Original Research Article: Prevalence of shivering after anesthesia in thyroidectomy

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ABSTRACT

Introduction: Due to the limited studies in the field of shivering after anesthesia in thyroidectomy surgeries, on the one hand, and different factors involved in the development of shivering in studies performed, on the other hand, and more sensitivity after thyroidectomy surgery to the hypothermia complications, the evaluation of the prevalence of postoperative shivering in children and determining the factors involved in its development was designed to use the results of the study to improve the anesthesia quality after thyroidectomy.
Materials and Methods: This study was performed between 2019 and 2020 with the participation of 100 patients candidates for thyroidectomy in the hospitals of Tabriz University of Medical Sciences. The prevalence of postoperative shivering in these patients was measured using an instrument for determining shivering after anesthesia and the results were reported.
Results: Prevalence of shivering in this study was 5% (6 patients). There was no significant difference between the two age groups and sex in terms of the prevalence of shivering. The prevalence of shivering was significantly lower in the intravenous anesthesia group ($p<0.05$). Also, in patients who received premedication anesthesia, the prevalence of shivering was significantly lower than patients who did not receive premedication ($p<0.05$).
Conclusion: The results of this study showed that the overall prevalence of shivering after thyroidectomy is the same as other surgeries. In addition, the prevalence of shivering after thyroidectomy is related to the patient's body temperature, recovery room temperature, receiving premedication, and type of anesthesia.

Introduction

The central temperature in humans is usually maintained in a small range. Adjustment of temperature changes during awakening is in the range of 0.1 °C. Induction of anesthesia disrupts this natural phenomenon and these changes are in the range of 2 to 4 °C during anesthesia [1]. Therefore, patients lose heat during anesthesia and therefore hypothermia is a common phenomenon during anesthesia. The onset of chills is a way to deal with hypothermia [2].

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The activity of the body temperature regulation system is disrupted by various factors, including drugs and diseases, and being in a cold environment exacerbates this disorder. Postoperative shivering, which involves muscle tremors and stiffness, is usually accompanied by heat loss and hypothermia. Hypothermia during anesthesia and surgery has several complications, including cardiovascular, metabolic, hematologic, delayed recovery from anesthesia, prolonged drug metabolism, and increased oxygen consumption [3,4]. In a limited number of studies performed on thyroidectomy, the prevalence of shivering and the factors contributing to its occurrence have been reported differently [5]. Due to the limited studies in the field of shivering after anesthesia in thyroidectomy surgeries, on the one hand, and different factors were involved in the shivering development in studies performed, on the other hand, and more sensitivity after thyroidectomy surgery to the hypothermia complications. The prevalence evaluation of postoperative shivering in children and determining the factors involved in its development was designed to use the results of the study to improve anesthesia quality after thyroidectomy.

Materials and Methods

In this descriptive-analytical study, 100 candidates for thyroidectomy were studied by convenience sampling method. After the patient entered the recovery room, patient information including age, sex, receiving or not receiving prodrug, duration of anesthesia, anesthesia method (patient armpit measurement method), and recovery room temperature were recorded in a questionnaire. The common prodrug in this center for patients is midazolam and fentanyl, which in all cases, is injected at the rate of one milligram per ten kilograms of weight in the prodrug room before transferring the patient to the operating room. The patient's body temperature was measured by placing a mercury thermometer on the axillary artery for ten minutes. In case of chills, its degree was determined according to Crossley and Mahajan criteria. Due to the possibility of differences in the prevalence of shivering before and after the age of six, according to a study by Mr. Akin *et al.*, we examined the prevalence of chills. Also, in case of complications due to hypothermia such as apnea and cyanosis, it was recorded in the questionnaire. After data collection, the data were statistically analyzed using SPSS software as well as Spearman and Chi-square tests. Chi-square test was used to compare the distribution of data frequency between both groups and Spearman test was used to determine the relationship between graded shivering and recovery room temperature and patient's body temperature in both groups.

This study was carried out with the approval of the Ethics Committee of Tabriz University of Medical Sciences and obtaining informed consent from all participants.

Results

The overall prevalence of shivering in this study was 5% (6 patients). There was no significant difference between the two age groups and sex in terms of the prevalence of shivering. The prevalence of shivering was significantly lower in the intravenous anesthesia group ($p < 0.05$).Also, in patients who received prodrug anesthesia, the prevalence of shivering was significantly lower than patients who did not receive prodrug ($p < 0.05$). In terms of the incidence of shivering based on the patient's body temperature in the recovery room, there was a significant difference between the temperature less than 0.4 °C and above ($p < 0.001$). In addition, no vibration was observed at the recovery room temperature above 37.2 °C. There was no significant difference between different surgeries in terms of the frequency distribution of shivering according to the type of surgery.

