



## COMPARISON OF EFFICACY OF INFUSIONS OF DEXMEDETOMIDINE VERSUS BUTORPHANOL AS SEDATIVE & ANALGESIC IN SHORT GENERAL ANAESTHESIA IN DAY CARE GYNAECOLOGICAL SURGERIES

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**ABSTRACT** **Background And Goals:** Development of selective alpha 2 adrenoceptor agonists may provide a new concept for the administration of perioperative anaesthesia & analgesia in day care surgeries. Goal of this study was to compare Inj. Dexmedetomidine & Inj. Butorphanol with respect to time required for onset & offset of sedation, quality of intraoperative as well as postoperative analgesia & the time required for post-operative recovery.

**Methods:** After obtaining permission from Institutional Ethical Committee (IEC), study was conducted in 40 patients of ASA I and II divided into 2 groups A & B by computer generated random number table. Patients, in group A received inj. Dexmedetomidine 1 mcg/kg i.v and group B received inj. Butorphanol 10 mcg/kg i.v, in infusion over 10 minutes prior to induction. Induction was done with inj. Propofol i.v 2mg/kg and maintained with 33% O<sub>2</sub>, 66% N<sub>2</sub>O & 0.6-0.8% of isoflurane with patient breathing spontaneously. Throughout the surgery the sedation and analgesia was maintained with inj. Dexmedetomidine 0.7 microgram/kg/hr infusion in group A and with inj. Butorphanol 2 microgram/kg/hr in group B. Patients were evaluated in postoperative recovery room with help of Visual Analogue Scale (VAS) for pain, Ramsay Sedation Score & Standard Aldrete Score for recovery.

**Results:** Demographically, the two groups were similar. Requirement of inhalational anaesthetic agents was significantly reduced in the group A ( $p < 0.05$ ). VAS was significantly less ( $2.75 \pm 0.44$ ) in the group B after 90 min and earlier rescue analgesia was given in group A ( $p < 0.05$ ). Eye opening was earlier ( $45.5 \pm 23.61$ ) in group A and was highly significant ( $p < 0.001$ ). Postop recovery was significantly improved ( $9.8 \pm 0.41$ ) with dexmedetomidine group.

**Conclusion:** Dexmedetomidine produces better sedation and analgesia without significant adverse effects and can be used as sole sedative and analgesic for day care surgery patients with better recovery.

**KEYWORDS :** Dexmedetomidine, butorphanol, day care, analgesia, Ramsay Sedation Score.

### Introduction

Pain is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage." [1] Dexmedetomidine is the dextrorotatory *s*-enantiomer of medetomidine. It is a  $\alpha$ -2 agonist. Use of  $\alpha$ -2 adrenoceptor agonist is not new, it dates back to 1960's but it was approved in December 1999, as the most recent agent in this group and was introduced into clinical practice as a short-term sedative (<24 hours). The development of new, more selective  $\alpha$ -2 adrenoceptor agonists with improved side effect profiles may provide a new concept for the administration of perioperative anaesthesia and analgesia. Dexmedetomidine, mechanism of action is unique and differs from those of currently used sedative agents, including clonidine. By binding to the presynaptic  $\alpha$ -2 adrenoceptor, it inhibits the release of norepinephrine, therefore, terminate the propagation of pain signals. Activation of the postsynaptic  $\alpha$ -2 decrease sympathetic tone, with attenuation of the neuroendocrine and hemodynamic responses to anaesthesia and surgery; reduce anaesthetic and opioid requirements; and cause sedation and analgesia. They allow psychometric function to be preserved while letting the patient rest comfortably. Butorphanol tartrate, (-) - 17 - (Cyclobutyl-methyl) morphinan-3, 14 - diol D- (-) - tartrate (1:1) (salt), is a synthetic intermediate acting opioid, agonist-antagonist of phenanthrene series. Butorphanol tartrate exhibits partial agonist-antagonist activity at  $\mu$  opioid receptor and agonist activity at the  $\kappa$  opioid receptor. It is five times more potent than morphine. An analgesic dose of butorphanol tartrate given by i.m, i.v or epidural route often produces marked sedation [2]. Butorphanol tartrate is a time tested analgesic used commonly in anaesthetic practice. Dexmedetomidine has been recently added to the armamentarium of anaesthesiologists for intra-operative and post-operative analgesia [3]. In this study we have compared it with butorphanol tartrate when used in providing intra-operative and post-operative analgesia.

### Aims and Objectives:-

- To compare Dexmedetomidine with Butorphanol in short general anaesthesia- day care surgeries.
- To see whether Dexmedetomidine and Butorphanol reduce the induction dose of propofol and volatile inhalational anaesthetics.

