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SHORT COMMUNICATIONS

Effect of dexamethasone on postoperative emesis and pain

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Summary

In this double-blind, randomized, placebo-controlled study, we have evaluated the effect of preoperative administration of dexamethasone on postoperative vomiting and pain in 60 women undergoing general anaesthesia for major gynaecological surgery. Dexamethasone 10 mg (group D) or saline (group S) was administered i.v. in a double-blind manner during induction of anaesthesia. Postoperative pain relief was controlled with bolus doses of morphine using an i.v. patient-controlled analgesia device, and patients were assessed for incidence of vomiting, sedation score, verbal pain rating score, time to first morphine demand and morphine consumption at 4, 8, 12 and 24 h after surgery. Six patients in group D and 19 in group S experienced vomiting at least once within the 24-h postoperative period; dexamethasone was effective in reducing the overall incidence of vomiting from 63.3% to 20.0% ($P < 0.01$). Other variables were similar between the groups, and the influence of dexamethasone on postoperative pain was minimal. (*Br. J. Anaesth*. 1998; **80**: 85–86)

Keywords: pharmacology, dexamethasone; vomiting, nausea, postoperative; vomiting, incidence; pain, postoperative; analgesia, patient-controlled

In 1964, Smith and colleagues injected a steroid–penicillin–local anaesthetic mixture into the tonsillar fossae during surgery and observed a reduction in postoperative pain and inflammation.[1] In 1972, Papangelou compared oral dexamethasone, in combination with analgesics, with analgesics alone, in 480 patients undergoing tonsillectomy and found less tissue oedema and pain in the steroid-treated group in the postoperative period.[2] After the antiemetic effect of dexamethasone had been well established in patients receiving cancer chemotherapy in the 1980s, McKenzie and co-workers showed that ondansetron and dexamethasone were more effective than ondansetron and saline in the prevention of postoperative nausea and vomiting (PONV).[3] Recently, the antiemetic effect of dexamethasone alone was demonstrated successfully in paediatric tonsillectomy patients and ambulatory gynaecological patients.[4,5] Tissue injury-induced acute inflammation is known to play a significant role in the genesis of surgical pain, and dexamethasone should theoretically be beneficial in the management of acute surgical pain because of its potent anti-inflammatory effect. In this study, we have examined a single dose of dexamethasone 10 mg i.v. as an antiemetic and its influence on postoperative pain in adult patients undergoing major gynaecological surgery.

Methods and results

After obtaining approval from the Human Investigation Committee and informed patient consent, we studied 60 ASA I–II patients undergoing major gynaecological procedures. Anaesthesia was induced with fentanyl 5 $\mu g\ kg^{-1}$ and diazepam 0.15 $mg\ kg^{-1}$; tracheal intubation was facilitated with lidocaine 1.5 $mg\ kg^{-1}$, thiopental 4 $mg\ kg^{-1}$ and succinylcholine 1.5 $mg\ kg^{-1}$. General anaesthesia was maintained with halothane or isoflurane, 50% nitrous oxide in oxygen and i.v. infusion of atracurium. Before surgical incision, dexamethasone 10 mg or normal saline 2 ml was administered i.v. in a double-blind manner. At the end of operation, the trachea was extubated when the train-of-four ratio was greater than 75% without the aid of an anticholinesterase.

For postoperative analgesia, a PCA pump was programmed to deliver morphine 1.5 mg i.v. on demand with a lockout interval of 10 min, and pain intensity was rated by patients using a 0–10 verbal pain score (VPRS 0–10: 0 = no pain, 10 = most severe pain imaginable). Level of sedation was assessed by staff in the acute pain team using a 0–3 scale (0 = fully awake; 1 = asleep with response to stimulus; 2 = asleep without response to stimulus; 3 = comatose). Episodes of vomiting, VPRS, sedation score, time to first morphine demand and morphine consumption were recorded at 4, 8, 12 and 24 h after operation. Duration of hospital stay was also noted. Rescue antiemetic administration of prochlorperazine 10 mg i.m. was given at the patient's request. Data were analysed using the Student t test, chi-square test or Mann–Whitney U test, as appropriate, and are presented as mean (SEM). Statistical significance was assumed at $P < 0.05$.

There was no significant difference between groups in age, weight, height, ASA status, type and duration of surgery, duration of hospital stay, VPRS, sedation score, time to first morphine demand or morphine consumption (table 1). Emesis occurred in six of 30 (20.0%) patients in group D compared with 19 of 30 (63.3%) in group S ($P = 0.00738$). Among those who experienced emesis, all six of group D and

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Table 1 Postoperative morphine consumption (mg) (mean (SD))

Time after surgery (h)	Group D ($n=30$)	Group S ($n=30$)
4	3.1 (0.2)	3.4 (0.2)
8	5.6 (0.5)	6.5 (0.4)
12	8.1 (0.8)	9.5 (0.6)
24	14.4 (1.4)	16.9 (1.0)

Table 2 Number of patients who vomited. $^{\star}P<0.05$

Vomiting episodes	Group D ($n=30$)	Group S ($n=30$)	P
>4	0	5*	0.02609
1-4	6	14*	0.02846
0	24	11*	0.00066
Incidence	20%	63.3%	
Patients received prochlorperazine	0	8*	0.00229

14 of group S patients had vomited no more than four times ($P = 0.02846$); the remaining five patients in group S vomited more than four times ($P = 0.02609$). The frequency of emesis in group S was significantly higher than that in group D (table 2).

Comment

The mechanism of dexamethasone-induced antiemesis is not fully understood, but central inhibition of prostaglandin synthesis[6] and decrease in 5-HT turnover in the central nervous system[7] or changes in the permeability of the blood CSF barrier to serum proteins[8] may be involved.[9] In contrast with the reported decreased wound pain following extraction of third molar teeth after dexamethasone administration,[9] the consistent reduction in morphine requirements observed in group D patients in this study was not significant ($P = 0.053$). Different postoperative pain intensities among these patients may be the major reason for this discrepancy. With its strong anti-inflammatory effect, dexamethasone should theoretically be beneficial for acute surgical pain, while for pain of lesser extent, its influence should be evident; for worse pain, its influence tends to be relatively small.

The number of patients required for this study was calculated to detect a difference in morphine requirements of 1.1 mg with a power of 90% at the 5% level of significance. Based on this, a minimum of 22 patients was required in each group. There were 30 patients in each group which implies that comparisons between groups were effective.

Dexamethasone is known to cause side effects such as increased incidence and severity of infection, adrenal suppression and delayed healing in surgical patients. The lack of difference in duration of hospital stay between groups implied that there was no additional wound infection or delayed healing accompanying dexamethasone usage. However, detailed investigation with a longer follow-up would be necessary to investigate this. The reported dose of dexamethasone for prevention of PONV is 0.15 mg kg^{-1}, up to a maximum of 10 mg i.v., yet favourable results were also noted with a single oral dose of dexamethasone 8 mg in adult patients.[9]

Among the antiemetics currently used, 5-HT antagonists (ondansetron, granisetron) are known to possess good antiemetic efficacy; however, their cost limits widespread clinical use. As emesis is not caused by a single mechanism at a specific site, studies with various combinations of antiemetics with different mechanisms of action may be promising. Dexamethasone, its with significant antiemetic properties and no evident adverse effects, may be a valuable constituent of combination antiemetic therapy.

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