	<0.000 01
score									
	At 25 min			At 30 min			At 45 min		
	Group A	Group D	P value	Group A	Group D	P value	Group A	Group D	P value
PR	82.36± 8.09	75.92±7.3	<0.000 01	85.28± 7.93	74.48± 6.92	<0.000 01	83.68± 6.49	73.92± 6.41	<0.000 01
SBP	113.2± 8.45	108.2± 15.04	0.04	116.4± 9.02	109.56± 4.9	<0.000 01	114.82± 8	109.6± 4.88	<0.000 01
DBP	71.64± 4.17	70.56± 2.91	0.01	73.84± 5.45	70.44± 2.3	<0.000 01	74.6± 6.12	70.28± 2.15	<0.000 01
SpO2	100±0	100±0	0	100±0	100±0	0	100±0	100±0	0
RR	14.72± 0.96	14.76± 1.03	0.6	14.6±1	14.6±1	0.9	14.72± 0.96	14.6±1	0.5
VAS	0.8± 1.49	0	0	1.44± 1.97	0	0	0.64± 1.57	0	0

Grade of	1.4± 0.66	1±0.2	<0.000 01	1.48± 0.69	0.92± 0.27	<0.000 01	1.5±0.78	0.86± 0.34	<0.000 01
bleed-ing									
Seda-tion	2.22± 1.56	5.16±0.5	<0.000 01	2.34± 1.58	5.24± 0.42	<0.000 01	3.22± 1.31	5.2±0.44	<0.000 01
score									
	At 60 min			**At 90 min**			**At 120 min**		
	Group A	**Group D**	**P val-ue**	**Group A**	**Group D**	**P value**	**Group A**	**Group D**	**P value**
PR	84.44± 6.73	73.92±6.1	<0.000 01	83.68± 5.11	73.76± 6.2	<0.000 01	81.52± 4.44	74±6.1	<0.000 01
SBP	116.48± 8.25	109.64± 5.14	<0.000 01	114±5.45	109.48± 4.72	<0.000 01	113.16± 5.02	110.84± 4.49	<0.000 01
DBP	73.72± 5.45	69.88± 1.62	<0.000 01	73.72± 4.78	70±2.07	<0.000 01	72.64± 4.29	71.12± 2.94	0.04
SpO2	100±0	100±0	0	100±0	100±0	0	100±0	100±0	0
RR	14.84± 0.98	14.68±1.0 2	<0.000 01	14.8± 0.97	14.64± 1.01	0.7	14.76± 0.97	14.6±1	0.83
VAS	0.2±0.6	0	0	0±0	0	0	0±0	0	0
Grade of	1.91±0. 89	0.92±0.27	0.78	1.34± 0.59	0.97± 0.14	<0.000 01	1.37± 0.55	1±0	<0.000 01
bleed-ing									
Seda-tion	3.24± 0.86	5.14±0.4	<0.000 01	3.02± 0.79	3.48± 1.29	0.01	2.83± 0.85	2.61± 1.15	0.02
score									
	At 180 min			**At 240 min**			**At 480 min**		
	Group A	**Group D**	**P**	**Group A**	**Group D**	**P value**	**Group A**	**Group D**	**P value**
			value						
PR	78.76± 11.6	75.04± 6.12	0.001	79.46± 4.47	75.84± 5.76	0.0005*	76.88± 15.4	77.2±5.5	<0.000 01*
SBP	112.92± 4.61	111.56± 4.45	0.8	112.9± 4.1	112.4± 4.47	0.2	111.92± 2.58	111.6± 4.71	<0.000 01
DBP	72.92± 4.34	70.96± 2.86	0.004	72±3.89	71.62± 3.49	0.45	72.88± 4.46	70.68± 2.81	0.001
SpO2	100±0	100±0	0	100±0	100±0	0	99±0	100±0	0
RR	14.72± 0.96	14.6±1.01	0.7	14.69± 0.95	15±1	0.72	14.74±0. 96	14.8±0.9 7	0.94
VAS	0.24± 1.17	0	0	2.65± 2.89	0	0	8.59± 14.1	0	0
Grade of	78.76± 11.6	75.04± 6.12	0.001	79.46± 4.47	75.84± 5.76	0.0005*	76.88± 15.4	77.2±5.5	<0.000 01
bleed-ing									
Seda-tion	112.92± 4.61	111.56± 4.45	0.8	112.9± 4.1	112.4± 4.47	0.2	111.92± 2.58	111.6± 4.71	<0.000 01
score									

The present study found that for first 10 mins vital parameters i.e. pulse rate, systolic blood pressure, diastolic blood pressure etc. increased and from 15 mins it started decreasing whereas grade of bleeding and sedation score were increasing. As compared between group A and group D the parameters were at a higher range in group A as compared to group D, majority of parameters had statistical significance. Rescue analgesia was required among group A at mean 25.54±11.55 min. No rescue analgesia was used among group D.

