Routine Administration of Dexamethasone in a Day Surgery Protocol might decrease postoperative vomiting and pain

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Abstract

Background and Objectives: Postoperative vomiting (POV) remains a major problem after ambulatory anaesthesia. In randomised controlled trials dexamethasone has been shown to reduce POV. We have investigated whether the routine use of corticoid administration can decrease the incidence of POV in ambulatory patients.

Methods: We analysed retrospectively 2115 patients, divided in two groups: Group A (n = 737) surgery undertaken between January and August 2001, without the use of dexamethasone; Group B (n = 1378) surgery undertaken between September 2001 and November 2002 with the administration of dexamethasone.

Results: Both groups were similar in relation to age, gender, physical status (ASA), surgical and recovery times; surgical specialty and anaesthetic technique.

We found a lower incidence of POV with the administration of dexamethasone and also a statistical significant inverse relationship between dexamethasone use and the level of pain ($p<0.001$).

Conclusions: Our study suggests that 5 mg dexamethasone given to patients undergoing a wide spectrum of surgery might reduce the incidence of POV and the level of pain.

Keywords: Postoperative vomiting; dexamethasone; pain; day surgery.

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Introduction

Dexamethasone is a corticosteroid that can decrease postoperative vomiting after ambulatory surgery. It has been used since 1981 with good results in reducing the incidence of emesis in patients undergoing chemotherapy [1–5]. The proposed mechanism of dexamethasone's anti-emetic effect 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 [6–8]. Dexamethasone is effective in reducing the incidence of postoperative vomiting (POV) in patients undergoing different types of surgery by about 26 percent [6,9–13]. In order to obtain the highest efficacy against POV, prophylactic dexamethasone administration should be given during the induction of anaesthesia, because the onset time of dexamethasone on antiemesis is approximately 2 hours, and its biological half-life is 36 to 72 hours [14,15]. The commonly used dose for the prevention of POV is 8–10 mg i.v. but the minimum effective dose is suggested to be 5 mg in patients undergoing thyroidectomy and ambulatory laparoscopic surgery [10,16,17].

In this prospective analysis we tested the hypothesis that dexamethasone in the minimum effective dose can reduce the incidence of POV in the day surgery programme of our Institution.

Materials and Methods

We analysed our database that include 2115 patients, with data collected prospectively, between 1st January 2001 and 3rd December 2002, with physical status classification based on the American Society of Anesthesiologists scale (I to VI) and we accepted only patients between I and III. We divided the patients into two groups: Group A (n = 737) surgery undertaken between January and August 2001, without the use of dexamethasone; Group B (n = 1378) surgery performed between September 2001 and November 2002 with the administration of dexamethasone.

Patients were excluded from the study if they had active gastric pathology, hypersensitivity to corticoids or who had received antiemetics within 48 h before surgery.

All patients in the two groups received droperidol in anti-emetic doses (0.625 mg i.v.), based on our day surgery unit (DSU) protocol.

Patients in the dexamethasone group B received dexamethasone 5 mg i.v. Surgery time was determined from skin incision to completion of the procedure. Before leaving the operating room, fast-track eligibility (score > 12) was assessed using standardized criteria [18].

Vital signs were registered every 15 minutes in the post-anaesthetic care unit (PACU) and every 30 minutes in the intermediate post-anaesthetic recovery unit (phase II recovery room), till the discharge time. IV saline (0.9%) was given as maintenance fluid for each patient (minimum of 20 ml/kg). Analgesia was assessed by using a 10-cm linear visual analogue scale (VAS) with 0 corresponding to no pain and 10 to the worst pain and analgesics were given according to the DSU protocol. For the purpose of data collection, retching (same as vomiting but without expulsion of gastric content) was considered vomiting. Rescue anti-emetics (ondansetron 4 mg i.v.) were given if repeated vomiting occurred.

Data related to POV was collected (from 8:00 AM to 8:00 PM) by a team of nurses every 1 h, or by spontaneous complaint of the patients. Side effects if present were recorded.

Statistical analysis was performed, comparing discrete variables by using chi-square test. Metric variables were compared using

independent samples t-test. A p value less than 0.05 was considered statistically significant. All values were expressed as mean +/- SD or as percentages (%).

We compared statistically the 2 groups with cross-tables and verified both homogeneity to gender; ASA status; surgical and recovery times; surgical specialty and anaesthetic technique.

