

## ARTICLE

# COMPARING THE EFFECTS OF REMIFENTANIL, ALFENTANIL, SUFENTANIL, AND FENTANYL ON THE INCIDENCE OF EPIGASTRIC PAIN AFTER ANESTHESIA WITH LARYNGEAL MASK AIRWAY (LMA) IN CATARACT SURGERY

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## ABSTRACT



**Introduction:** One of the complications of general anesthesia and anesthetic drugs, especially opioids is abdominal pain. The aim of this study is to examine the effects of remifentanil, alfentanil, sufentanil, and fentanyl on the incidence of epigastric pain after anesthesia with LMA in cataract surgery. **Materials and Methods:** In this analytical cross-sectional study, 104 patients in each group of fentanyl, alfentanil, sufentanil, and remifentanil who underwent cataract surgery and general anesthesia with LMA in operating room of Motahari Hospital, Jahrom were studied. Pearson correlation test was used to determine the relationship between the occurrence of epigastric pain and opioid.

**Results:** In fentanyl group, out of 104 patients, 20 patients (19.2%) had mild abdominal pain, 6 patients (5.8%) moderate abdominal pain, and four patients (3.8%) had severe abdominal pain. In alfentanil group, 11 patients (10.6%) had mild abdominal pain and six patients (5.8%) had moderate abdominal pain. In sufentanil group, 15 patients (14.4%) had mild abdominal pain, five patients (4.8%) had moderate abdominal pain, and 4 (3.8%) had severe abdominal pain. In remifentanil group, 20 patients (19.2%) had mild abdominal pain and 15 patients (14.4%) had moderate abdominal pain. The incidence of abdominal pain has a significant relationship with opioid ( $P=0.009$ ).

**Conclusion:** According to the present study, it was revealed that the incidence of abdominal pain in remifentanil group is more than the others and in alfentanil group is less than the other groups, which indicates opioid acute tolerance in association with remifentanil.

## INTRODUCTION

Any opacity in the lens of the eye is called cataract [1]. Among the major known causes of cataract age, genetic factors, inflammation, blow, and so on can be noted [2]. Ninety percent of all cataracts are related to age. [3] In various studies, it is found that the prevalence of cataract in women is more than in men and most patients are older than 65 [4]. Sudden movements or attempts to cough while eyeball is open can lead to protrusion of eye contents and permanent damage to the eye. For these reasons, when general anesthesia is chosen for cataract surgery, it is necessary to maintain sufficient depth of anesthesia [5]. The greatest responsibility of the anesthesiologists is to provide enough breathing for patient, and the most vital factor in this regard is airway protection [5]. Placing LMA is a non-invasive alternative approach appropriate to replace endotracheal intubation and in short-term surgeries and in difficult intubation, it is an acceptable method that due to lack of need for laryngoscopy does not have the strong adverse consequences related to it [6-8]. Establishing hemodynamic stability with LMA shows that, it can easily be used in people with cardiovascular and respiratory diseases [9]. Placing LMA during anesthesia induction prevents the sharp rise in blood pressure and tachycardia during induction of anesthesia [10]. Therefore, a simple way to keep the airways that brings about effective breathing and oxygenation is LMA [11]. Fentanyl analgesic, with 80 times more analgesic effect as morphine was introduced to medicine as intravenous anesthetic in the 1960s. Its main use is as pre-medication and sedation before anesthesia in the operating room. Today, fentanyl is widely used for anesthesia and for relieving pain. Its effect mechanism is  $\mu$  opioid receptor agonist and its side effects are decreased diastolic blood pressure and blood-oxygen saturation decrease, nausea, and vomiting [12]. Sufentanil is used as the main or supplemental anesthesia drug due to its power to weaken the central nervous system. This drug is 7 times more powerful than fentanyl, and its return from anesthesia is more rapid than fentanyl [13]. Alfentanil is a preserving drug in anesthesia and pain control after surgery. Its effect is short-term and is a narcotic painkiller used as supplementary medicine as well as for induction of anesthesia. Through intrathecal and dural injection, this medicine is used to create analgesia after surgery [14]. Remifentanil has more rapid effect onset and shorter duration of effect, so that in comparison with fentanyl and the similar drugs, it has shorter half-life [about 5 minutes]. Moreover, like alfentanil, it reaches its peak quickly. Remifentanil power is slightly less than fentanyl. Remifentanil has a significant role in modern anesthesia and is a safety drug for continuous infusion. Its most common use is administration along with propofol in total intravenous anesthesia (TIVA). In addition, it is useful as a single dose when a short-term analgesia is needed [13]. In the study by Jalalian Taghadomi et al. who had studied the role of remifentanil in the development of abdominal pain after cataract surgery, the results showed that in remifentanil group, 20 patients (40%) complained of severe abdominal pain during recovery and in the propofol group, only three subjects (6%) complained of blurred abdominal pain around the abdomen. In remifentanil group, in 14 patients with

## KEY WORDS

cataract, epigastric pain, laryngeal mask airway

Received: 11 June 2016  
Accepted: 4 September 2016  
Published: 1 January 2017

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abdominal pain, intravenous injection of hyoscine was effective, while it had no effect on the propofol group. According to the mentioned study, abdominal pain is a rare complication, but according to clinical observations of the researcher in the operating room, it seems that the prevalence of abdominal pain (in the epigastric region) in operating rooms of Jahrom hospitals is more than the amount listed in other studies. The objective of this study is to find the prevalence of this complication and to study the related factors to reduce this complication. Therefore, studying the prevalence of epigastric pain after anesthesia with LMA with remifentanyl, alfentanil, sufentanil, and fentanyl drugs after cataract surgery appears necessary.

