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COMPARATIVE STUDY OF INTRAVENOUS DEXMEDETOMIDINE AND INTRAVENOUS PROPOFOL INFUSION FOR MONITORED ANESTHESIA CARE IN PATIENTS UNDERGOING TYMPANOPLASTY UNDER LOCAL ANESTHESEIA.

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ABSTRACT

Background and Aim: To get ideal sedative state in patients undergoing surgery in local anesthesia is challenging for Anesthesiologist. Our aim was to evaluate efficacy of intravenous Dexmedetomidine and intravenous Propofol infusion in patients undergoing Tympanoplasty in local anesthesia for monitored anesthesia care. **Material and Methods**: Ninety patients were randomly divided into two groups of 45 each. Group D patients were given I.V. Dexmedetomidine on initial loading dose of 1 μg/kg for 10 minutes period followed by 0.2-0.7 μg/kg/hr. Patients in group P were given I.V. Propofol 75 μg/kg/min for 10 minutes followed by maintenance dose of 12.5-75 μg/kg/min. Sedation level of patients were recorded regularly using Ramsay Sedation Scale. Besides that pulse, blood pressure, respiratory rate, saturation, rescue analgesia and any untoward effect were noted. **Result:** Dexmedetomidine and Propofol provide adequate sedation needed for MAC, but Propofol require rescue analgesia in three patients. The onset and recovery from sedation were earlier with Propofol. Mean heart rate was lower in Dexmedetomidine group and blood pressure was lower in the Propofol group. Both the drug doesn't affect respiration. Patients of Dexmedetomidine group develop dryness of mouth. **Conclusions:** Both Dexmedetomidine and Propofol were effective in providing monitored anaesthesia care, but Dexmedetomidine was found to be better drug as it provides hemodynamic stability, additional rescue analgesia and better sedation.

KEYWORDS: Dexmedetomidine, Local anaesthesia, Monitored Anaesthesia Care, Propofol and Tympanoplasty.

INTRODUCTION

Local anaesthesia involves the injection or application of an anaesthetic drug to a specific area of the body, as opposed to the entire body and brain as occurs during general anaesthesia. Various surgeries are being done under local anaesthesia e.g.; otoplasty, facelift, eye surgeries, endoscopies etc.

Tympanoplasty is preferably done under LA with monitored anaesthesia care in adults owing to its various advantages like higher degree of safety, less bleeding, ability to assess a patients hearing ability after putting graft, maintain a sense of psychological comfort by not losing consciousness, less nausea & vomiting, early oral intake and discharge, less expensive.

Surgery under LA has its own limitations like fear of surgery, claustrophobia, nonsurgical pain, unwanted movements etc.[1] Sedation has been shown to increase patient satisfaction and acceptance and make it more convenient for the anaesthesiologist and the surgeon also.[2] To keep the patients comfortable and satisfied, moderate sedation has been recommended.

Several drugs have been used till date for sedation during surgical procedure under monitored anaesthesia care including benzodiazepines, opioids, phenothiazines, propofol etc.[3] Ideal sedative drugs are those which provide sedation and analgesia without respiratory depression, maintain airway and hemodynamic stability, cost effective, less toxic, non allergic, having early onset and fast recovery and can attenuate stress response.[4]

Intravenous Dexmedetomidine is a FDA approved drug to provide conscious sedation in ICU in patients on ventilator. Dexmedetomidine is centrally acting α2 receptor agonist having property of analgesia and conscious sedation without respiratory depression and seems to be drug of choice for procedural sedation.[5-7]

Propofol is widely used as sedative hypnotics with rapid onset and offset along with antiemetic and euphoric

properties.[8] In this study we are comparing two drugs to produce moderate sedation intra operative under LA.

MATERIAL AND METHODS

This is randomized double blind prospective study done in our institute after taking approval from institutional ethical committee in year 2015 – 2016. Ninety patients of ASA I and II in age of 18 – 45 year of either sex undergoing for Tympanoplasty under LA were enrolled in this study after taking informed consent.

Patients having allergy to local anesthetics and studied drug and patients having cardiac disease, COPD, hepatic, renal insufficiency, metabolic and CNS disorder, addiction or on psychotic medication, a history of sleep apnoea, pregnant and lactating woman and obese patients were excluded from this study.