Table 4: Analgesia

Effect of analgesia	Group A	Group D	P value
Mean ± SD	258.2 ± 56.54	548.6 ± 64.72	<0.00001

Effect of analgesia was more among group D (548.6 ± 64.72) as compared to group A (258.2 ± 56.54), statistical significance was seen.

Discussion

An ideal anaesthetic technique for ear surgeries should be such as to produce adequate analgesia for the surgical procedure, maximize patients comfort, reduce intraoperative bleeding as well as provide good pain relief and minimize nausea and vomiting postoperatively. [12] General anaesthesia is a more expensive option, associated with increased postoperative nausea and vomiting and hypotensive technique has to be ensured to minimize intraoperative bleeding. [13]

Both groups were comparable in terms of age, gender and type of surgery and no statistical significance was noted. The preoperative vitals were comparable in both the groups and were statistically significant. The present study found that for first 10 mins vital parameters i.e. pulse rate, systolic blood pressure, diastolic blood pressure etc. increased and from 15 mins it started decreasing whereas grade of bleeding and sedation score were increasing. As compared between group A and group D the parameters were at a higher range in group A as compared to group D, majority of parameters had statistical significance. Shende S. et al[12] conducted a study among sixty patients of age group 18-60 years, presents study also showed similar results. Study by Tungana S. et al [13] showed that Mean Heart Rate (HR) and Mean Arterial Pressure (MAP) were significantly decreased from baseline in group ND as compared to group D ($p<0.001$). Study by Tungana S. et al [13] showed that rescue analgesic with IV fentanyl was administered in 8 patients and 42 patients respectively in groups ND and D. Patient and surgeon satisfaction scores were also significantly higher in group ND vs group D. A combination of Dexmedetomidine with Nalbuphine as an adjuvant for Monitored Anaesthesia Care in microscopic ear surgery was found to provide superior sedoanalgesia. Palai PK et al [14] conducted a prospective observational study and found that Time to rescue analgesia was greater for group D. Duration of postoperative analgesia was lasted longer in Group D as compare to Group C (690.00±80.12 vs 417.67±58.64 min, $p<0.001$) and sedation scores were higher in Group D. [15,16] No difference was observed in both of the groups regarding other parameters including onset of analgesia, mean pulse rate, mean blood pressure and grade of bleeding at different time intervals ($p<0.05$). Similar findings were seen by present study.

Rescue analgesia was required among group A at mean 25.54±11.55 min. No rescue analgesia was used among group D. Effect of analgesia was more among group D (548.6 ± 64.72) as compared to group A (258.2 ± 56.54), statistical significance was seen. Managutti A et al [17] compared local anaesthetic with two concentrations of adrenaline (1:80,000 and 1:2,00,000), there was immediate rise in the heart rate, systolic blood pressure and diastolic blood pressure in local anaesthetic with higher concentration of adrenaline when compared to local anaesthetic with lower concentration of adrenaline which showed no significant rise in pulse, systolic blood pressure while the diastolic blood pressure decreased from the normal value after administration of the local anaesthetic. Ketabi et al [18] in 2012, they noted a decrease in SBP, DBP and HR in plain lignocaine group and increase in those parameters in patients administered with lignocaine containing adrenaline. They concluded that the adrenaline in the local anaesthetic showed minor effects on the cardiovascular parameters. P Eniya et al [19] found that there was a statistically significant difference between dexmedetomidine and lignocaine in parameters like heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure at all time intervals after tracheal intubation, with dexmedetomidine being the most effective. Sedation scores were more with dexmedetomidine. No adverse effects were noticed in patients of both groups. Dexmedetomidine attenuates the hemodynamic stress response to laryngoscopy and intubation more effectively when compared with lignocaine 1.5 mg/kg IV, without any adverse effects.

Conclusion

In dexmedetomidine group pulse rate, systolic blood pressure, diastolic blood pressure, respiratory rate all the vital parameters were maintained at the lower range as compared to control group. In dexmedetomidine group, VAS score was also good, no rescue analgesia was needed, grade of bleeding and sedation score both were at lower range. The present study concluded that use of dexmedetomidine shows good results in terms of hemodynamic stability, analgesia, sedation and can be used in day to day ear surgeries.