## METHODS

The present study was analytical cross-sectional. Sampling method was convenience. The sample in this study was 104 patients, studied in fentanyl, alfentanil, sufentanil, and remifentanyl groups, 416 patients were studied. Inclusion criteria included all patients of 50 to 75 years of age group that undergo cataract surgery with phacoemulsification device and general anesthesia with opioid that fall into classification Group ASA I (American Society of Anesthesiologists) (without sickness and healthy) and ASA II (with mild systemic disease). Exclusion criteria included a history of chronic abdominal pain, ischemic heart disease, gastroesophageal reflux, pulmonary aspiration, gastrectomy, diabetes, history of extensive abdominal surgery, gastric and duodenal ulcer history, and any change in hemodynamic condition of the patient that requires injection of other drugs. Before implementing the project, the researcher received the approval of project and licensing from research committee, permission from the Ethics Committee, and coordinated with operation room officials, and Motahari Hospital administration. Patients, undergoing eye surgery (cataract) for whose anesthesia opioid is used, after recovery and gaining full consciousness are examined and asked about the presence or absence of epigastric pain (as yes or no). Previously, the patients are also asked question about the history of stomach pain, so as during the examination after consciousness not to mistake the abdominal pain because of a history of stomach problems with cramps caused due to the use of opioid. The patients are also asked questions about the novelty or old pain. It should be noted that in all the patients studied to induce anesthesia, sodium thiopental (3-4 mg/kg) and atracurium (0.5 mg/kg), and for the maintenance of anesthesia, propofol (50-150 µg/kg/min) with an infusion pump were used. Moreover, alfentanil (25µg / kg), sufentanil (0.25µg / kg), fentanyl (2-4µg / kg), and remifentanyl (1-2µg / kg) were used. The results of the information contained in the questionnaire were statistically analyzed using SPSS version 22 and Pearson Chi-Square test.

## RESULTS

In this study, 416 patients who underwent cataract surgery under general anesthesia with LMA entered the study. They were 53.1% male and 46.9% female. Among them, 23.6% were at age 55-50 years, 19.0% at age 60-56 years, 18.8% at age 61-65 years, 16.1% at age 66-70 years, and 22.6% were aged 75-71 years. The incidence of epigastric pain after anesthesia with LMA in cataract surgery was 25.5%. Ninety eight point three percent of patients had duration of 30-39 minutes of mask use, and 1.7 percent had 40-50 minutes if mask use. Among the patients, 18.5% were in the weight range of 60-69 kg, 54.3% were 70-79 kg, 21.9 percent were 80-89 kg, and 5.3% were in 100-90 kg weight range. The patients were divided into four groups of 104: remifentanyl, alfentanil, sufentanil, and fentanyl.

**Table 1:** The incidence of epigastric pain according to the drug

Opioids		Epigastric pain			
		No pain	Mild	Average	Severe
Fentanyl		74	20	6	4
		71.2%	19.2%	5.8%	3.8%
Alfentanil		87	11	6	0
		83.7%	10.6%	5.8%	0.0%
Sufentanil		80	15	5	4
		76.9%	14.4%	4.8%	3.8%
Remifentanyl		69	20	15	0
		66.3%	19.2%	14.4%	0.0%
Total		310	66	32	8
		74.5%	15.9%	7.7%	1.9%

**Table 2:** Comparison of the effect of remifentanyl, alfentanil, sufentanil, and fentanyl on the incidence of epigastric pain using Chi-square test

		Epigastric pain		Pearson Chi-Square	p-value
		no	Yes		
		n (%)	n (%)		
opioid	fentanyl(N=104)	74(71.2)	30(28.8)	9.166	0.027
	alfentanil(N=104)	87(83.7)	17(16.3)		
	sufentanil(N=104)	80(76.9)	24(23.1)		
	remifentanyl(N=104)	69(66.3)	35(33.7)		

Chi-square test results show that there is a significant difference between remifentanyl, alfentanil, sufentanil, and fentanyl on the incidence of epigastric pain after anesthesia with LMA in cataract surgery (p-value = 0.027). Remifentanyl and alfentanil had the highest and lowest incidence of pain in the epigastric region respectively. The incidence of epigastric pain in patients using fentanyl has been 28.8%, in alfentanil 16.3%, in sufentanil 23.1%, and in emifentanil 33.7%.

