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Original Article

Treatment of Postoperative Shivering with Dexamethasone: A Prospective Randomized Clinical Trial

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Abstract

Background: Postoperative shivering is an important and troublesome condition during recovery from general anesthesia. Corticosteroids have been recommended to facilitate recovery and diminish shivering after cardiac surgery. Previous studies recommended 0.6 mg/kg dexamethasone for reducing postoperative shivering in patients undergoing cardiac surgery.

Objective: To test this assertion, we administered 0.15 mg/kg dexamethasone to patients undergoing routine surgeries, *e.g.*, laparotomy, thoracotomy, and orthopedic, urologic and gynecological operations.

Methods: A total of 200 patients undergoing elective operations were randomly selected and divided into two groups. To the first group 0.15 mg/kg dexamethasone and to the control group, a placebo was injected right after the induction of anesthesia and before making any skin incision. Patients did not have any coexisting diseases, *e.g.*, diabetes, hypertension, ischemic heart disease, etc., nor were they on any specific medication. All patients received the same doses of diazepam, morphine, sodium thiopental, 50% O_2, 50% N_2O, and 0.5% halothane for the induction and maintenance of general anesthesia.

Results: Patients who had received dexamethasone had a significantly ($p<0.001$) lower incidence of postoperative shivering (12%) compared to the control group receiving placebo (31%).

Conclusion: Small doses of dexamethasone (0.15 mg/kg) could effectively decrease the incidence of postoperative shivering.
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Keywords • Dexamethasone • shivering, postoperative • anesthesia, general

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Introduction

Postoperative shivering is reported in 5% to 76% of patients undergoing different kinds of operations in the immediate postoperative period.[1-3]

Table 1: The incidence of postoperative shivering in different surgeries

Type of Surgery	Placebo(%)	Dexamethasone(%)	p-value
General	16 (36.4)	7 (12.5)	0.004
Orthopedic	10 (30.3)	4 (21.1)	NS
Urologic	2 (16.7)	1 (10)	NS
Gynecologic	3 (27.3)	0 (0)	NS
Total	31	12	0.001

It is a troublesome condition for both the anesthesiologist and the patient. Shivering increases O_2 consumption by 100% to 600%, and elevates CO_2 production, heart rate, blood pressure, cardiac stroke volume, intracranial pressure (ICP), and intraocular pressure (IOP). Suppression of shivering, on the other hand, decreases metabolic demands and myocardial work.[3,4] The etiology of postoperative shivering is still unclear; however, it is thought that intraoperative hypothermia and reset of thermoregulatory centers are the major causative factors.[3,5] Besides, electromyography studies have shown that post-anesthesia shivering is different from cold-induced shivering.[3,6] Other factors thought to modulate shivering include anesthetic drugs used, and febrile response.[3,6,7]

In humans, core temperature is normally maintained within narrow limits of 36.5 to 37.5°C.[8,9] It is believed that postoperative shivering occurs in response to intraoperative hypothermia and a decrease in skin to core temperature gradient.[10] Dexamethasone can decrease the temperature gradient between core and skin via its anti-inflammatory action and inhibition of the release of vasoconstrictors and pyrogenic cytokines.[11-15] According to the reported studies patients who had open cardiac surgery, besides a reduction in the incidence of postoperative shivering, dexamethasone facilitates early tracheal extubation, reduces the incidence of early postoperative fever, and is associated with a lower incidence of new onset atrial fibrillation.[16-17] This study was done to evaluate the effect of dexamethasone, on the incidence of postoperative shivering after non-cardiac surgeries.

Patients and Methods

Between November and December 2000, two hundred patients (114 males and 86 females), aged 18 to 50 years, undergoing different types of elective surgeries (including urologic, gynecologic, orthopedic and general) and for whom the average duration of operations was three hours, entered a prospective, randomized double blind controlled trial. After obtaining written informed consents, we divided the patients into two equal groups. The study group received 0.15 mg/kg dexamethasone and the control group, an equal amount of distilled water as placebo. All patients received the injections after the induction of anesthesia and before making any skin incision. Both groups received exact doses of diazepam, morphine, Na-thiopental and nondepolarizing muscle relaxants (atracurium or pancuronium) for induction. Anesthesia was maintained with 50% O_2, 50% N_2O, and 0.5% halothane. All patients were premedicated with 0.15 mg/kg diazepam orally 8 to 10 hrs before operation. None of the patients had any co-existing disease and did not receive any specific medication. Shivering, defined as generalized, repetitive involuntary skeletal muscle contractions, was checked during the first 30 min after discontinuation of N_2O and halothane at the end of surgery. The temperature of the operating rooms was the same for all patients (20º C).

Statistics

We processed and interpreted the data, using SPSS Software program and chi-square test.

Results

In the control group, 25.6% of females and 35% of males, and in the dexamethasone group, only 7.1% of females and 15.5% of males had shivering ($p<0.02$). These data show that low dose dexamethasone (0.15 mg/kg) significantly reduces the postoperative shivering, both in female ($p<0.02$) and male ($p<0.02$) patients (Table 1).

Regardless of sex, dexamethasone reduces the incidence of postoperative shivering significantly from 31% in the placebo group to 12% in the study group ($p<0.001$) (Table 1).

Discussion

We found that low dose (0.15 mg/kg) dexamethasone significantly ($p<0.001$) decreased the postoperative shivering compared to placebo. The difference in the incidence of shivering between males and females was not statistically significant.

As observed in previous studies, dexamethasone inhibits shivering independent of any other factors

including, age, duration of anesthesia and type of operation.[3,5] However, these studies found no difference between the core and skin temperatures, and the core to skin temperature gradient between the patients who shivered and those who did not.[3,11,12] Shivering also occurs in some patients who are actively warmed and who remain normothermic during surgery.[3,7] Current treatment of shivering includes avoidance of intraoperative hypothermia, application of external warming devices, meperidine, clonidine and neostigmine.[3,18]

Previous studies on patients undergoing cardiac surgery revealed that **e**xcept for decreased glucose tolerance and mild metabolic acidosis no other important adverse effect could be attributed to dexamethasone, with respect to mortality and morbidity.[16,17]

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