- To compare the untoward effects of Dexmedetomidine and Butorphanol.
- To compare the efficacy of Dexmedetomidine achieving intraoperative and postoperative analgesia with that produced by using Butorphanol.

### Materials & Method:-

- Prior permission of institutional ethical committee was obtained to conduct the study.
- The study was conducted in 40 patients. In group A patients received Dexmedetomidine (n=20) & in group B patients received Butorphanol (n=20) randomized by chit method.
- All patients were subjected to thorough pre-anesthetic evaluation and relevant laboratory investigation.

### Inclusion Criteria:-

- ASA grade I or II.
- Age 18-60 years.
- Availability of informed consent.
- Patients undergoing elective short gynaecological procedures under short general anaesthesia.
- Hemodynamically stable patients with all routine investigations within normal limits.

### Exclusion criteria:-

- Patients unwilling or hesitant to undergo the procedure under prescribed anaesthesia.
- Patients with known hypersensitivity to opioids.
- Patients addicted to opioids.
- Patients with chronic obstructive pulmonary disease, bronchial asthma and/or respiratory insufficiency.
- Patients with head trauma and raised intracranial pressure due to any cause.
- Patients suffering from psychiatric illnesses.
- Emergency surgeries

- Method of randomisation:-** A statistician was consulted and with the help of chit method randomization was done, adequacy of

sample size and power of test was confirmed and then 40 patients were divided into 2 equal groups of 20 patients each ie. Group A and group B.

- Group A: Patients were given Inj.Dexmedetomidine 1mcg/kg body weight as loading dose and maintained on 0.7 mcg/kg body weight.
- Group B : Patients were given Inj.butraphanol 10mcg/kg body weight and maintained on 2 mcg/kg body weight

**Methodology**

Anaesthetic plan was discussed and explained to all the patients a day prior to surgery. Patients were asked for any previous history of allergy to any anaesthetic given before or any kind of medication. All patients were kept fasting overnight prior to scheduled day of operation. In operation theatre, pre-operative vitals i.e. Pulse rate, BP, oxygen saturation were recorded. 20 gauge i.v cannula was placed in situ. All patients received inj.glycopyrolate 0.004 mg per kg body weight and injondansteron 0.1 g per kg body weight intravenously and inj.dexmedetomidine 1 microgram /kg body weight intravenously in infusion pump over 10 minutes prior to induction of GA in group A & inj.Butraphanol 10mcg/kg in infusion pump over 10 minutes body weight intravenously prior to induction of GA. After medication patients in both the groups were analysed for sedation using Ramsay sedation scale(4) & anxiety prior to induction.

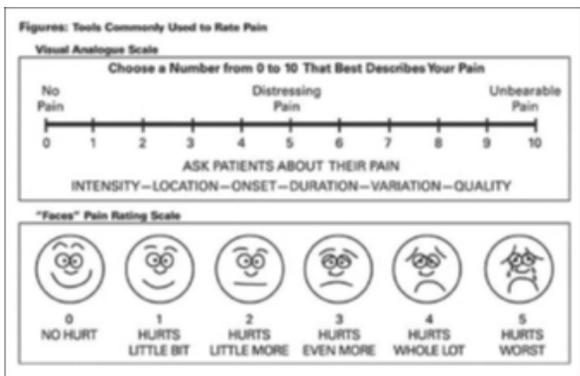
Source: Arq. Bras. Cardiol. vol.93 no.6 São Paulo Dec. 2009.

**Table 1 - Ramsay scale for the assessment of the level of sedation**

LEVEL OF ACTIVITY	POINTS
Patient anxious, agitated or restless	1
Patient cooperative, orientated and tranquil	2
Patient responding only to verbal commands	3
Patient with brisk response to light glabella tap or loud auditory stimulus	4
Patient with sluggish response to light glabella tap or loud auditory stimulus	5
Patient with no response to light glabella tap or loud auditory stimulus	6

All the patients of group A were maintained on 0.7mcg/kg dexmedetomidine infusion and all the patients of group B were maintained on 2mcg/kg butarphanol infusion. Infusions were stopped 5 minutes prior to end of surgery. Following preoxygenation induction of GA was done with inj. propofol 2 mg/kg body wt. After the loss of eyelash reflex / patient in apnea patients were ventilated via face mask till the patient regains the spontaneous ventilation. Anaesthesia was maintained with 33% oxygen, 66% nitrous oxide and isoflurane (0.5% to 0.8%), with the patient breathing spontaneously. In the recovery room patient were followed up for vitals, for pain using visual analog scale(5) & standard Aldrete score[6] for recovery.