The patient were examined and evaluated on the day before surgery. Patients were fully explained for the procedure of anaesthesia to allay anxiety and apprehension. Informed consent was taken for study. All patients were pre-medicated with oral dose of Alprazolam 0.5 mg at night before surgery. On the day of surgery the baseline heart rate and blood pressure of the patient noted. After shifting the patient to the O.T., I.V access was obtained and monitors were connected.

Randomization was done by computer generated table of random numbers. The patients were randomly allotted into two groups of 45 patients each. Patients in study group D were given I.V. Dexmedetomidine initial loading dose 1 μg/kg for 10 minutes period followed by 0.2-0.7 μg/kg/hr. Patients in study group P were given I.V. Propofol 75 μg/kg/min for 10 minutes followed by maintenance dose 12.5-75 μg/kg/min. Drug was prepared by one of the authors who was not involved in monitoring. Drugs were given by infusion pump.

On establishing sedation level, local was infiltrated by surgeon using lignocaine 2% and 1/100,000 epinephrine and surgery was started. Infusion dose was adjusted to maintain the adequate sedation grade 2 to 4 of Ramsay scale. Oxygen 2L/min by nasal cannula was given throughout the surgeries. Efficacy of sedation using Ramsay sedation score, pulse, blood pressure, respiration, oxygen saturation and any other untoward effect was noted. Patients were monitored before administering the drug, after giving the loading dose and every 15 minutes till the end of the surgery.

Side effects were treated symptomatically. Hypotension (systolic BP fall below 30% of previous value was treated with slowing down of drug infusion, intravenous fluids and if needed drug Mephentermine 6mg. Bradycardia (heart rate below 60/min) was treated with intravenous drug Atropine 0.6 mg. Respiratory depression was treated by reducing drug infusion and increasing oxygen support. Drug Ondensatron was used for nausea and vomiting and for rescue analgesia Fentanyl was given as per need. At the end of the surgery the infusion was discontinued. In the operating room, sedation assessment, blood pressure, heart rate and saturation was recorded at minutes 10, 20, 30 and 40 there-after every 20 minutes for 90 minutes.

Statistical analysis

The data were analyzed using MiniTab Version 17.0, appropriate univariate and bivariate statistical analysis were carried out using the Students ‘t’ Test for the continuous variables and two-tailed Fisher Exact Test or Chi-Square Test for categorical variables.

RESULT

All patients were enrolled in the study completed the study protocol. There was no difference found among two groups regarding their demographic data. They were comparable in age, sex, weight and ASA as shown in table no.1.

Table No. 1: Demographic characteristics of study population

Parameters	Group D (n = 45)	Group P (n = 45)	P Value
Age in years	31.16 ± 12.21	31.02 ± 11.05	0.957, NS
Weight in Kg	52.98 ± 6.74	54.44 ± 6.99	0.314, NS
ASA Grading Grade I Grade II	 35 (77.8%) 10 (22.2%)	 39 (86.7%) 6 (13.3%)	0.270, NS
Gender Female Male Male : Female	 20 (44.4%) 25 (55.6%) 1.25 : 1	 20 (44.4%) 25 (55.6%) 1.25 : 1	1.000, NS

Values were expressed as number and percentage or mean±SD as appropriate
n: number of patients; NS: Nonsignificant; S: Significant; SD: Standard deviation

As shown in Table no. 2: In group D, 38 patients achieved target Ramsay scale 2-3 in 10 mint after loading dose, as comparable to group P where 42 patients achieved. In group D, 7 patients had inadequate sedation after loading dose as compared to 3 patients in group P which were managed by increasing the infusion rate. Three patients of group P needed additional rescue analgesia in form of Fentanyl 1μg/kg. No patients of group D went in deep sedation any time as compared to group P where 3 patients found to be in deeper level and

needed tapering of drug infusions.

Table No. 2: Sedation Score

	Group D (n=45)	Group P (n=45)	P Value
No. of Patients achieved target sedation after loading dose	**38**	**42**	**0.744 NS**
Patients having inadequate sedation after loading dose	**7**	**3**	**0.229 NS**
Patients needed rescue analgesia intra-operative	**0**	**3**	**0.088 NS**
Deep level sedation	**0**	**3**	**0.088 NS**

n: number of patients; NS: Nonsignificant; S:Significant.

There was no statistically difference found in mean heart rate between two groups as shown in table no.3. Heart rate remained low in intra operative period in group D. There was not much fall seen in group P.

