

Intravenous Dexamethasone as an Adjuvant in Reducing Post-Operative Pain, Nausea, Vomiting and Shivering

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Abstract

Background: Outcome of any surgery depends on perioperative care of patients. Aim of our study was to hasten the recovery by reducing most common encountered complications like Pain, Nausea, Vomiting and Shivering seen in immediate postoperative period by using single dose of intravenous Dexamethasone. **Subjects and Methods:** This prospective randomized controlled study enrolled 120 patients scheduled for surgery under general anaesthesia. Patients were randomly divided in two groups. Group 1 was given intravenous Dexamethasone 8mg (2ml) preoperatively and Group 2 was given intravenous normal saline(2ml). Patients were observed for 24 hours post operatively to record postoperative pain, nausea, vomiting, shivering, haemodynamic and other complications. **Results:** Both the groups were similar in demographic data. Patients from study group had statistically significant lower postoperative VAS for pain at 0hrs, 6hrs and 24hrs (P value 0.048). Similarly patients of study group was also found to have statistically significant low incidence of Nausea (P value 0.022), Vomiting (P value 0.033) and shivering grade (P value 0.008) in first postoperative day. There was lesser requirement of rescue analgesia and rescue antiemetic in patients pre-treated with Dexamethasone (P value <0.05). There were no significant variation in blood sugar levels or any other side effects noted in any patients. Patients from study group were more comfortable postoperatively as compared to control group. **Conclusion:** Intravenous 8mg Dexamethasone given preoperatively was found to reduce immediate postoperative pain, shivering, nausea and vomiting without any significant side effects.

Keywords: Fentanyl, Dexmedetomidine, BIS monitoring, Endoscopy.

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Introduction

Despite of increasing number of complex surgical procedures, anaesthesia has now become safe due to advanced technology and safer medicines. Surgery and anaesthesia together leads to lots of metabolic, hormonal, inflammatory and immune responses and attenuation of these not only reduce morbidity postoperatively but also leads to early recovery of patients.

Dexamethasone is synthetic glucocorticoid (half-life 36 to 72 hours) is most potent, cheap and easily available medicine that has been used in various inflammatory disorders till now. Now a days it is one of the important agent used as adjuvant to nerve block. It is also used for smooth and early recovery as it blocks inflammation and stress response. It is used as adjuvant for analgesia and to treat PONV. It is found to improve appetite, reduce shivering, enhance mood and give sense of wellbeing in recovery phase.^[1-3]

On this hypothesis that administration of small dose of Dexamethasone preoperatively improves quality of recovery,

we conducted this study on clinical parameters of postoperative pain, nausea vomiting, and shivering on 1st postoperative day.

Subjects and Methods

This prospective study was conducted after obtaining approval by hospital ethical committee in index medical college in February 2018 to February 2019. 120 adult patients of age 20 yrs. to 60 yrs. belonging to American Society of Anaesthesiologist physical status 1 & 2 of either sex undergoing surgery under general anaesthesia were included in this study. Exclusion Criteria: Patient's refusal, Patients taking steroids prior to the surgical procedure, Patients with known allergic reaction to Dexamethasone, any systemic illness, laparotomies, Laparoscopic Surgeries & Surgeries lasting more than 2hrs. After taking informed, written and valid consent patients were randomly divided in two groups on the basis of computer generated random table. All patients were preoperatively evaluated as per hospital's protocols and explained study protocol.

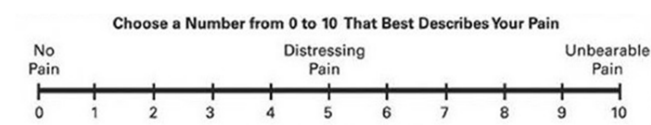
Group1 - Received intravenous dexamethasone 8mg (2ml) 60 minutes pre-operatively.

Group2- Received intravenous normal saline 2ml 60 minutes pre-operatively.

In preoperative room blood sugar and temperature of patients were recorded along with vitals. Intravenous Glycopyrrolate 0.004mg/kg and intravenous Midazolam 0.03mg/kg were given. Under proper monitoring general anaesthesia was induced with Intravenous Fentanyl 2mcg/kg and Intravenous Sodium thiopentone 4mg/kg. Endotracheal intubation was facilitated by Intravenous Succinylcholine 2mg/kg & kept on controlled ventilation on Oxygen +Nitrous Oxide + Sevoflurane. Muscle relaxation was achieved with Intravenous Vecuronium loading (0.08 – 0.12 mg/kg) and then maintenance dose (0.02mg/kg).Intravenous Diclofenac sodium 75mg aqueous form was put in drip to every patient. Intravenous Fentanyl was repeated after 1hr of duration if required, intraoperative Intravenous fluid was given as per requirement. At the end of surgery patients were reversed with intravenous Glycopyrrolate 0.01mg/kg and Neostigmine 0.05mg/kg, extubated after meeting Aldrete score and were shifted to Postoperative anaesthesia care unit (PACU). All patients were monitored for hemodynamic, input, output charting and other vitals.

