ORIGINAL RESEARCH PAPER

Anesthesiology

KEY WORDS: Dexamethasone, PONV, Hyperglycaemia, Head and neck surgeries

EVALUATION OF BLOOD GLUCOSE CONCENTRATION PROFILE AFTER 8 MG DEXAMETHASONE IN PATIENTS COMING FOR HEAD AND NECK SURGERIES

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ABSTRACT

BACKGROUND AND AIMS: Dexamethasone administration has many advantages in perioperative period. But being a corticosteroid, it can produce detrimental hyperglycaemia which may affect patient adversely. Hence the present study aimed at evaluating magnitude of hyperglycaemia induced by dexamethasone 8mg in patients undergoing elective head and neck surgeries.

MATERIAL AND METHODS: 60 patients belonging to ASA physical status I and II of either sex , aged between 18-65 years undergoing elective head and neck surgeries were randomised into two groups of 30 each and received intravenously. 2 ml bolus of either dexamethasone (8 mg) or normal saline before induction of anaesthesia. Blood glucose measurements were obtained at baseline (T0). Then 60 min (T1), 120 min (T2), 240 min (T3) and 24 hours (T4) after the intravenous injection. Data collected was analysed using Statistical software IBM SPSS 22.

RESULTS: There was an increase in blood glucose concentration from baseline at all time periods in both the groups. Increase in blood sugar levels was statistically significant in dexamethasone group at T3 and T4 compared to normal saline group.

CONCLUSION: Perioperative administration of single dose dexamethasone can cause significant increase in blood glucose concentration. Thus, the benefits of administering corticosteroids should be weighed against the potential side effects of hyperglycemia

INTRODUCTION

Dexamethasone given during perioperative period has many advantages. It is commonly used for postoperative nausea and vomiting (PONV) prophylaxis[11]. It has similar efficacy to ondansetron, without any sedative side-effects[11]. Many guidelines[12,21] for prevention of PONV advocates prophylaxis with combination therapy which includes dexamethasone in patients who are at high risk for PONV. The proposed mechanism of anti-emetic effect of dexamethasone is related to the inhibition of prostaglandin synthesis and an increase in the release of endorphins, resulting in mood elevation, a sense of "well-being" and appetite stimulation[13]. In order to obtain the highest efficacy against PONV, prophylactic dexamethasone administration should be given during the induction of anaesthesia, because the onset time of dexamethasone on antiemetic effect is approximately 2 hours, and its biological half-life is 36 to 72 hours[13]. Dexamethasone being a potent corticosteroid has anti inflammatory, immunomodulating, and analgesic[10]. It reduces edema, postoperative pain and opioid consumption after surgery[3]. Dexamethasone enhances recovery in the postoperative period by modulating the neuroendocrine and inflammatory stress response induced by surgery[10]. It is also known to reduce pain on Propofol injection[4]. But being a corticosteroid, it can increase blood sugar which may affect wound healing[8]. This effect may be related to an increase in gluconeogenesis and the development of insulin resistance[8]. Acute hyperglycemia may produce a number of adverse physiologic effects that include osmotic diuresis and hypovolemia, decreased immune function, increased circulating inflammatory cytokine concentrations and adhesion molecule expression, endothelial dysfunction, and electrolyte and acid-base imbalances[9]. Many studies [05,15] have reported that Peri-operative administration of dexamethasone as well surgical stress causes increase in blood glucose concentration, increase is significant when patient received dexamethasone. But there are studies[10] that reports blood glucose concentrations during the first 24 hours after administration of single dose dexamethasone did not differ from those observed after saline administrations. Hence present study is undertaken to determine whether single perioperative dose of dexamethasone (8mg) significantly influences blood glucose concentrations in patients undergoing head and neck surgeries.