Table No. 3: Comparison of the study group in terms of Heart rate

Heart Rate	Group D [Mean ±SD]	Group P [Mean±SD]	P Value
Basal	80.89 ± 11.52	84.51 ± 10.84	0.128, NS
At 10 min of infusion	79.71 ± 11.10	83.53 ± 9.89	0.088 NS
At 20 min	78.38 ± 12.29	83.93 ± 10.06	0.0213 NS
At 30 min	78.73 ± 12.74	83.64 ± 11.14	0.0548 NS
At 40 min	77.71 ± 12.69	83.09 ± 11.81	0.0403 NS
At 60 min	77.20 ± 12.46	83.05 ± 13.62	0.0363 NS
At 90 min	77.53 ± 11.88	83.22 ± 12.27	0.028 NS

Values were expressed as number and percentage or mean±SD as appropriate
n: number of patients; NS: Nonsignificant; S:Significant; SD: Standard deviation

As shown in Table no. 4 Systolic BP fall in both the groups, however there was statistically difference found in fall of BP among two groups at various time intervals. Diastolic fall in BP was in both the groups, which was not found to be significant. (P >0.05).

Table No. 4: Comparison of intra-operative blood pressure values between the study groups

	Blood pressure	Dexmede-tomidine [Mean ±SD]	Propofol [Mean±SD]	P Value
Basal	Systolic Diastolic	114.38 ± 11.17 75.33 ± 9.27	113.24 ± 7.02 74.13 ± 8.53	0.566 NS 0.228 NS
At 10 min of infusion	Systolic Diastolic	120.11 ± 11.38 72.42 ± 8.28	115.11 ± 6.70 71.48 ± 6.74	0.013 S 0.556 NS
At 20 min	Systolic Diastolic	111.40 ± 10.17 69.69 ± 8.30	107.91 ± 4.21 68.38 ± 6.93	0.036 S 0.418 NS
At 30 min	Systolic Diastolic	110.11 ± 8.49 66.47 ± 6.47	106.53 ± 5.52 65.20 ± 5.76	0.020 S 0.328 NS
At 40 min	Systolic Diastolic	111.11 ± 9.23 66.58 ± 8.19	107.51 ± 4.63 64.82 ± 6.76	0.022 S 0.269 NS
At 60 min	Systolic Diastolic	110.69 ± 8.49 65.51 ± 9.69	108.58 ± 5.45 63.20 ± 7.44	0.164, NS 0.208 NS
At 90 min	Systolic Diastolic	110.73 ± 8.29 66.84 ± 8.68	108.58 ± 4.96 64.87 ± 6.80	0.138, NS 0.233 NS

Values were expressed as number and percentage or mean±SD as appropriate
n: number of patients; NS: Nonsignificant; S:Significant; SD: Standard deviation

As shown in Table no. 5 none of the any studied patient had respiratory depression at any time. Saturation was maintained more than 95% in both the groups.

Table No. 5: SpO_2 (%) in the dexmedetomidine and propofol group

SpO_2	Group D [Mean ±SD]	Group P [Mean±SD]	P Value
Baseline	99. 98± 0.63	99.75 ± 0.93	0.173 NS
At 10 min of infusion	99.30 ± 0.52	98.99 ± 1.43	0.177 NS
At 20 min	99.25 ± 0.69	98.88 ± 1.54	0.146 NS
At 30 min	99.23 ± 0.65	98.84 ± 1.67	0.149 NS
At 40 min	99.21 ± 0.65	98.81 ± 1.54	0.113 NS
At 60 min	99.18 ± 0.65	98.77 ± 1.62	0.121 NS
At 90 min	99.15 ± 0.65	98.73 ± 1.56	0.101 NS

Values were expressed as number and percentage or mean±SD as appropriate
n: number of patients; NS: Nonsignificant; S:Significant; SD: Standard deviation

With regards to adverse effect as shown in table No. 6: Two (4.5%) patients of Dexmedetomidine group had bradycardia who responded well by reducing drug infusion. Ten (22.2%) patients from Group P had hypotension. Out of those 6 patients recovered by reducing drug infusion and of rest of 4 needed fast intravenous fluid infusion. Two (4.5%) patients of Group D had hypotension who responded well by reducing drug infusion.

