

# Effectiveness Dose of Injection Acetaminophen for Control of Shivering After General Anesthesia in Inguinal Hernia Surgery

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## Abstract

**Introduction:** Inguinal hernia is the most common type of abdominal hernia which is 7 times more common in men than women. Surgical treatment is performed under general anesthesia. about 40 to 60 percent of patients of post-surgery are experiencing tremor. these patients after anesthesia, shivering is very undesirable and from the physiological aspect is very stressful, mild tremor increases the oxygen consumption like a light physical activity and judder increases the metabolic rate and oxygen consumption up to 600%. injection acetaminophen is a safe drug, in recent study determines of Effectiveness dose for control of shivering after anesthesia in surgeries.

**Aim:** The aim of this study was to determine the effect of injection acetaminophen on the quality and timing of the Shivering after on the inguinal herniation surgery.

**Materials and Methods:** This is a randomized double-blind study, that the statistical population was patients that were candidates for general surgery, that were referred to hospitals of Qazvin University of Medical Sciences for treatment. The patient's undergone surgery with general anesthesia with number 1 and 2 anesthetic Class based on anesthesiologist detection. From 80 patients that were randomly selected, 40 people were selected for experimenting group with injection acetaminophen with IM injection of 0.5 mg/kg and 40 people were selected for the placebo control group (routine order).

**Results:** The shivering in the experimenting group was decreased than the control group and was statistically significant. Tremor intensity in the experimental group was lower than the control group in all three measures [1, 2] which was also significant for comparing the linear regression, relative risk (RR) was 8 in two groups according to the normal distribution of the data, in the age group between 20 to 40 years the minimum range of tremor was observed and in the age group that were younger than 20 years range of tremor was observed.

**Conclusion:** injection acetaminophen (IM) after general anesthesia can reduce the amount and severity of shivering at post-surgery and can be an effective choice drug in the post-surgery in patients with inguinal herniation surgery.

**Keywords:** inguinal herniation; injection acetaminophen; general anesthesia

## Introduction

An inguinal hernia is a protrusion of the contents of the abdomen in the area of the inguinal canal. The main cause of abdominal hernias is a decrease or weakness in the abdominal wall or increased pressure on it in one area. Inguinal hernia is the most common type of abdominal hernia, which is 7 times more common in men than women. Inguinal hernia repair is

one of the most common surgeries performed by general surgeons and its repair can be performed under general, typical (spinal) anesthesia or local anesthesia [1]. Considering that spinal anesthesia is a safe method of anesthesia for surgery, but about 40 to 60 percent of patients are experiencing shivering. for patients undergoing new methods of spinal anesthesia, shivering is very undesirable and from the physiological

aspect is very stressful, mild tremor increases the oxygen consumption like a light physical activity and judder increases the metabolic rate and oxygen consumption up to be 600%. This case causes a reduction in the amount of arterial oxygen, metabolic acidosis, increased intraocular pressure and increased intracranial pressure, and ECG monitoring, pulse rate, blood pressure and pulse oximetry are interference track in this situation [2]. A variety of methods exist to control shivering during spinal anesthesia: Such as non-pharmacological methods that are devices and equipment's that are used to maintain body temperature significantly, but this equipment may be expensive and not practical in all situations. In the pharmacological methods, several drugs have been studied for the prevention or treatment of tremor, including pethidine, flax serine, sufentanil, alfentanil, tramadol, Nefopam, physostigmine, Doksapram, clonidine and Nalbofen. These days the attempt is to use the drugs that are simple cost-effective and readily available. Although the mechanism of all drugs is not fully understood but the impact on body temperature regulation center, opiate receptors, antagonists' control of N-methyl-aspartate receptor in the regulation of body temperature reduces the tremor and shivering. acetaminophen is a safe drug, which is cheap and available that can inhibit shivering by controlling the competitive antagonist of -methyl-D-aspartate receptor. In recent studies the effects of acetaminophen alone or with other medications to reduce tremor during and after surgery with different doses (from 0.5 mg/kg) has been approved but the doses, have side effects such as hallucinations, that appropriate dosage in reducing tremor needs to be obtained by appropriate research. Other studies compared the effect of acetaminophen, pethidine and tramadol with comfort, tremor and temperature inside the esophagus that showed the impact of three drugs to prevent tremor during spinal anesthesia, but better hemodynamic stability and having less side effects of acetaminophen, is superior to the two other drugs. In a study in 2013 in South Africa on 90 patients with 60-18 years that anesthesia for lower limb surgery was performed, it was found that the effect of low-dose midazolam (0.2 mg/kg) with acetaminophen in prevention of tremor is equal to the effect of higher doses of midazolam by 0.25 mg/kg with acetaminophen. The effect of acetaminophen in cesarean section with spinal anesthesia revealed that 0.4 mg/kg acetaminophen, as much as 0.6 mg/kg acetaminophen is effective in preventing tremor. In

Iran a study in the field of contrasting the effect of different doses of acetaminophen and pethidine in reducing the tremor after cesarean surgery was performed, the results showed that: Although acetaminophen significantly controls the tremor but pethidine is still a better choice for this complication. Therefore, in this study the effect of intramuscular acetaminophen at a dose of 0.5 mg/kg to prevent tremor in patients undergoing spinal anesthesia were evaluated [3-16].