Visual analogue scale for pain (VAS score)^[11], grading of Nausea and Vomiting^[12] and shivering^[16] was evaluated at 0 hrs, 6 hrs. And 24 hrs post operatively, in accordance to the following tables.

VAS Score for Pain



Nausea Grading

Not at all -	Grade 0
Mild (Sometimes) -	Grade 1
Moderate (Often) -	Grade 2
Severe (most of the time) -	Grade 3

Vomiting Grading

No emesis (Complete control) -	Grade 0
One episode (Nearly complete control) -	Grade 1
Two episodes (Partial control) -	Grade 2
>= Three episodes (Failure/no control) -	Grade 3

Shivering Grading

1. Without Shivering	0
2. Occurrence of one or more of the following criteria	
A. Piloerection, peripheral vasoconstriction, peripheral cyanosis without other specific cause, but without visible muscle contraction.	1
B. Contraction observed limited to a bunch of muscle contraction.	2
C. Contraction observed in more than one group of muscles	3
D. The whole body clear muscular activity	4

Results

This study was conducted on 120 patients which was completed uneventfully without any significant unwanted side effects in any patient. Demographic data of our study in terms of Age, Sex, ASA status and duration of surgery did not differ in two groups (p>0.05) as shown in table1 .No patient was excluded from our study for any other reasons.

Table 1: Demographic Data

	Control	Case	P Value	Significance
Age(years)	34.37±13.378	40.52±11.478	0.561	NS
ASA(I/II)	39/21	28/32	0.396	NS
Duration of Surgery (min)	87.67±19.320	85.58±21.552	0.748	NS
Temperature (pre operatively)	98.37±0.427	98.22±0.502	0.346	NS
Sex	30/30(M/F)	36/24(M/F)		

S - Significant, NS - Not significant, Mean +- 2 Standard deviation. All the patients were analyzed postoperatively for VAS score for pain and maximum.

Table 2: Comparison of VAS for pain, and grading for nausea, vomiting, shivering in two groups at different time intervals.

	Control			Case			P Value	Significance
	0 Hrs	6 Hrs	24 Hrs	0 Hrs	6 Hrs	24 Hrs		
Analgesia	4.02±1.242	2.75±0.795	2.45±1.185	3.52±1.269	2.53±1.016	2.25±1.144	0.048	S*
Nausea	0.22±0.220	0.05±0.220	0.10±0.354	0.17±0.592	0.03±0.181	0.05±0.22	0.022	S*
Vomiting	0.24±0.635	0.07±0.252	0.02±0.129	0.18±0.617	0.07±0.252	0.0±0.0	0.033	S*
Shivering	0.84±0.781	0.07±0.252	0.02±0.129	0.71±0.418	0.05±0.220	0.0±0.0	0.008	S*

Difference between the two groups of 0.50 of score was seen at immediate postoperative period that is at 0 hrs which was statistically significantly lower in study group. Similarly VAS score at 6 hrs and 24 hrs was also found to be significantly lower in the study group (p value 0.048) as shown in [Table 2].

Table 3: Number of Analgesia Needed.

No. of Rescue analgesia (control)	No. of Rescue analgesia(case)	P Value	Significance
29 (48.3%)	11 (18.3%)	0.027	S*

*S - Significant, NS - Not significant, Mean +- 2 Standard deviation.

Grading of nausea and vomiting among the 2 groups at 0 hrs,6 hrs and 24 hrs were as follows as shown in table 2.Nausea in study group was found to be lower in grade as compared to control group (p value 0.022) similarly vomiting was also found to be lower in study group (p value 0.033). Thus nausea and vomiting were found to be statistically significantly lower

in the study group. Intensity and severity of shivering was compared at 0hrs, 6hrs, and 24hrs as shown in table 2. P value was found to be 0.008 which was statistically significant, indicating lower grade of shivering in study group.

29 patients in control group and only 11 patients in study group out of 60 each received rescue analgesia in the form of intravenous Paracetamol 1gm (when VAS score for pain was more than 5) which was statistically significantly high in control group as shown in [Table3].

Table 4: Number of Anti Emetic Needed

Control	Case	P Value	Significance
No. of Metoclopramide	No. of Metoclopramide		
22 (36.6%)	17 (28.3%)	0.006	S*

*S - Significant, NS - Not significant, Mean +- 2 Standard deviation.

