

Comparison of Nausea and Vomiting after Upper Limb Orthopedic Surgery in Two Groups with and without a History of Radiotherapy for Breast Cancer

Abstract

Background: To date, there has been no accurate information on whether the history of radiotherapy for breast cancer can lead to increased nausea and vomiting in upper limb orthopedic surgery or not. Therefore, the present study aimed to compare nausea and vomiting in upper limb orthopedic surgery candidates with and without a history of radiotherapy.

Methods: In total, 90 patients (45 per group) who were candidates for upper limb orthopedic surgery during 2019-2020 were selected by convenience sampling. In this research, post-operative nausea and vomiting (PONV) was assessed using the Rhodes Index. In addition, data analysis was carried out using the Shapiro-Wilk test and t-test, and a P-value of less than 0.05 was considered statistically significant.

Results: In this study, PONV was detected in 100% of the subjects with a history of breast radiotherapy, but only 40% of the participants (n=18) without a history of radiotherapy experienced PONV (P=0.001). According to the results, the mean and standard deviation of PONV in the group of patients with a history of radiotherapy was reported to be 25.51 ± 5.29 , which was significantly higher than the group of subjects without a history of radiotherapy (14.19 ± 3.45) (P=0.003).

Conclusion: According to the results of the present study, a history of breast radiotherapy could worsen nausea and vomiting after upper limb orthopedic surgery.

Keywords: Nausea, Vomiting, Orthopedics, Orthopedic Procedures, Radiotherapy

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Introduction

Postoperative nausea and vomiting (PONV) remains one of the most common complications related to surgery, which leads to patient dissatisfaction and discomfort, increased medical costs, increased need for antiemetic drugs, and higher stress in healthcare team members^(1, 2). Different severities have been recorded for PONV, the highest of which is related to abdominal surgeries. In general, abdominal surgeries are the second most performed procedures and have a long-term duration. Upper limb surgery is one of the most highly performed abdominal surgeries, and there is a high possibility of neural damages associated with this surgery⁽³⁾. Various factors are involved in this complication, including a history of PONV, nausea and vomiting in the days before surgery, duration of surgery, diabetes, use of analgesics (e.g., opioids) and some anesthesia drugs, as well as a history of chemotherapy and radiotherapy⁽⁴⁾. Radiotherapy is used to treat breast cancer, one of the most common complications of which is nausea and vomiting⁽⁵⁾. Of patients who receive upper-abdominal radiotherapy, 25-30% will experience nausea and vomiting. In fact, the more radiotherapy sessions, the more severe nausea and vomiting. Since nausea and vomiting caused by breast cancer treatment may remain several days after the radiotherapy process, it increases stress in physicians as a post-radiation issue⁽⁶⁾. There is no specific information about the possible role of radiotherapy for breast cancer in an increase of nausea and vomiting following upper extremity orthopedic surgery.

Therefore, the present study aimed to evaluate nausea and vomiting after upper extremity orthopedic surgery in two groups of patients with and without a history of radiotherapy for breast cancer.

Methodology

Study Design

This was a correlational study performed at Tabriz University of Medical Sciences in 2019-2020. The participants included women with a history of radiotherapy, who were candidates for upper extremity orthopedic surgery. Using the sample size formula in correlation studies, the sample size was estimated at 80 after pilot research (participation of 10 patients) at a Pearson's correlation of +42, a 95% confidence interval and 90% test power. However, considering a 10% attrition rate, a total of 90 individuals (45 per group) were selected by convenience and purposive sampling based on the inclusion and exclusion criteria.

Inclusion and Exclusion Criteria

The inclusion criteria were being a candidate for upper extremity orthopedic surgery, a history of radiotherapy for cancer treatment (for patients in the breast cancer group), method of general anesthesia for surgery, age above 18 years, and willingness to participate in the study. On the other hand, the exclusion criteria included trauma patients, a history of radiotherapy (for patients in the control group), a history of gastrointestinal problems, a history of psychological diseases under the supervision of a psychiatrist, a history of diabetes, and a history of endocrine disorders. It is notable that patients in the control group were selected from those who were similar to the patients of the main group in terms of demographic variables and type of surgery as well as the length of surgery in order to carefully examine the main outcome between the two groups.

Methods

Patients with a history of radiotherapy for cancer treatment referring to Shohada and Imam Reza Hospitals (affiliated with Tabriz

University of Medical Sciences) as candidates for upper extremity orthopedic surgery along with another group of other candidates without a history of radiotherapy (control group) were enrolled in the study. Patients underwent general anesthesia and surgery by an anesthesiologist and a surgeon, and PONV was assessed using the Rhodes Index tool.

Research Instruments

In this study, a two-section questionnaire was applied; the first section included age, number of radiotherapy sessions, body mass index (BMI), and marital status. The second section encompasses the Rhodes Index. This eight-item instrument was used to evaluate nausea and vomiting and its items were scored based on a five-point Likert scale. The score range of the tool is 0-22, where a higher score is indicative of worse nausea and vomiting.