Results

Both baseline and operative characteristics were similar in both groups, except for age. (Table 1).

We found a lower incidence of POV in patients where dexamethasone was administered (p = 0,001) (Table 2.)

Moreover, we found an inverse relationship between the administration of dexamethasone and the level of pain ($p<0.001$) (Table 2)

The majority of patients reported low VAS pain scores (VAS < 3) in both groups: 95.2% in the dexamethasone group, 87.8% in the non-dexamethasone group. No significant side effects were found.

Discussion

Until 5 years ago, the incidence of POV at our DSU was similar to the 20% presented in the literature. It is one of the most annoying side effects after surgery performed under general anaesthesia [19,20]. Between 1998 and 2001 we were able to reduce this incidence to 8% owing to the introduction of low dose of intravenous droperidol (0,625 mg).

Table 1 Patient characteristic, anaesthetic and surgical data. Values are number of patients (%) except age, surgical time and recovery time, which are given in years and minutes; are presented as mean + standard deviation (SD), and with the 95% confidence interval (CI). ASA = American Society of Anesthesiologists.

Characteristic	A - without dexamethasone (n=737)	B - dexamethasone 5 mg (n=1378)	difference (95%CI)	t-test p-value
Age, yr	37.7 + 16.8	39.8 + 17.0	2,08 (0.56-3.59)	0.007
Surgical time, min	35.3 + 25.1	35.2 + 24,3	0.08 (-2.12-2.28)	0.945
Recovery time, min	364.8 + 115.5	365.8 + 120.1	1.02 (-9.65-11.69)	0.946
Characteristic	**A - without dexamethasone (n=737)**	**B - dexamethasone 5 mg (n=1378)**	**chi-square test p-value**	
Sex, No (%)			0.572	
Male	340 (46.1)	618 (44.8)		
Female	397 (53.9)	760 (55.2)		
ASA, No (%)			0.069	
I	407 (55.2)	692 (50.2)		
II	278 (37.7)	590 (42.8)		
III	52 (7.1)	96 (7.0)		
Surgical specialty, no (%)			0.349	
General Surgery	326 (44.2)	643 (46.6)		
Vascular Surgery	92 (12.5)	158 (11.5)		
Gynaecology	107 (14.5)	163 (11.8)		
Neurosurgery	25 (3.4)	37 (2.7)		
Neuropathology	35 (4.8)	58 (4.2)		
Orthopaedics	78 (10.6)	180 (13.1)		
Urology	74 (10.0)	139 (10.1)		
Anaesthetic technique, no (%)			0.163	
General anaesthesia	311 (42.2)	607 (44.1)		
Loco-regional anaesthesia	95 (12.9)	203 (14.7)		
Combined anaesthesia	215 (29.2)	342 (24.8)		
Sedation	116 (15.7)	226 (16.4)		

Table 2 The Evaluation of POV and Level of Pain. Values are number or proportion.

variable	A – without dexamethasone (n=737)	B - dexamethasone 5 mg (n=1378)	Chi-square test p-value
POV, No (%)			p = 0.001
No	699 (94.8)	1346 (97.7)	
Yes	38 (5.2)	32 (2.3)	
PAIN, No (%)			p < 0.001
Minimum (VAS 0-3)	647 (87.8)	1312 (95.2)	
Moderate (VAS 4-6)	88 (11.9)	65 (4.7)	
Severe (VAS 7-10)	2 (0.3)	1 (0.1)	

In this study, we found that dexamethasone in the minimum effective dose (5 mg i.v.), could reduce even more the POV incidence, reaching values below 3%.

All data related to POV was collected every 1 h, until the patient discharge. We had no possibility of obtaining information about the vomiting incidence in the first 24–48 hours after discharge, because only recently we have introduced a follow-up service by phone to all our patients, during the first 24 hours after operation.

The presence of risk factors such age, gender, physical status, history of motion sickness or postoperative nausea and vomiting, the duration of anaesthesia and type of surgery and anaesthetic technique, may contribute to the episodes of POV [21,22,24–26].

We found a small difference between the mean ages of both groups, yet this was statistically significant. However we doubt if this clinical difference could be strong enough to modify the results obtained, especially because this effect is small, the difference in POV due to an increase of 2 years of age is below 1%, and is not always detected [22,23,27].