Three (6.6%) patient of Group D and 1 (4.5%) patient of Group P had nausea and were given intravenous Ondensatron. Two (4.5%) patients of Group P experienced pain on injection in the form of discomfort. Nine (20.0%) patients of Group D and 2 (4.5%) patients from Group P had dry mouth.

Table No. 6: Adverse Events

Adverse Events	Group D		Group P	
	No	%	No	%
Bradycardia	2	4.5	0	0.0
Hypotension	2	4.5	10	22.2
Nausea	3	6.6	1	2.2
Pain on injection	0	0.0	2	4.5
Dry mouth	9	20.0	2	4.5

No: number of patients; NS: Nonsignificant; S:Significant; %: percentage.

DISCUSSION

According to American Society of Anesthesiologist (A.S.A.), a monitored anesthesia care (MAC) is a planned procedure during which the patient undergoes local anesthesia together with sedation and analgesia. In our study we evaluated the efficacy of Dexmedetomidine and Propofol for MAC in Tympanoplasty done under local anesthesia.

Dexmedetomidine has been used successfully in various surgeries and diagnostic procedures as primary sedative agent owing to its analgesic properties, cooperative sedation and lack of respiratory depression properties,[6,9,10] whereas Propofol infusion has also been used for MAC because of easy titratibility and rapid emergence. We chose single type of surgery to avoid difference in intra operative condition and to maintain Ramsay sedation score of 2-4 to get better patient cooperation intraoperatively.

The major findings of our study were:
Demographic data were comparable in both the groups, thus we were able to provide uniform platform for our study.

All patients achieved targeted sedation levels; however, the patients receiving Propofol for sedation achieved levels of sedation more rapidly than those receiving Dexmedetomidine. The early onset times of sedation in the Propofol group compared to Dexmedetomidine group occurs because Propofol is highly lipophilic and distributes rapidly into the central nervous system. Arain, et al[11] noted that the target sedation was achieved within 10 min with Propofol as compared to 25 min with Dexmedetomidine. Similar results were obtained by Abdelkareim, et al.[12] as shown in table no. 2, no. of patients who achieved target sedation in group D was 38 as compared to 42 patients of group P.

We noted that more no. of patients required rescue analgesia in group P whereas rescue analgesia was not required in group D, which is consistent with the findings of Arain and Ebert.[11] This explains the analgesic property of Dexmedetomidine.

Deep level of sedation was observed in 3 patients of Group P and none of Group D. Reason being Dexmedetomidine causes conscious sedation and patient remains arousable under Dexmedetomidine sedation where as Propofol being more lipophilic crosses blood brain barrier readily and produces deep sedation.

We observed that 2 patients of Group D developed bradycardia which was managed by reducing infusion rate. This is due to sympatholytic and vagal mimetic effects of Dexmedetomidine[13] and it is correlated with Al-Mustafa, et al.[14] and Mahmoud, et al.[15]

Blood pressure was significantly decreased in Group P as compared too Group D. The fall in blood pressure in patients receiving propofol could be attributed to direct powerful inhibitory effect of propofol on sympathetic outflow causing vasodilatation. Dexmedetomidine is also known to decrease sympathetic outflow and circulating catecholamine levels and would, therefore, be expected to cause a decrease in MBP similar to those of propofol. However, larger doses of dexmedetomidine have a direct effect at the postsynaptic vascular smooth muscle to cause vasoconstriction and it is possible that the sympathoinhibitory effects of dexmedetomidine were slightly opposed by direct α-2 mediated vasoconstriction. Results similar to our study were observed by Arain, *et al*.;[11] Al-Mustafa, *et al*.[14] and Mahmoud, *et al*.[15]

Use of propofol has been associated with local anesthetic injection pain in the form of patient discomfort or patient movement.[16,17] we observed that 2 patients of Group P had discomfort to Propofol infusion.

Dry mouth is a known side effect of α-2 agonists. We also observed that more patients (20%) in Group D complained of dry mouth as compared to those in Group P (4.5%).[18]

CONCLUSION

It is concluded from our study that both Dexmedetomidine and Propofol provide effective MAC to patients undergoing surgery under local anesthesia. Propofol provides early onset of sedation, require rescue analgesia and result in lower blood pressure intra operative as compared to Dexmedetomidine. Neither Dexmedetomidine nor Propofol influence respiration. Thus Dexmedetomidine proves to be better drug for MAC in patients undergoing surgery under local anesthesia.

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Conflict of interest

There are no conflicts of interest.

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