In the fentanyl group, 20 patients had (19.2%) mild epigastric pain, 6 patients (5.8%) moderate epigastric pain, and four patients (3.8%) had severe epigastric pain. In alfentanil group, 11 patients (10.6%) had mild epigastric pain, and six patients (5.8%) had moderate epigastric pain. In sufentanil group, 15 patients (14.4%) had mild epigastric pain, five patients (4.8%) had moderate epigastric pain, and four patients (3.8%) had severe epigastric pain. In remifentanyl group, 20 patients (19.2%) had mild epigastric pain, and 15 patients (14.4%) had moderate epigastric pain.

**Table 3:** Incidence of epigastric pain in terms of surgery time

Epigastric pain		Time (minutes)	
		30-39	40-50
No pain		307	3
		99.0%	1.0%
Mild		64	2
		97.0%	3.0%
Average		32	0
		100.0%	0.0%
Severe		6	2
		75.0%	25.0%
Total		409	7
		98.3%	1.7%

Chi-square test results show that the incidence of abdominal pain has a significant relationship with operation time (P-value=0.000)

**Table 4:** Incidence of epigastric pain based on gender

Epigastric pain		Gender	
		Men	Women
No pain		177	133
		57.1%	42.9%
Mild		26	40
		39.4%	60.6%
Average		13	19
		40.6%	59.4%
Severe		5	3
		62.5%	37.5%
Total		221	195
		53.1%	46.9%

Chi-square test results show that epigastric pain has no significant relationship with gender (P-value=0.138). Chi-square test results show that epigastric pain has a significant relationship with patients' age (P-value =0.003).

## DISCUSSION

The aim of this study was to examine the effects of remifentanyl, alfentanil, sufentanyl, and fentanyl on the incidence of epigastric pain after anesthesia with LMA in cataract surgery. The main finding in this study was that the incidence of abdominal pain has a relationship with opioid (P-value=0.27), so that the incidence of epigastric pain in remifentanyl group (33.6%) is more than in all groups and is the lowest in alfentanil (16.3 %). Few studies have examined the effect of remifentanyl, alfentanil, sufentanyl, and fentanyl on the incidence of epigastric pain after surgery. Among few studies conducted, the study by Jahanbakhsh et al. (2007) at Khatam Alanbya Hospital, Mashahd, which evaluated 100 patients, is consistent with results obtained from our study [14]. They found that, 40 percent of patients who received remifentanyl had abdominal pain during recovery. In our study, 34.6% of patients in the remifentanyl group complained of abdominal pain while in the fentanyl group 28.8%, in alfentanil 16.3%, and in sufentanyl group 23.1% complained of abdominal pain. Our results are in line with the results of this study [14].

In the research by Guignard B, Bossard AE, Coste C et al. (2010) on 50 patients undergoing major abdominal surgery, it was found that in remifentanyl group, the required morphine for pain relief after surgery was twice the patients in desflurane group. In our study, the highest incidence of abdominal pain was in the remifentanyl group [15]. However, in the study by Gustorff B, Hanlik G, Hoerauf KH et al. (2012) on 20 patients, which was conducted in remifentanyl and control groups, there was no significant difference in pain perception threshold after 180 minutes infusion that is in contrast with the result of result of our study [16]. In research by Schraag S, Checketts MR, Kenny GN (2009) on 51 patients receiving alfentanil after cardiac surgery, and 30 patients receiving remifentanyl after orthopedic surgery, no significant difference was observed in pain.

This result was inconsistent with the results of our study as well [17]. In the study by Derrode, N, et al. (2009) on 50 patients who underwent laparoscopic ventral surgery, the consumption of morphine in remifentanyl was more than sufentanyl group in the first 2 hours after surgery, which is in line with our research [18,19]. Another result of our study was that the incidence of abdominal pain is correlated with operation time (P=0.000). It was also observed that abdominal pain has no significant relationship with gender (P-value=0.138). The rate of incidence of abdominal pain in female patients was more than male. Another result of our study was that the incidence of abdominal pain is correlated with the patient's weight (P-value =0.035). It was also observed that the incidence of abdominal pain is correlated with patient age (P-value=0.003). However, no other studies have been conducted in this area to examine the results of our study further, and with this small number of studies, there is more need for such research.

## CONCLUSION

According to the present study, it was revealed that the incidence of abdominal pain in remifentanyl group is more than the others and in alfentanil group is less than the other groups, which indicates opioid acute tolerance in association with remifentanyl.

## SUGGESTIONS

In general, given much controversy about the effect of the opioid, especially remifentanyl on postoperative epigastric pain, it is recommended that in future studies broader, more comprehensive, and more studies be conducted on the role of opioids, especially remifentanyl, in this regard. Due to the high rate of epigastric pain in remifentanyl, it is better to use other opioid with longer effect in surgeries.

### ACKNOWLEDGEMENTS

This study was conducted as part of the findings related to the medical PhD thesis of Reza pourbehesht. The authors would like to thank all the staff and officials of research deputy and technology deputy of this university who sincerely helped us in the course of this research.

### CONFLICT OF INTEREST

None

### FINANCIAL DISCLOSURE

None

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