Original Article

Effect of intraperitoneal lidocaine administration versus traditional analgesics only on postoperative pain control in laparoscopic bariatric surgeries

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ABSTRACT

Background: Opioids have traditionally been the primary treatment for managing pain during surgical procedures. Regrettably, there have been recent concerns regarding the potential adverse consequences of these substances. The introduction of opioid-free anesthesia aimed to offer a safer option that would yield advantages and facilitate postoperative recovery. This study's principal goal is to conduct a comparative analysis of the effects of intraperitoneal lidocaine injection and traditional analgesics only in the treatment of postoperative pain following laparoscopic bariatric surgeries.
Patients and Methods: At a tertiary hospital, a prospective comparative study was carried out on a cohort of 50 individuals suffering from obesity with a body mass index (BMI) of 35 kg/m^2. These patients were undergoing laparoscopic bariatric procedures. They were segregated into two distinct groups: in group A, a total of 25 patients were administered a solution consisting of 20 ml of lidocaine 2% diluted with 500 ml of normal saline for intraperitoneal irrigation along the stappled residual portion of the stomach and/or anastomosis area. In group B, 25 patients were solely administered analgesics.
Results: There is a statistically significantly lower pain score at recovery, at 4 h and at 24 h in patients treated by intraperitoneal lidocaine than those treated by analgesics.
Conclusion: Our results showed that intraperitoneal lidocaine administration showed lower pain scores and was more effective compared with analgesics exclusively for managing pain during laparoscopic bariatric surgeries.

Key Words: Bariatric surgery, intraperitoneal, laparoscopy, lidocaine, postoperative pain.

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INTRODUCTION

Bariatric surgery has been more popular as a means of treating obesity in the past few years. Research has demonstrated its efficacy in achieving the desired body weight and mitigating the presence of obesity-related health conditions[1]. The surgical techniques encompassed in this category consist of sleeve gastrectomy, Roux-en-Y gastric bypass (RYGB), biliopancreatic diversion with duodenal switch, adjustable gastric banding, intermittent vagal blockade, and gastrointestinal endoscopic devices, among various others. The operation that is performed most frequently is the laparoscopic sleeve gastrectomy, serving as the initial bariatric surgery for patients classified as high-surgical risk[2]. Research has demonstrated that the laparoscopic technique exhibits reduced rates of complications, shorter durations of hospitalization, and earlier readiness for mobilization in comparison to open surgery. Around 75% of surgical patients encounter immediate postoperative pain, frequently characterized by a moderate to high level of severity. Less than 50% of individuals who have surgery report sufficient pain alleviation after the surgery[3].

Nevertheless, effective management of pain after surgery is crucial as it can lead to significant morbidity, particularly pulmonary problems during the initial postoperative phase[4]. Pain management therapeutic approaches are designed to specifically target the afferent pain pathway through different methods[5]. The implementation of personalized postoperative pain management strategies, taking into account a patient's comorbidities and social circumstances, has been found to be linked to a drop in postoperative opioid consumption, a reduction in the duration of hospitalization following surgery, a decrease in preoperative anxiety, and a decrease in requests for sedative medicine[6]. A common recommendation for bariatric surgery is the use of non-sedative pain management techniques, local analgesics, and prompt movement. Due to their significant analgesic properties, opioid analgesics are frequently used for pain control[7].

Opioids have many positive effects, although they are also accompanied by a wide range of adverse side effects, including sleepiness, vertigo, constipation, nausea, vomiting, hyperalgesia, immunologic and hormonal

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dysregulation, muscle rigidity, tolerance, and respiratory depression[8].

The postoperative pain sensation is a consequence of tissue injury and the subsequent secretion of histamine and inflammatory agents. In the context of tissue injury, local anesthetics have the capacity to modulate the inflammatory response. It has been documented that lidocaine has the capacity to reduce levels of TNF-alpha and interleukin. Thus, it may be asserted that the suppression of inflammatory reactions is a primary mechanism behind the pain-relieving properties of lidocaine[9].