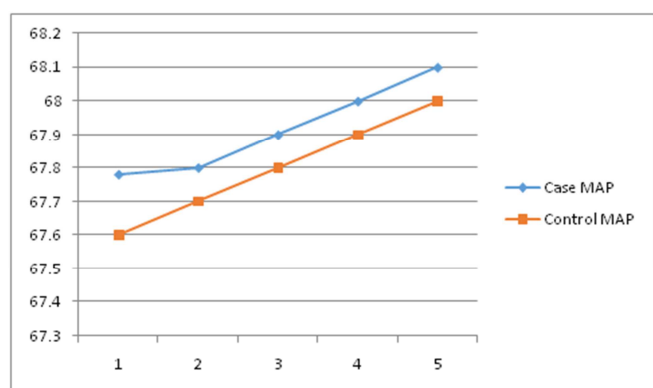
Post operatively 22 patients in control group and 17 patients in study group received intravenous Metoclopramide for nausea and vomiting as rescue antiemetic when grade of nausea and vomiting reached up to 3. This was again found to be statistically significantly high in control group as shown in [Table 4].

Table 5: Blood Sugar (Complication)

Blood Sugar	Control	Case	P Value	Significance
Pre OP	96.40±12.781	90.82±11.787	0.52	NS
06 Hrs Post OP	117.70±17.675	107.92±12.192	0.77	NS

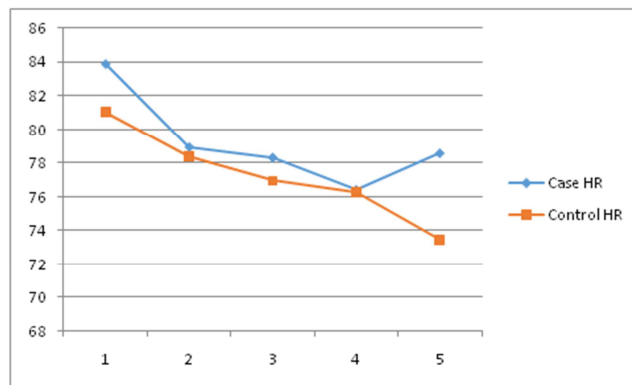
*S - Significant, NS - Not significant, Mean +- 2 Standard deviation.

All patients were evaluated preoperatively and after 6 hrs of operation for blood sugar which was found to be clinically not significantly changed there by showing that Dexamethasone indirectly has no effect on blood sugar levels as shown in [Table 5].

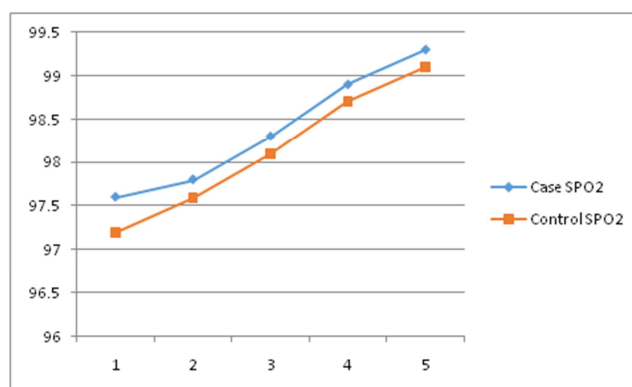


Graph 1: Mean Blood Pressure

Patients from both group were found to be hemodynamically stable for Mean Arterial Pressure (MAP), Heart Rate (HR) and Arterial Oxygen Saturation (SpO2) throughout the peri operative period, as depicted in [Graph 1, 2 and 3].



Graph 2: Heart Rate



Graph 3: Blood Saturation

Over all patients who received intravenous Dexamethasone were found to show lesser incidence of nausea, vomiting, shivering and lower VAS score for pain. They were more comfortable, relaxed with good mood as compared to control group and also received lesser medication in the postoperative period.

Discussion

Recovery from general anaesthesia is a time of great physiological stress that affects multi organ system. Common problems that hampers early recovery are pain[4], nausea[5], vomiting[6], shivering[7], hypothermia, hypertension, delirium etc. Prevention and treatment of postoperative complication is the mainstay for Enhanced recovery after surgery (ERAS) [13].

Dexamethasone has been used to reduce inflammation in number of medical conditions like Rheumatoid arthritis, inflammatory bowel disease etc. Similarly if given preoperatively Dexamethasone is found to reduce inflammatory mediators during surgical procedures thereby reducing postoperative complications generated by these inflammatory mediators. [8-10]

Number of studies had been done which show that single dose of dexamethasone given preoperatively is found to be effective in reducing postoperative pain, nausea, vomiting, shivering and oedema.