**Table 2:- VAS**



**Table 3:-Standard Aldrete score.**

Criteria	Points
<b>Vital signs</b>	
Within 20% of preoperative baseline	2
Within 20–40% of preoperative baseline	1
> 40% of preoperative baseline	0
<b>Activity level</b>	
Steady gait, no dizziness, at preoperative level	2
Requires assistance	1
Unable to ambulate	0
<b>Nausea and vomiting</b>	
Minimal, treated with oral medication	2
Moderate, treated with parenteral medication	1
Continues after repeated medication	0
<b>Pain: minimal or none, acceptable to patient, controlled with oral medication</b>	
Yes	2
No	1
<b>Surgical bleeding</b>	
Minimal: no dressing change required	2
Moderate: up to two dressing changes	1
Severe: three or more dressing changes	0

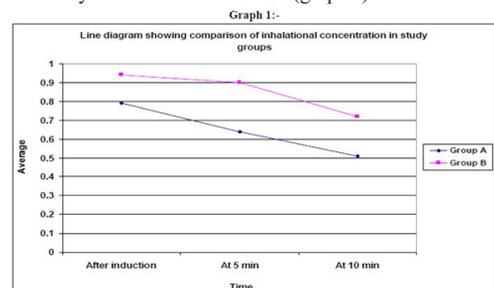
Source: Rev. bras. ter. intensiva vol.21 no.2 São Paulo Apr./June 2009

Along with this, vitals were monitored. (Pulse, BP, SPO2 and RR). The patient were followed up until the VAS was more than or equal to 5. Then the rescue analgesia will be given if required. The time will be noted and patient will be released from the study. Results in both groups will be tabulated and compared to draw the conclusion.

**Parameters Recorded**

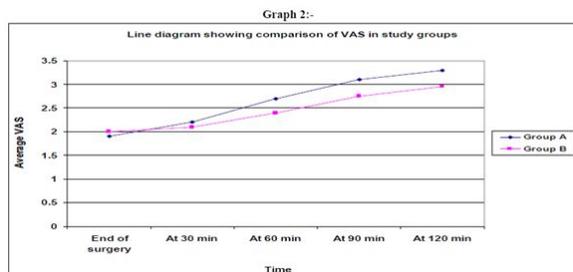
1. Pre operative vitals
2. Base line vitals before premedication.
3. Vitals before induction.
4. Intra operative events (average).
5. Post operative vitals.
6. Duration of surgery
7. V.A.S score :
  - T0 – at the time of premedication: drugs to be given.
  - T1 – when patient wakes up/responds to verbal stimuli
  - T2 – when patient starts complaining of pain with V.A.S > or equal to 5 (rescue analgesia to be given)
  - T1-T2 = total duration of action
8. Ramsay sedation score.
9. Standard aldrete score for recovery.

**Results:-** There was no significant difference in pulse rate. There was significant fall in systolic (z = 2.55) and diastolic (z = 2.04) blood pressure in dexmedetomidine group after induction. (p< 0.05). Requirement of inhalational anaesthetic agents was significantly reduced in the dexmedetomidine group (p < 0.05) as compared to the butorphanol group (graph 1). VAS was significantly less (2.75 0.44) in the butorphanol group after 90 min and earlier rescue analgesia was given in dexmedetomidine group ( p< 0.05) (graph 2). Sedation score in both the groups was similar as assessed by Ramsay sedation score. Eye opening was earlier (45.5 / 23.61) in dexmedetomidine group as compared to the butorphanol group and was highly significant as p < 0.001 (graph 3). Recovery was significantly improved (9.8 0.41) with dexmedetomidine group than butorphanol group and its p < 0.001 as assessed by Standard Aldrete Score. (graph 4)

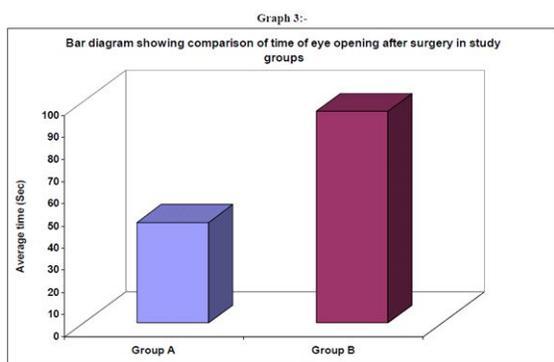


**Graph 1:** Line diagram showing comparison of inhalational concentration in study groups after induction, at 5 min, at 10 min