The utilization of intraperitoneal local anesthetics (IPLA) is well acknowledged for its convenience and safety, with a notable benefit being the absence of side effects commonly associated with systemically injected opioids. The utilization of these substances as a successful supplement in postoperative multimodal pain relief has been documented in laparoscopic gastric surgeries[10]. Lidocaine has the potential to serve as a local anesthetic in IPLA due to its comparatively gradual adsorption rate from the peritoneal cavity and its minimal adverse effects when administered at the prescribed dosage. Administering lidocaine soon after creating the pneumoperitoneum and before commencing dissection can effectively reduce postoperative discomfort and the need for painkillers. This observation aligns with the hypothesis that the injection of local anesthesia prior to surgery results in an afferent block, which in turn can alter the behavioral response and neuronal sensitization of posterior horn neurons in response to nociceptive stimuli[11].

Multiple mechanisms of IPLA have been hypothesized. It is probable that IPLA has inhibitory effects on unbound afferent nerve terminals within the peritoneum. Reduced nociception may be attributed to the local anesthetic absorbed systemically from the peritoneal cavity, which is a common occurrence following any local anesthetic treatment[12].

Recent evidence has confirmed that administering a low-dose intravenous local anesthetic infusion is more beneficial than using parenteral opioids alone in patients undergoing abdominal operations. Furthermore, it has been established that local anesthetics have anti-inflammatory properties[13]. Local anesthetics for wound infiltration offer anesthesia for minor surgical procedures and contribute to the alleviation of postoperative pain as a constituent of multimodal pain treatment subsequent to general or regional anesthesia[14]. Lignocaine, often known as lidocaine, is a frequently employed, cost-effective, and easily accessible. It has a half-life of 1.5–2 h in adult individuals. Research has demonstrated its efficacy in mitigating postgastrectomy pain when compared with a placebo[15].

Thus, this study aims to compare the effect of intraperitoneal lidocaine administration and traditional analgesics only on post-operative pain control in laparoscopic bariatric surgeries.

PATIENTS AND METHODS:

The prospective comparative study was carried out in the surgery department of a tertiary hospital on 50 patients with obesity undergoing laparoscopic bariatric surgeries from July 2022 to January 2023. Study population was divided into two groups: group A; included 25 patients which received 20 ml 2% of lidocaine diluted with 500 ml normal saline 0.9% for intraperitoneal irrigation along the stappled remaining part of the stomach and/or anastomosis area, in addition to patient-controlled analgesia (PCA) and group B; included 25 patients, which received analgesics only (1 gm of paracetamol immediately postoperative I.V. and every 6 h as baseline analgesia for 24 h in addition to PCA after assessment of pain score by the physician. Revision bariatric surgery, patients allergic to lidocaine or other local analgesics, those with history of prolonged administration of NSAID, history of fibromyalgia, using opioid or addiction, patients with cardiac disease or with advanced liver disease were excluded from our study.

All participants in the research study were subjected to the following:

The included patients were subjected to detailed personal, medical and surgical history taking along with clinical examination. We recorded information on postoperative pain.

We trained all patients about the use of the Numerical pain rating scale (NRS) to assess pain after the operation (Fig. 1).

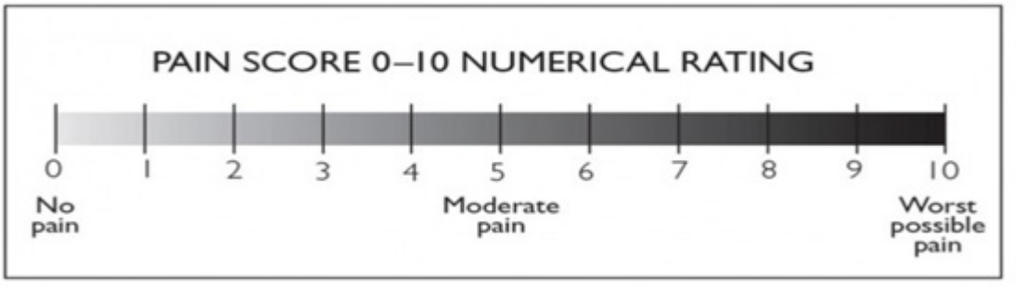

Fig. 1: Numerical pain rating scale.