## Materials and Methods

This is a randomized double-blind study, that the statistical population was patients that were candidates for inguinal hernia Surgery with the age group between 20 and 60 years that were referred to hospitals of Qazvin University of Medical Sciences for treatment. Patients with emergency surgery, receiving blood and blood products, surgery less than half an hour and more than two hours, further period of anesthesia during surgery that requires medical intervention (drug) and those that have a history of chronic disease and drug consumption were excluded. After obtaining permission from the ethics committee of the University and necessary information, the consent of the patients has completed and the patient's undergone surgery with general anesthesia with number 1,2 and 3 anesthetic Class based on anesthesiologist detection. From 80 patients that were randomly selected, 40 patients were selected for experimenting group with acetaminophen IM injection related to Rotex of Germany and 40 patients were selected for the placebo control group (routine order). The surgery with general anesthesia was performed. Then the patient post-surgery was observed with the help of anesthesiologist using a visual scale of shivering or not and the degree of tremor (from zero to three), and required data were recorded in the check list. The tremor degree was determined as followed: - grade number zero was without shivering -grade number one was classy, mild tremor of the face and neck - grade number two was visible tremor in more than one muscle group - grade number three was the whole-body muscle activity [14]. Then the data were given to the SPSS29 software and was analyzed with independent t-test and regression. This plan was approved by the Ethics Committee in the Vice Chancellor for Research of Qazvin University of Medical Sciences and Health Services with the ethics code IR.QUMS.REC.1399.112 on 8/12/99.

## Results

Clinical signs and symptoms of shivering	Shivering degree
Without shivering	0
Low grade shivering of face and neck	1
Visible shivering in more than one muscle	2
Intense muscular activity in whole body	3

**Table 1:** Shivering category in patients.

Group / Shivering	frequency	0 degree of tremor	1 degree of tremor	2 degrees of tremor	3 degrees of tremor	Total	p-value
Experimenting group	Number of patients	19	14	6	1	40	0.003
	Percentage of patients	47%	35%	15%	2.5%	100%	
Control group	Number of patients	7	17	11	5	40	
	Percentage of patients	17.5	42.5%	27.5%	12.5%	100%	
Total	number	26	31	17	6	80	
	percent	32.5%	38.75%	21%	7.5%	100%	

**Table 2:** The degree of shivering in both control group and experimenting group

Shivering		Group	Without shivering		With shivering (from 1-3 degree)		p-value
Group/variable			Number	Percentage	Number	Percentage	
Experimenting group	sex	men	11	58%	8	38%	0.04
		women	8	42%	13	62%	
	Time of surgery	≤1hour	13	68.5%	5	24%	0.001
		>1hour	6	31.5%	16	76%	
	age	≤20y/o	5	26%	8	38%	0.02
		20-40	11	58%	4	19%	
40-60		3	15%	9	43%		
Control group	sex	men	2	28%	13	39%	0.036
		women	5	72%	20	61%	
	Time of surgery	≤1hour	3	43%	10	30%	0.0012
		>1hour	4	57%	23	70%	
	age	≤20y/o	2	28%	6	18%	0.73
		20-40	2	28%	20	60%	
40-60		3	43%	7	21%		

**Table 3:** The relation of dynamic variables with the degree of shivering in studied group

## Discussion and Conclusion

In this study, 40 patients were selected for experimenting group and 40 patients were selected for the control group, then comparing the two groups according to the normal distribution of the data, t-test independent and post hoc test were performed. The mean age in the control group was (30±77) y/o and the mean age in the intervention group was (29±47) y/o. A

significant difference with the age was observed (p=0.02), in the age group between 20 to 40 years the minimum range of tremor was observed and in the age group that were younger than 20 years and older than 56 years, the maximum range of tremor was observed. Most people were in the age group of 20-40 years (60%) with time surgery more than 1hour. The shivering severity of the patient's body was recorded in the

