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Title : MEPERIDINE ARRESTS POSTANESTHESIA SHIVERING

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Introduction. In this study we determined the effectiveness and minimal dose of meperidine to arrest postanesthesia shivering and prevent its recurrence. We evaluated meperidine because it has been used to control chills and shivering resulting from granulocyte infusions and chemotherapy[1] and because clinical experience suggests that intravenous meperidine is effective in the perioperative period. Shivering occurs unpredictably during emergence from anesthesia and increases metabolic need for oxygen, increases CO_2 production and produces acidemia. Patients with compromised cardiopulmonary reserve or neuromuscular disease may not be able to compensate for these increased demands. Postanesthesia shivering is also uncomfortable and frightening to the patient. Thus, treatment should be available to reduce this stress.

Methods. We studied 58 ASA physical status I or II patients over a three month period when one of the authors was available. All patients were awake and shivering at the time of admission to the recovery room. Shivering was defined as involuntary muscular activity; either generalized or present predominantly in the neck, thorax and jaw muscles. Spastic involuntary muscular activity which occurred before the patients regained consciousness was not called shivering.[2] Criteria for selection were: 1.shivering determined visually to last more than 5 minutes, 2.ability to respond to a simple command, 3.stable BP,RR, and pulse. We studied patients regardless of anesthetic technique. We excluded patients who had intracranial, cervical or ear operations. We administered meperidine, IV, according to a randomized, double-blind design. The doses and number of patients receiving each dose were 6.25mg(10), 12.5mg(12), 25mg(11), 37.5mg(4), or 50mg(9). The fact that only 4 patients received 37.5mg was a result of randomization. Control patients(12) received saline. Shivering was graded as intense, mild or absent at 1,2,4,5,8,12,15,30 and 45 mins. after injection. We considered treatment a success if shivering stopped within 5 mins. after injection and did not recur within 45 mins. The effect of treatment(meperidine or saline) on shivering(stop or no-stop) was tested statistically using the chi-square test with Yates correction or Fisher's exact test for each dose of meperidine compared to saline.

We calculated the mean time to arrest shivering for all patients receiving meperidine, and for patients receiving each dose of meperidine. We then compared the time to arrest shivering for each dose of meperidine using a two-sample t-test. We used student's unpaired test to test age, body weight and duration of anesthesia as determinants of treatment success(stop shivering or no-stop) within the group of patients who received meperidine. We also evaluated the effect of gender, anesthetic agent(N_2O-narcotic or N_2O-halogenated agent), or site of operation (open or closed body cavity) on treatment success(shivering stop or no-stop) using the chi-square test.

Results. Meperidine arrested shivering within 5 minutes and prevented its recurrence within 45 mins. in 68%(31/46) of patients. In 8%(1/12) of patients receiving saline, shivering stopped within 5 minutes and did not recur during the next 45 minutes. The effect of meperidine on shivering is significant ($p<.001$). Eight of 12 patients receiving saline shivered more than 15 mins. Each dose was effective when tested against saline except for 6.25mg($p=.1$). In patients receiving meperidine, 12.5mg was successful in 67%(8/12,$p<.01$), 25mg was successful in 73% (8/11,p .001), 37.5mg was successful in 75%(3/4, $p<.05$) and 50mg was successful in 89%(8/9, $p<.001$). Meperidine did not arrest shivering within 5 minutes of injection in 15 patients. Of the 15 treatment failures, one cannot be explained. Of the 14 explainable failures, 6 received 6.25mg, 3 received a narcotic antagonist administered by their anesthetist in the operating room prior to admission to our study (12.5,25,50mg), one had documented bacteremia intraoperatively with rapidly rising temperatures (37.5mg) and one shivered after a blood transfusion(12.5mg). Another patient (12.5mg) was judged a treatment failure at 5 mins. but stopped shivering at 6 mins. and two may have had bacteremia(12.5, 25mg).

The mean time to arrest shivering was 3.3±.5 mins.(1 SEM,range 2-5mins.). The time to arrest shivering did not decrease significantly as the dose of meperidine was increased. There was no difference between patients treated successfully and unsuccessfully with meperidine on the basis of age, weight, or duration of anesthesia($p>.05$, t-test); and there was no difference between treatment success and failure on the basis of anesthetic agent, gender or site of operation ($p>.05$,chi-square). Four patients experienced adverse reactions to meperidine treatment. They were respiratory depression(37.5 and 50mg), vomiting(25mg) and retching(12.5mg). No patient had a change in BP or pulse requiring therapeutic intervention, two patients required nasal airways. No patient required a narcotic antagonist as a result of meperidine treatment for shivering. Eighty-seven % of all shivering patients felt cold prior to treatment. Most (exact % unknown) felt warmer or less cold after successful treatment.

Discussion. The low incidence of adverse reactions and high success rate from using meperidine for postanesthesia shivering make it a desirable treatment. The data suggest a dose of 12.5 to 25mg is sufficient. Neither of these doses was effective if the patient received a narcotic antagonist. However, a 50mg dose can arrest shivering, but not prevent recurrence, if the patient has had a narcotic antagonist.

References.

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2. Pflug AE, Aasheim GM, Foster C, Martin RW: Prevention of postanesthesia shivering. Canad. Anaesth. Soc. J. 25:43-54,1978.