All patients were operated upon by one professional specialized bariatric surgeon. They all received the same protocol of anesthesia.

The management of postoperative analgesia.

(a) All patients were advised to start ambulation after 6 h from surgery.

(b) Professional administration of 300cc PCA device was constructed by adding Nalbuphine to normal 0.9% saline. The device was set to a flow rate of 5 ml/h and a bolus dose of 1 ml every 15 min after a pain score greater than 6.

(c) The assessment of postoperative pain relief was conducted using an NRS score.

(d) Patients having an NRS score of 6 or above were administered Nalbuphine at a dosage of 0.1 mg/kg for the purpose of rescue analgesia.

(e) If deemed essential, this was repeated after a duration of 4 h.

(f) During the postoperative period, all patients were administered intravenous pantoprazole at a dosage of 1x40 mg/12 for 24 h to protect the stomach.

(g) Each patient was administered intravenous ondansetron at a dosage of 1x4 mg per 12 h for a duration of 24 h.

(h) The readmissions of patients within 30 days were noted as well as adverse effects of lidocaine and analgesics.

(i) All patients were evaluated to compare the NRS between two groups.

All patients stayed in the hospital for 24 h postoperatively during which we evaluated pain at recovery, 2, 4, 6, 12, and 24 h postoperative before discharge.

Statistics and data management

Data entry, processing, and statistical analysis were performed with IBM® SPSS® (Statistical Package for the Social Sciences), Chicago, USA, version 20. The following significance tests were used: Kruskal–Wallis, Wilcoxon's, χ^2, logistic regression analysis, and Spearman's correlation. Descriptive statistics were calculated using mean, standard deviation (±SD), and range for parametric numerical data, median and interquartile range (IQR) for nonparametric numerical data, and frequency and percentage of non-numerical data. To determine the statistical significance of a nonparametric variable's difference, the Kruskal–Wallis test was applied. One-way analysis of variance was used for variables with continuous normal distributions. Following analysis of variance, the Tukey test was used for post-hoc analysis by means of the Mann–Whitney U test. *P values* of less than 0.05 (5%) were considered statistically significant.

RESULTS:

Our study included 50 patients. Regarding age and sex, there is no statistically significant disparity observed between patients who received intraperitoneal treatment and those who received traditional analgesics. In the analgesics group, 88% of the patients were female, with a mean age of 32.6±9.7 years. Conversely, in the lidocaine group, 89% of the patients were female, with a mean age of 34.4±8.5 years. Furthermore, our analysis revealed that there was no statistically significant disparity in anthropometric measurements between patients who received intraperitoneal lidocaine treatment and those who received traditional analgesics. Specifically, there were no significant differences seen in terms of weight, height, or BMI, which varied between 35 and 59.5 kg/m^2, as indicated in (Table 1).

Analyzing the postoperative pain score at different hours, we found a statistically significant lower pain score at recovery, at 4 h and at 24 h in patients treated by intraperitoneal lidocaine than those treated by traditional analgesics (Table 2) (Fig. 2).

Evaluation of NRS by time in each group separately using post-hoc analysis revealed no statistically significant difference among patients in the group treated by intraperitoneal lidocaine (*P value > 0.05*). On the other hand, there is statistically significant decline of NRS by time among patients treated by analgesics (*P value <0.05*).

There is no statistically significant correlation between age, BMI, and postoperative pain score in patients treated by intraperitoneal lidocaine (*P value >0.05*). However, there is statistically significant negative correlation between BMI and pain score at 12 h in patients treated by analgesics (Table 3).