MATERIAL AND METHODS

After Institutional Ethical Committee approval, 60 patients belonging to ASA physical status I and II of either sex , aged between 18-65 years, scheduled for elective head and neck surgeries under general anaesthesia were included and patients with FBS > 126 mg/dl , medical comorbities, ASA physical status III and above, posted for Emergency surgeries were excluded. After pre anaesthetic evaluation and routine investigations patient is taken up for surgery. Intra-operative anaesthetic technique was performed according to standardised institutional protocols. Routine monitoring (ECG, non-invasive blood pressure and pulse oximetry) was performed. Intravenous access was obtained and intravenous fentanyl 2 mcg/kg administered. All the patients received Ringer lactate intravenously intraoperatively and postoperatively.

Patients were randomly assigned to two groups of thirty each by sealed envelope method. Patients in Group 1 received intravenous bolus of 2 ml Dexamethasone (8 mg) and patients in Group 2 received intravenous bolus of 2ml of Normal saline. Intravenous propofol was used as an induction agent, and neuromuscular blockade was achieved using vecuronium. Maintenance of anaesthesia was with isoflurane in oxygen:air mixture. Intravenous Ondansetron 0.1 mg/kg was given to all patients before extubation. Neostigmine and glycopyrrolate were used to reverse neuromuscular blockade at the end of surgery. Patients were extubated after fulfilling the extubation criteria.

The blood glucose measurements were obtained from finger prick capillary blood samples at baseline (T0). Then 60 min (T1), 120 min (T2), 240 min (T3) and 24 hours (T4) after the intravenous injection and analysed using Glucometer. Data collected was analysed using Statistical software IBM SPSS 22. For statistical analysis of data within the groups paired 't' test was used while for comparison between groups independent 't' test was used.

RESULTS

A total of 60 patients who underwent head and neck procedures were enrolled for the study and were randomly divided into two groups .The demographic profiles of the patients in both groups were comparable with regard to age, body mass index and gender distribution. Patient characteristics are presented in Table 1. Distribution as per ASA status was similar in both groups and mean duration of surgery and anaesthesia was comparable in both groups and statistically non-significant (P > 0.05).

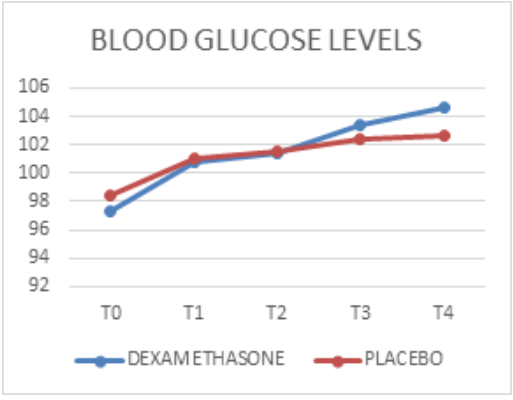
TABLE 1 - COMAPRISON BETWEEN THE TWO GROUPS INDEPENDENTLY

	GROUP	N	Mean	SD	t	Df	P VALUE
AGE	DEXA	28	43.39	17.087	0.572	56	0.57
	SALINE	30	41	14.765			
BMI	DEXA	30	24.6	1.07	0.969	58	0.336
	SALINE	30	24.33	1.061			

TABLE 2- BLOOD GLUCOSE LEVELS AT DIFFERENT TIME PERIODS

	GROUP	N	Mean	SD	t	Df	P VALUE
T0	DEXA	30	97.3	4.481	-1.006	58	0.319
	SALINE	30	98.47	4.501			
T1	DEXA	30	100.73	5.139	-0.276	58	0.783
	SALINE	30	101.07	4.16			
T2	DEXA	30	101.4	5.042	-0.085	55.036	0.932
	SALINE	30	101.5	3.981			
T3	DEXA	30	103.37	4.767	0.851	58	0.398
	SALINE	30	102.4	3.997			
T4	DEXA	30	104.63	4.545	1.787	58	0.079
	SALINE	30	104.63	102.63			