Dexamethasone as Analgesic

Due to strong antiinflammatory properties of Dexamethasone it was introduced for postoperative analgesia but mechanism

is not clearly known. Tissue damage due to surgery releases substance P, Bradykinin and Prostaglandins which stimulate the Delta and C fibre resulting in pain perception. Dexamethasone inhibits the synthesis of these mediators.

Waldron N.H et al 2013 [8] studies shows that single dose of dexamethasone given preoperatively reduce postoperative pain, required less analgesia and shorter PACU stay.

De Olivera et al 2011 [9] also studied the effect of single dose Dexamethasone and found it be effective adjuvant in multimodal approach to reduce the postoperative pain and rescue analgesia. We also found similar result like studies done by Waldron N.H et al and De Olivera et al , that Dexamethasone significantly reduces postoperative VAS score for pain ($p < 0.05$) in study group and hence the number of rescue analgesia.

Dexamethasone as Antiemetic

PONV is one of the common complication after surgery which delays recovery and discharge from hospital. The exact mechanism of Dexamethasone in PONV prevention is not fully understood. Dexamethasone is synthetic glucocorticoid which act on glucocorticoid receptors located in nucleus of solitary tract and area postrema. Dexamethasone prevents PONV by inhibition of prostaglandins synthesis and decrease in serotonin activity.

Kakodkar PSet al 2013 [14] studied the role of dexamethasone in postoperative nausea and vomiting and the result was significant inhibition of nausea and vomiting.

Chiu Ming et al 2011 [15] studies the prevention of nausea and vomiting by Dexamethasone. The IV dose of 5 to 10 mg for adults is effective and safe for PONV. This study suggest Dexamethasone given before induction of anaesthesia is highly effective in PONV prevention

DREAMS Trial Collaborators and West Midlands Research Collaborative found in their study that addition of single dose of 8mg intravenous Dexamethasone at induction of anaesthesia significantly reduces both the incidence of postoperative nausea and vomiting in first 24 hrs. and the need for rescue anti emetics for up to 72 hrs. in patients undergoing large and small bowel surgery with no increase in adverse events .As concluded by Chiu Ming et al and DREAMS trail Collaborators in our study we found that preoperative single dose of intravenous Dexamethasone 8mg significantly reduced ($p < 0.05$) the incidence of postoperative nausea and vomiting in study group, along with reduction in requirement of rescue antiemetic in first 24 hrs. Postoperatively.

Dexamethasone for postoperative shivering

Postoperative shivering is commonly seen after surgery. It leads to many complications like increased oxygen demand, rise in blood pressure, pain and carbon dioxide production. Body core temperature is one of the most important parameter to maintain the physiology of body. Due to anaesthesia the core body temperature regulation like vasoconstriction is abolished which cause peripheral vasodilation. Drug such as Dexamethasone reduce the

gradient between skin and core body temperature. It reduces shivering by regulating immune response.

Masood et al [16] studied the anti-shivering effect of Dexamethasone as compared to opioids (Pethidine). The conclusion of this study was administering Dexamethasone before the induction of anaesthesia was effective in reducing shivering.

Khosravi A et al [17] studied effect of Dexamethasone before induction of anaesthesia on postoperative shivering and they found that small dose of dexamethasone (0.15mg/kg) could effectively decrease the incidence of postoperative shivering. In our study we found that administration of preoperative Intravenous Dexamethasone helps in significantly ($p < 0.05$) reducing postoperative shivering in study group as also concluded by Masood et al and Khosravi et al.

Effect on Blood sugar

Many studies done till now on evaluation of effect of Dexamethasone on either postoperative pain, nausea ,vomiting or shivering they did not get any significant unwanted effect like hyperglycaemia.

Nazar c et al [18] showed single dose of Dexamethasone have failed to demonstrate significant impairment of blood glucose.

Pasternak JJ et al [19] concluded in their study that single intravenous dose of Dexamethasone elevate intraoperative blood glucose but in our study we observed that short term treatment with Dexamethasone does not leads to any significant change in the blood sugar levels which goes along with the study done by Nazar C et al.

Several studies were done till now to investigate effect of Dexamethasone as adjuvant to analgesia , antiemetic and as antishivering individually, we have tried to keep all parameters together along with wellbeing of patients to focus on smooth recovery of patients.

Goal of any surgery is early recovery and discharge. On this goal we have worked on reducing immediate post operative complications which often delays early recovery.

Conclusion

In this study we observed that preoperative administration of 8 mg of Dexamethasone significantly reduced VAS score for pain, incidence of nausea and vomiting, shivering and enhance the sense of wellbeing on 1st postoperative day.

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