Ethical Consideration

Attempts were made to adhere to ethical considerations by receiving consent from the participants prior to the research and ensuring them that participation in the study required no costs. Notably, the study was approved by the ethics committee of Tabriz University of Medical Sciences IR.TBZMED.REC.1397.598, and written informed consent was obtained from all patients and the research objectives were explained to them before initiating the study.

Statistical Analysis

Data analysis was performed in SPSS version 21 using the Shapiro-Wilk test and t-test. In addition, a P-value of below 0.05 was considered statistically significant.

Results

The mean and standard deviation of age and BMI of the participants were reported at 49.64 ± 5.18 years and 23.41 ± 3.89 , respectively. In addition, the majority of the participants were married and most of them had a history of 10-15 radiotherapy sessions. A comparison of demographic characteristics of the participants in the two groups showed no significant difference in this regard (Table 1).

In this study, PONV was observed in 100% of patients with a history of radiotherapy. Meanwhile, only 40% (n=18) of the subjects without a history of radiotherapy experienced nausea and vomiting. Therefore, PONV seems to be significantly higher in those with a history of radiotherapy, compared to those without a history of radiotherapy ($P=0.001$). In addition, the overall mean and standard deviation of PONV in the two patient and control groups was reported at 25.51 ± 5.29

and 14.19 ± 3.45 , respectively, which showed a significant difference between the groups in this regard ($P=0.003$). In addition, PONV was significantly higher in participants with a history of breast radiotherapy, compared to healthy individuals.

The results were indicative of a significantly higher frequency of PONV in patients with a history of radiotherapy, compared to the other group (Table 2).

Table 1. Demographic characteristics of the subjects

Variable		Cancer patient group	Control group	P-Value
Age (mean±standard deviation)		50.5±59.23	49.5±03.10	0.513
BMI (mean±standard deviation)		23.3±15.19	23.3±84.59	0.419
Number of radiotherapy sessions	<5	3 (06.66%)	3 (06.66%)	0.361
	5-10	7 (15.55%)	9 (20.00%)	
	10-15	15 (33.33%)	16 (35.55%)	
	15-20	13 (28.88%)	10 (22.22%)	
	>20	7 (15.55%)	7 (15.55%)	
Marital Status	Single	7 (15.55%)	5 (11.11%)	0.578
	Married	38 (84.45%)	40 (88.88%)	

Table 2. Comparison of frequency of PONV in the groups of patients with and without a history of radiotherapy

Variable		Cancer patient group	Control group	P Value
Frequency of PONV	1	5 (11.11%)	9 (20.00%)	0.361
	2	9 (20.00%)	6 (13.33%)	
	3	11 (24.44%)	3 (06.66%)	
	4	15 (33.33%)	0 (0%)	
	>4	5 (11.11%)	0 (0%)	

Discussion

The present study aimed to evaluate PONV in individuals with and without a history of radiotherapy. According to the results, radiotherapy history increased the frequency of nausea and vomiting after upper extremity orthopedic surgery. Similar to previous studies, PONV was observed in one-fourth to one-third of the participants. The results demonstrated that breast radiotherapy increased the frequency of nausea and vomiting after surgery. It is believed that the type and dose of the drug used in breast radiotherapy are among the causes of increased PONV. In addition, nausea and vomiting could be worse in surgery candidates

who have a history of breast radiotherapy, which is consistent with our findings. Studies conducted by Chiang et al.⁽⁷⁾, Dhawan et al.⁽⁸⁾, and Mohanty et al.⁽⁹⁾ are among the limited research on this topic, the results of which are in line with our findings. In addition to the higher severity of PONV in subjects with a history of radiotherapy, the frequency of nausea and vomiting was higher in those with a history of breast radiotherapy, compared to healthy individuals. In other words, a history of breast radiotherapy had an impact on the frequency of nausea and vomiting in subjects undergoing upper extremity orthopedic surgery. According to the results of the present research, there was a direct relationship between the frequency of PONV and radiotherapy and chemotherapy, which

inherently lead to nausea and vomiting. The higher the experience of nausea and vomiting for issues such as radiotherapy, the higher the frequency of PONV. In fact, a positive correlation was observed between the frequency of previous nausea and vomiting and PONV, which is congruent with our findings. In this respect, our findings are consistent with the results obtained by Ren et al.⁽¹⁰⁾, McCracken et al.⁽¹¹⁾ and Porceddu et al.⁽¹²⁾.

Some of the major drawbacks of the present study included lack of assessment of the type of surgery, duration of anesthesia, the amount of bleeding, and dosage of consumed drugs for anesthesia. It is recommended that the mentioned limitations be considered in future studies. Given the high prevalence of nausea and vomiting after upper extremity orthopedic surgery in subjects with a history of radiotherapy, it is suggested that medication and preventive measures for nausea and vomiting be taken for these people in future studies.

Conclusion

Nausea and vomiting after upper extremity orthopedic surgery depend on numerous factors. According to the results of the present study, a history of radiotherapy for cancer treatment could worsen PONV.

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