Other patients' characteristics that may have modified the incidence of POV were well balanced between the two groups, so the differences found might be attributed to the use of dexamethasone. Nevertheless, we did not assess the history of POV or the non-smoking status, as this was a retrospective analysis and this data was not collected. These two factors if present in a higher percentage in one of the groups could influence the results obtained but given that the population was comparable in other aspects it is unlikely that an imbalance has caused this difference.

Another limitation of our study was the fact that it is a non-randomised design. However the effectiveness of dexamethasone in the prevention of POV is well proven [6,9–12] and thus the need for another placebo-controlled trial can be questioned from an ethical point of view. Moreover, the aim of this study was to see the impact of dexamethasone in our DSU clinical practice and if we could reduce even more the incidence of POV.

The dose often used is 8 to 10 mg and Lee at al. have demonstrated that the pre-induction administration of 8 mg i.v. was the smallest effective dose for the reduction of PCA (patient-controlled analgesia) morphine-related POV [28], but the minimal effective dose is 5 mg in patients undergoing thyroidectomy and ambulatory laparoscopic surgery [21,25,26]. Another study by Apfel et al. supports that at least 4 mg of dexamethasone i.v. is equally effective to 1,25 mg i.v. droperidol and to 4 mg i.v. ondansetron, all antiemetics can be freely combined, and that the type of surgery doesn't affect the efficacy of antiemetics [13]. In this study we wanted to use the minimum dose capable of lowering the incidence of POV with a minimum of side effects.

At the end we found that the dexamethasone group (5 mg) had a lower incidence of POV (p=0.001) and lower levels of post-operative pain (p<0.001). These results are similar to the ones found by Baxendale et al, who also reported decreased wound pain following extraction of third molar teeth after dexamethasone administration [29]. However, Liu et al. showed different results since the influence of dexamethasone on postoperative pain was minimal in patients undergoing major surgery [30,31], and by Lee at al. who reported that dexamethasone might not alter the intensity of pain after surgery, nor did it enhance the efficacy of PCA-morphine [28].

Probably, the different postoperative pain intensities and different degree of inflammation and oedema associated with different types of surgery can explain these differences, remembering that pain after tooth extraction might be related to swelling and that dexamethasone has a potent anti-inflammatory effect. This needs to be studied further.

The exact mechanism by which dexamethasone, a corticosteroid, exerts an anti-emetic action is not fully understood but there have been some suggestions, such as central [6–8] or peripheral mechanism [7,11,33]. It also has strong anti-inflammatory actions and may significantly reduce tissue inflammation around the surgical sites and thus reduce the ascending parasympathetic impulses (e.g., vagus) to the vomiting centre reducing POV. Finally, theoretically, as dexamethasone has a potent anti-inflammatory

effect, it probably also has the capacity to lower postoperative pain [30,32,33,34]. However these results are not conclusive and further investigations are needed.

Long-term corticosteroid therapy causes side effects such as an increased risk of infection, glucose intolerance, delayed wound healing, superficial ulceration of gastric mucosa, and adrenal suppression with significant morbidity [34]. However, side effects from short corticosteroid therapy (24–48 h), even in a high dose, have been rare. In the current study, no discernible side effect accompanying a single dose of dexamethasone 5 mg was found. Although a single dose of dexamethasone is considered safe [6,9,10,29,32], further studies are warranted.

As we used dexamethasone in all our patients in order to prevent POV, we can be criticized because of: i) promoting an increased rate of side effects owing to its corticosteroid properties; ii) giving it to patients who probably did not need it; iii) increasing costs related to the administration of this drug. Nevertheless, the authors are not aware of any important complication related to this low-dose corticosteroid administration. Moreover, the administration of 5 mg dexamethasone represented an increase in costs of around 0.7 € per patient and when associated with droperidol 0.625 mg an increase of 1.3 € per patient. Our results have proved that we have been able

to reduce POV incidence from around 20% without antiemetics to values lower than 3% when we gave a combination of dexamethasone and droperidol to all patients. The question is: Was this a price too high to pay for the advantages that we got? Gan et al in a way answered this question when they reported that patients are willing to pay between US$56 and US$100 for a completely effective antiemetic [35].

In conclusion, our study suggests that 5 mg dexamethasone given to patients undergoing a wide spectrum of surgery might reduce the incidence of POV and the level of pain.

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