References

1. Bennett CR. Monheim's Local Anesthesia and Pain Control in Dental Practice. 7th ed. St. Louis, MO: C.V. Mosby; 1984.
2. Calasans-Maia JA, Zapata-Sudo G, Sudo RT. Dexmedetomidine prolongs spinal anaesthesia induced by levobupivacaine 0.5% in guinea-

pigs. Journal of pharmacy and pharmacology. 2005 Nov;57(11):1415-20.
3. Brummett CM, Norat MA, Palmisano JM, Lydic R. Perineural administration of dexmedetomidine in combination with bupivacaine enhances sensory and motor blockade in sciatic nerve block without inducing neurotoxicity in rat. The Journal of the American Society of Anesthesiologists. 2008 Sep 1;109(3):502-11.
4. Yoshitomi T, Kohjitani A, Maeda S, Higuchi H, Shimada M, Miyawaki T. Dexmedetomidine enhances the local anesthetic action of lidocaine via an α-2A adrenoceptor. Anesthesia & Analgesia. 2008 Jul 1;107(1):96-101.
5. Malamed SF. Handbook of Local Anesthesia. 6th ed. St. Louis: Elsevier; 2013. pp. 2–24.
6. Gertler R, Brown HC, Mitchell DH, Silvius EN. Dexmedetomidine: a novel sedative-analgesic agent. InBaylor University Medical Center Proceedings 2001 Jan 1 (Vol. 14, No. 1, pp. 13-21). Taylor & Francis.
7. Kaur M, Singh PM. Current role of dexmedetomidine in clinical anesthesia and intensive care. Anesthesia Essays and Researches. 2011 Jul 1;5(2):128-33.
8. Kanazi GE, Aouad MT, Jabbour-Khoury SI, Al Jazzar MD, Alameddine MM, Al-Yaman R, Bulbul M, Baraka AS. Effect of low-dose dexmedetomidine or clonidine on the characteristics of bupivacaine spinal block. Acta anaesthesiologica scandinavica. 2006 Feb;50(2): 222-7.
9. Saadawy I, Boker A, Elshahawy MA, Almazrooa A, Melibary S, Abdellatif AA, Afifi W. Effect of dexmedetomidine on the characteristics of bupivacaine in a caudal block in pediatrics. Acta Anaesthesiologica Scandinavica. 2009 Feb;53(2):251-6.
10. Brummett CM, Padda AK, Amodeo FS, Welch KB, Lydic R. Perineural dexmedetomidine added to ropivacaine causes a dose-dependent increase in the duration of thermal antinociception in sciatic nerve block in rat. The Journal of the American Society of Anesthesiologists. 2009 Nov 1;111(5):1111-9.
11. Esmaoglu A, Yegenoglu F, Akin A, Turk CY. Dexmedetomidine added to levobupivacaine prolongs axillary brachial plexus block. Anesthesia & Analgesia. 2010 Dec 1;111(6):1548-51.
12. Sarmento Jr KM, Tomita S. Retroauricular tympanoplasty and tympanomastoidectomy under local anesthesia and sedation. Acta otolaryngologica. 2009 Jan 1;129(7):726-8.
13. Yung MW. Local anaesthesia in middle ear surgery: survey of patients and surgeons. Clinical Otolaryngology & Allied Sciences. 1996 Nov;21(5):404-8.
14. Shende S; Chakravarty N; Raghuwanshi SK; Shidhaye RV. Comparison of dexmedetomidine and clonidine as an adjuvant to lignocaine with adrenaline in infiltration anesthesia for tympanoplasty. Anaesth Pain and Intensive Care 2016;20(3):309-314.
15. Sowjanya Tungana, A Satyanarayana. Comparative Study between IV Dexmedetomidine versus IV Dexmedetomidine with Nalbuphine as an adjuvant for Monitored Anesthesia Care in Tympanoplasty surgeries. JMSCR. Feb 2020; Volume 08: Issue 02: 436-444.
16. Palai PK, Ekka S, Ekka M, et al. A comparative study of dexmedetomidine and propofol for sedation in middle ear surgery under monitored anaesthesia care at VIMSAR, Burla, Odisha. J Evid Based Med Healthc 2021;8(17):1 105- 1110.
17. Managutti A, Prakasam M, Puthanakar N, Menat S, Shah D, Patel H. Comparative analysis of local anesthesia with 2 different concentrations of adrenaline: a randomized and single blind study. Journal of international oral health: JIOH. 2015 Mar;7(3):24.
18. Ketabi M, Shamami MS, Alaie M, Shamami MS. Influence of local anesthetics with or without epinephrine 1/80000 on blood pressure and heart rate: A randomized double-blind experimental clinical trial. Dental research journal. 2012 Jul;9(4):43-7.
19. P Eniya, US Arutselvan, A Anusha. Comparison of intravenous Lignocaine and Dexmedetomidine for attenuation of hemodynamic stress response to Laryngoscopy and Endotracheal Intubation. Indian J Anesth Analg. 2020; 7(4):873–878.