Discussion

The aim of this study was to evaluate the shivering prevalence after thyroidectomy and to determine the factors involved in its development. According to the results of this study, the prevalence of shivering after surgery was about 2%, which is lower than the usual

prevalence of shivering in adults. The prevalence of chills has been reported in several different studies in children [6]. In the Doyle and Moir study, the prevalence of shivering in children was reported to be between 2% and 2%. Crossley reported a prevalence of chills of 5%. In the study of Akin *et al.*, the prevalence of shivering was 2.7%. The different prevalence of shivering in the studies mentioned follows the same pattern in other surgeries [7]. Various studies report a prevalence of between 3% and 2% for shivering in adults. One of the reasons for these differences is the difficulty in diagnosing shivering, especially the first and the second degree shivering based on Crossly and Mahajan classifications in postoperative patients [8]. The fact that the patient's body is covered in the recovery room with different coverings is one of the reasons for this mistake. Other reasons for the use of different drugs during anesthesia can be the use of inhaled anesthetics, operating room temperature, fluid temperature, and the extent of surgery [9].

However, the common denominator of all these studies is that the prevalence of chills in children is generally lower than in adults. This is largely due to the role of brown fat metabolism in the body, and as the child gets older, brown fat replaces its role with the production of heat by shivering. Lyons *et al.* suggested Diazepam as a premedication on the prevalence of chills. In previous studies, they studied this issue, but could not find a relationship between the prevalence of chills and the use of diazepam as a premedication. However, in contrast to the results of a study by Lyons *et al.*, our study showed that the use of midazolam as a premedication reduced the shivering occurrence in the recovery room [10]. The role of midazolam on temperature regulation mechanisms has been the subject of several studies, but no definitive results have been reported. One study found that midazolam was the only drug that did not interfere with temperature regulation during spinal anesthesia. Since the predominant premedication used in our patients in this study was midazolam, the study of the role of this drug on the occurrence of chills requires additional studies.

In a study by Singh *et al.*, the induction of anesthesia with premedication reduced chills with respect to sodium thiopental. In the study of Akin *et al.*, shivering was greater in venous anesthesia. However, our study showed that the inhalants presence in the anesthesia of the patient increases shivering and the prevalence of shivering in patients who received intravenous anesthesia was significantly lower than the other two groups. The results of our study are in line with the findings of Singh *et al.* One of the characteristics of halogenated inhalation agents is anesthesia of diffuse vasodilation. Therefore, heat loss through the skin due to vasodilation is a reasonable justification for the higher prevalence of chills after receiving inhalation anesthesia in the recovery room [11].

In our study, there was a positive relationship between the incidence of chills and the patient's body temperature less than 1.5. This finding is in line with the findings of a study by Vaughan et al. However, a study by Lyons *et al.* was failed to establish such a relationship. Lyons *et al.* suggested that patients who experienced chills in the recovery room had less temperature during the operation, and in these patients, less active heating methods were used. Since our study was limited to the time of the recovery room and in a descriptive way, if the patient had a decrease in temperature during the operation, it was not treated because it was not monitored and as a result, the resulting hypothermia caused shivering in the recovery room. Failure to routinely monitor the patient's body temperature in our operating rooms can be the cause of this discrepancy in the results, because due to the lack of monitoring, patients' hypothermia temperature is not detected and as a result, timely facial treatments during surgery are less common. Our study showed that if there is a temperature of 26 °C or less in the recovery room, a higher prevalence of chills is observed. This finding is also in line with previous studies. The two most common methods of heat loss around the operation are through convection and radiation. Therefore, it is clear that the colder the environment, the

greater the risk of heat loss and chills. In the study by Lyons *et al.* [3], there was a positive relationship between atropine and ambient temperature. Since all patients received atropine in our study, the relationship between atropine intake and the prevalence of chills could not be studied. Likewise, there was a positive relationship between the incidence of chills and ambient temperature in our study [12].

Conclusion

The results of this study showed that the overall prevalence of shivering after thyroidectomy is the same as other surgeries. In addition, the prevalence of shivering after thyroidectomy is related to the patient's body temperature, recovery room temperature, receiving premedication, and type of anesthesia.

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