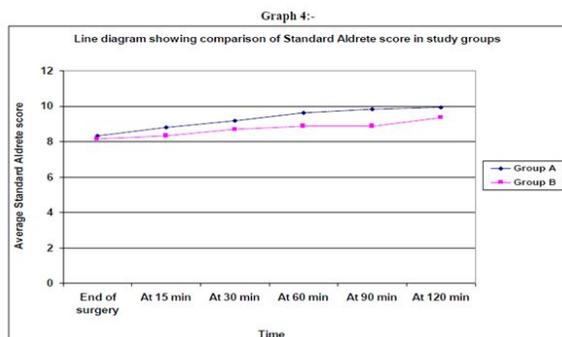
**Graph 2:-** Line diagram showing comparison of VAS in study groups  
0 0.51 1.52 2.53 3.5 End of surgery At 30 min At 60 min At 90 min At 120 min Time Average VAS Group A Group B 0 10 20 30 40 50 60 70 80 90 100 Average time (Sec) Group A Group B Bar diagram showing comparison of time of eye opening after surgery in study groups



**Graph 3:-** Bar diagram showing comparison of time of eye opening after surgery in study groups.



**Graph 4:-** Line diagram showing comparison of Standard Aldrete score in study



## Discussion

In the modern day hospitals, there is an established principle of ambulating the surgical patient as early as possible. Day care surgery (6) has been defined by the Royal College of Surgeons as when the surgical day case patient is admitted for investigation or operation on a planned non-resident basis and who requires facilities for recovery. This definition excludes upper and lower GI endoscopies, outpatient procedures such as flexible cystoscopy, and minor superficial surgery under local anaesthetic, none of which require full day care facilities for recovery. It is important to mention that day care surgery is different from out-patient surgery in that the patients of day care surgery need some degree of post-operative observation for a few hours. All day care surgical patients essentially come early in the morning and after the surgery is over and the post-operative observation is uneventful, the patient is discharged home the same day. The reduction in cost to both the patient and community, coupled with the advantages of Day Surgery for both patients and their relatives, have served to increase the demand for Day Surgery. The use of a Day surgery facility reduces the number of in-patient beds required. Shortened hospital stays and earlier mobilisation also reduces the risk

of hospital-acquired infections and venous thromboembolism (VTE). The bulk of these patients come from specialties of ophthalmology and ENT, followed by Gynaecology and General Surgery. The other super-specialties only contribute a very small fraction.

In last few years, a great enthusiasm has been shown toward the use of  $\alpha_2$  agonists in anaesthesia practice because it has been found to decrease serum catecholamine levels by upto 90%, to blunt the haemodynamic response to laryngoscopy, tracheal intubation, pneumoperitoneum and extubation, to provide sedation without respiratory depression and to decrease post-operative analgesic requirements. Whereas butorphanol is used as a pre-anaesthesia adjunct, narcotic analgesic for the relief of moderate to severe migraine, postoperative, or obstetric pain. Early studies suggested that butorphanol did not produce compete respiratory depressant effects and a plateau or "ceiling effect" was observed.

In 2003, Ard et al and Nelson et al suggested that Dexmedetomidine provides sedation, analgesia, and anxiolysis with minimal effect on respiratory function during the awake craniotomy similar to sedation during natural sleep. (8)

In 2009, Wang F et al study found in a study that the butorphanol combined with intravenous morphine PCA in patients undergoing abdominal hysterectomy shows effective analgesia with sedation and fewer side effects. This study also demonstrated that the butorphanol group had analgesia superior to the physiological saline control. The study found that there were no differences between urinary catheterization of more than 24 h, first time out of bed and time to discharge to home. (9)

We choose butorphanol as drug of comparison with dexmedetomidine because the analgesic activity is 4-7 times that of morphine, 15-30 times that of pentazocine (10) and has fewer side effects than other opioids and all of them can be reversed by naloxone. The safe dose of butorphanol that can be given intravenously is 20-40  $\mu\text{g}/\text{kg}$ . We have used 10  $\mu\text{g}/\text{kg}$  of butorphanol in our study. The duration of analgesia after intravenous injection of 1 or 2 mg of Butorphanol lasts for 3-5 hours. (11)

## Conclusion

Our study demonstrated that dexmedetomidine produces better sedation and analgesia without significant adverse effects compared to butorphanol. It can be used as sole sedative and analgesic for day care surgery patients. Patients also show better and faster recovery on usage of dexmedetomidine.

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