FIGURE 1 - BLOOD GLUCOSE LEVELS AT DIFFERENT TIME PERIODS

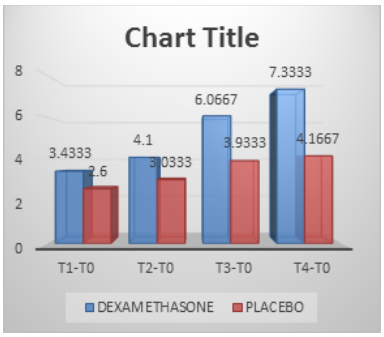


Mean blood glucose concentration increased from baseline T0 at all time periods T_1, T_2, T_3, T_4 in both the groups.

TABLE 3 - COMPARISION OF DIFFERENCES OF SUGAR LEVELS AT EACH TIME PERIOD FROM BASELINE

	GROUP	N	Mean	SD	t	Df	P VALUE
T_0-T_1	DEXA	30	3.4333	3.1259	1.163	58	0.25
	SALINE	30	2.6	2.37225			
T_0-T_2	DEXA	30	4.1	3.2942	1.405	58	0.165
	SALINE	30	3.0333	2.53912			
T_0-T_3	DEXA	30	6.0667	3.52267	2.679	53	**0.01**
	SALINE	30	3.9333	2.57218			
T_0-T_4	DEXA	30	7.3333	3.45746	3.656	58	**0.001**
	SALINE	30	4.1667	3.24923			

FIGURE 2- COMPARISION OF DIFFERENCES OF SUGAR LEVELS AT EACH TIME PERIOD FROM BASELINE



Comparision of differences of sugar levels at each time period from baseline in both groups is presented in Table.3. Comparision of differences of sugar levels from baseline T_0 is higher in Dexamethasone group at all time periods, but is statistically significantly higher at T_3 with a t value of 2.679 and p value of 0.01 and at T_4 with a t value of 3.656 and p value of 0.001. Although sugar levels increase in the normal saline group also, the rate of increase is more in the Dexamethasone group and is statistically significantly at T_3 and T_4.

DISCUSSION

In this randomized, double-blinded, placebo-controlled investigation, the effect of intraoperative single dose of Dexamethasone (8mg) on intraoperative and postoperative blood glucose concentrations was examined. A number of preoperative patient variables may influence the incidence of perioperative hyperglycemia, which include age, sex, body weight, and preoperative medications[10]. These risk factors were evenly divided among both groups. Intraoperative anesthetic management was standardized in both groups. In our study we observed a increase in mean blood glucose concentration from baseline T_0 at time periods T_1,T_2,T_3,T_4 in both the groups. This increase could be attributed to the surgical stress response characterized by changes in serum norepinephrine, epinephrine and cortisol levels[05]. Though Blood glucose concentration also increased over time in those who received placebo, but the magnitude of change was less than that observed in those receiving Dexamethasone and is not statistically significant. Increase in mean blood glucose concentration over time from baseline was 6±3.52 for T_3 and 7.3±3.45 for T_4 in Dexamethasone group when compared to 3.93±2.57 and 4.16±3.24 in normal saline group which was statistically significant. Greater increase in blood glucose concentration in Dexamethasone group may be due to increase in gluconeogenesis and development of insulin resistance[8] induced by it. This increase was seen as early as 4hrs after induction of anaesthesia. Our results correlate with the study of Jeffrey et al.[16] who observed that a single dose of Dexamethasone produced significant increase in the blood glucose concentration. In contrast to our study, Murphy et al[10] observed that blood glucose concentrations during the first 24 hours after administration of single low-dose dexamethasone did not differ from those observed after saline administrations. There was no incidence of clinically significant intraoperative hyperglycemia observed in both the groups in our study.

CONCLUSION

Peri-operative administration of single low dose dexamethasone causes statistically significant increase in blood glucose concentration. Thus, the benefits of administering corticosteroids should be weighed against the potential side effects of hyperglycemia especially in patients with impaired glucose tolerance test and diabetis mellitus.

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