EDITORIAL VIEW

Can you stop this shivering, doctor?

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SUMMARY

Postoperative shivering and feeling of cold associated with it is rated as worse than pain by some patients. It has been a problem not only after general anesthesia, but also during and after spinal anesthesia. This editorial compliments an original article in this issue of 'Anesthesia, Pain & Intensive Care' on comparison of three different drugs for the treatment of postoperative shivering, and draws attention towards pathogenesis of shivering and its control. Shivering is not a point in time event and its cessation with pharmacological intervention does not guarantee against its recurrence.

Key words: Postoperative shivering; Spinal anesthesia; Tramadol; Butorphanol; Ondanstron

Citation: Taqi A. Can you stop this shivering, doctor? Anaesth Pain & Intensive Care 2013;17(1):4-5

Shivering evolved as a protective response against hypothermia in mammals. This blessing may turn out to be a cause for distress in a significant number of patients undergoing anesthesia. Postoperative shivering is accompanied by cutaneous vasoconstriction and occurs in response to intraoperative hypothermia in majority of cases. Shivering associated with pain and accompanied by cutaneous vasodilatation is observed in around 15% cases.[1] Hypothermia during central neuraxial blocks is thought to be a consequence of absence of sensory input from the lower limbs.

Patients rate shivering as highly uncomfortable; feeling of cold associated with shivering is rated as worse than pain by some patients. It increases oxygen consumption, increases intraocular and intracranial pressures, interferes with monitoring and adds to postoperative pain by stretching the wounds[2]. Postoperative pain on the other hand may facilitate nonthermogenic shivering.[3] Eberhart has shown that beside patient's age and endoprosthetic procedures, core hypothermia is an independent risk factors for postoperative shivering.[4] Cutaneous warming improves patient comfort and reduces oxygen consumption but fails to decrease the duration of shivering in patients undergoing both regional and general anesthesia. This highlights the limited role of skin temperature in the control of shivering.[5] Rapid and effective control of shivering, therefore, is largely achieved using pharmacological means. A wide range of drugs have been tried with varying results; pethidine remains the most frequently tested drug with a consistent efficacy with an intravenous dose that is not likely to cause significant side effects.[6]

Monoamine theory of thermoregulation proposed by Feldberg and Meyers in 1963 attributed maintenance of body temperature to a balance between norepinephrine and 5-hydoxytryptamine (5-HT) in preoptic area of anterior hypothalamus. We now know that temperature regulation is not confined to a specific area of the brain, it is rather modulated by an interplay between different areas of the brain and spinal cord and chemical mediation is not confined to norepinephrine and 5-HT, peptides and cholinergic receptors influence the interthreshold range (range of temperatures between onset of shivering and sweating).[7] Therapies aimed at control of shivering largely work by targeting these chemical mediators. Tramadol largely works through its effect on alpha-2 receptors; nefopam, is a powerful antishivering agent inhibiting synaptosomal uptake of serotonin (5-HT), norepinephrine and dopamine. NMDA receptors are also involved, which explains the role of ketamine in preventing and treating shivering.[8]

In this issue of this journal, Suresh et al have compared the efficacy and safety of ondansetron, butorphanol and tramadol for control of shivering in patients undergoing surgery under spinal anesthesia.[9] This study highlights the importance of pharmacological interventions in control of shivering. The study is well designed; method of randomisation is described, both subjects and observers were blinded, eliminating the possibility of selection or observer bias; a sample size with the power to detect the difference between interventions was calculated and enough patients were recruited to have 13 or more patients shivering in each group; minimum required to detect a difference with sufficient power. Results of the study, however

are not exactly in line with earlier studies carried out with these agents. One reason could be different doses used. Ondansetrone was used in a dose of 4.0 mg - a dose usually employed for control of nausea and vomiting in clinical practice. Powell et al have shown that ondansetrone 8.0 mg rather than 4.0 mg is effective in preventing postoperative shivering as compared to placebo, lower efficacy of the drug in this study, therefore may not be surprising.[10] Butorphanol had a more rapid onset of effect and was effective in the control of shivering in greater number of patients with recurrence of shivering in lower number with tramadol. Both tramadol and butorphanol were significantly superior to ondansetron, no comparison was done between butorphanol and tramadol, which do not look significantly different in their effect, except a more rapid onset of effect with butorphanol at one minute.

Authors have conceded that the sample size may be small considering the burden of the problem. This may have contributed to lack of efficacy with ondansetron, a drug that has demonstrated its efficacy in other studies. A limitation of the study is failure to measure the core temperature. Ozer et al have shown that core temperature decreases while surface temperature increases irrespective of anesthetic technique. With ambient temperature of the operating room ranging between 22° to 28° C there is a possibility that differences in core temperature may have contributed to the frequency of shivering within groups.[11] Sedation was more frequent in butorphanol whereas nausea and vomiting were more frequent in tramadol groups, but was the study powered to detect a difference in these outcomes?

Shivering is not a point in time event and its cessation with pharmacological intervention does not guarantee against its recurrence. The authors followed these patients to look for recurrence of shivering that was observed in both Butorphanol and Tramadol but interestingly not in Ondansetron group. Perhaps a larger study would be able to observe the duration of anti shivering effect of ondansetron.

In the end, the authors need to be complemented for highlighting an important area for concern in our practice. Results of this study raise a few questions that can only be answered with further research.

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