anesthesia class (class one, two, three) during the surgery by an anesthesiologist, according to the physiological conditions and (Table 1). In this study, all hemodynamic parameters were similar for both groups, except IM injection acetaminophen; anesthesia and the surgical procedures were performed in the operating room under the same conditions. The severity and timing Shivering in the experimenting group was lower than the control group and was statistically significant ( $p=0.003$ ). Shivering intensity in the experimental group was lower than the control group in all three measures [1, 2 and 3], which was also significant ( $p=0.003$ ). According to (Table 2), from 40 patients in the control group 33% of patients had no chills and 77% experienced the chill. From 40 patients in the experimenting group, 47% had no chills and 53% experienced the chill. With injection acetaminophen of 0.5mg/ kg, reducing from grade number 3 to zero was tangible ( $P = 0.001$ ). The results of this study matched with the study of Mr. Bhatnagar and colleagues confirm the effects of injection acetaminophen doses in reducing the chill during spinal surgery. Also in this study, according to the (Table 3), significant correlation between patient's ages and reduction in chills with injection acetaminophen in both groups, were observed. In the experimental group at an early age, the intensity of shivering increased but then it was considerably decreased and again at 40 years of age, an increase in shivering was observed. Which has been confirmed in other clinical trials (12-17) According to the table (3), in this study, using regression analysis, significant correlation was observed between shivering in both groups and time of surgery ( $P = 0.0012$ ), the highest chills were in more than 1 hour time of surgery less than 1 hour time of surgery and the lowest chills was in patient. The tremor was also higher in women than men, and this co-relation was statistically significant ( $P = 0.02$ ). This relationship shows that women are more prone to chills and necessary injection acetaminophen is more effective in this group. Because of low price and availability of injection acetaminophen, this drug is distinguished in this context. But the determination of a single dose of injection acetaminophen according to hallucinogenic effects of this drug after the patient's

www.opastonline.com J Anesth Pain Med, 2019 Volume 4 | Issue 4 | 3 of 5 recovery causes extensive research on the drug's dose. In this study, it was shown that the effect of injection acetaminophen (0.5mg/ kg) compared to the standard that was set for other studies

(0.3- 0.6. mg/kg) was effective in reducing the intensity of chills during the surgery with general anesthesia and controlling factors such as gender and type of surgery and anesthesia class can be very effective [22]. Also in this study, a comparison between the types of anesthetic drugs and injection acetaminophen dose with shivering was not performed but according to previous studies [24]. This factor can be very effective that by choosing a suitable auxiliary drug in spinal anesthesia (e.g., low dose of petedin or diazepam) that does not have a synergic or antagonistic interfere with the injection acetaminophen, shivering during the surgery can be controlled [20-25]. Hemodynamic status such as temperature, oxygen consumption, cell metabolism and electrolytic stability can be maintained with controlling the chill. The effective injection acetaminophen with the amount of 0.5 mg per kg of body weight to control or reduce the severity of shivering in this study had the same preventing effect in reducing the chill in patients who had undergone the general anesthesia with the study that was conducted by Coase and colleagues, with the injection acetaminophen of 0.6 mg per kg of body weight up to 0.5 mg per kilogram of body. This study and other studies in addition to demonstrating the efficacy of acetaminophen in reducing the shivering, which confirms the results of our study, emphasized on achieving a single and effective dose [13-18]. The relationship between age and the dose of injection acetaminophen in both groups with decreasing the chill and its severity was observed that the amount of shivering in the age groups under 20 and more than 60 years was more than the age groups between 20 and 60 years. In other studies, such as Miller and colleagues it was found out that two factors have played a decisive role in the incidence of tremor: 1 - Young people 2 - reduction in central body temperature. Also, it is believed that with the increasing in the age of patients, the threshold of shivering, which in normal condition is at a temperature of 36 °C, decreases one °C and reaches to 35 °C. In other words, shivering is higher in the old and adolescents age group. injection acetaminophen was effective for both the upper and lower age limit that corresponds with the results of the study. Considering the prevalence of shivering among adolescents and old people, other methods of analgesia or anesthesia should be used for this age group or the necessary conditions (operating room temperature regulation function and intravenous fluids and blood, and the use of cover heating) for tremor controlling

during spinal anesthesia for the patient - before anesthesia -should be provided. Other notable results from this study were the association of gender with shivering ( $P=0.06$ ), which is in same direction with available resources. In both groups, as well as control group, shivering in women was more than men. Reduction and control of shivering during and after surgery with general anesthesia should be determined with controlling the effective factors such as the type of anesthesia drug, age, gender and type of surgery in the study. injection acetaminophen at a dose of 0.5mg/kg in after general anesthesia can reduce the amount of shivering after the surgery and can be an effective choice in the field of inguinal hernia surgery for candidates over 60 years of age or in women who are candidate for surgery.

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