Table 1: Comparison of age, sex, weight, height, and body mass index of the studied population

	Treated by traditional analgesics	Treated by intraperitoneal lidocaine	Independent student *T* test/chi-square test
	N=25	*N*=25	*P* value
Age years			
Median (IQR)	34 (10)	32 (15.5)	0.489
Mean±SD	32.640±9.746	34.440±8.451	

Sex, n (%)			
Male	3 (12)	5 (20)	0.44
Female	22 (88)	20 (80)	
Weight (kg)			
Median (IQR)	112 (24)	120 (35.5)	0.298
Mean±SD	115.900±22.704	122.820±23.793	
Height (m)			
Median (IQR)	1.57 (0.11)	1.54 (0.3)	0.632
Mean±SD	1.548±0.073	1.538±0.068	
BMI (Kg/m^2)			
Median (IQR)	41.4 (6.4)	45.1 (15.5)	0.129
Mean±SD	42.588±6.771	45.744±7.635	

Table 2: Comparison of the pain score of the studied population

	Treated by traditional analgesics	Treated by intraperitoneal lidocaine	Independent student *T* test
	N=25	*N*=25	*P* value
At recovery			
Range	6–10	0–9	**<0.0001**
Mean±SD	8.520±1.558	4.640±3.040	
At 2 h			
Range	3–5	0–5	0.066
Mean±SD	4.520±0.714	3.960±1.306	
At 4 h			
Range	2–6	1–6	**0.041**
Mean±SD	3.760±0.926	3.200±0.957	
At 6 h			
Range	0–4	1–4	0.327
Mean±SD	3.160±1.344	2.840±0.898	
At 12 h			
Range	1–4	0–4	0.899
Mean±SD	2.040±1.136	2.080±1.077	
At 24 h			
Range	1–5	0–2	**<0.0001**
Mean±SD	2.600±1.555	1.280±0.792	

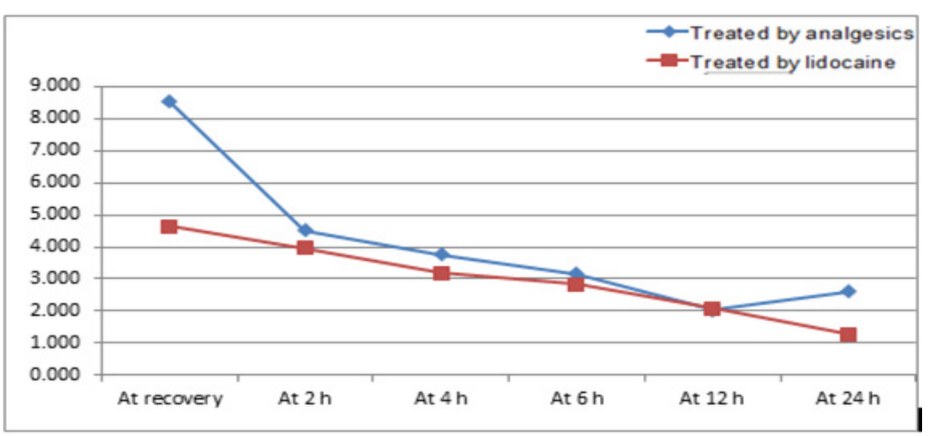

Fig. 2: Pain score in patient treated by lidocaine and patients treated by analgesics.

Table 3: Correlation between age, body mass index, and pain score in patients treated by analgesics

	Age		BMI	
	r	*P* value	r	*P* value
At recovery	–0.174	0.407	0.290	0.160
At 2 h	0.051	0.810	0.199	0.341
At 4 h	–0.001	0.996	–0.068	0.747
At 6 h	0.163	0.435	–0.133	0.527
At 12 h	0.097	0.646	–0.439	**0.028**
At 24 h	–0.081	0.699	–0.081	0.701

DISCUSSION

Obesity is a prevalent global health condition, and there is a growing trend towards the utilization of bariatric procedures as a means to enhance both quality of life and address comorbidities[16]. The laparoscopic method is generally favored whenever possible because of its correlation with decreased postoperative discomfort and morbidity[4]. Local anesthetics are well acknowledged for their user-friendly nature and safety, making them a crucial category of medications in perioperative care[17]. The purpose of our study was to assess the impact of administering lidocaine intraperitoneally compared with standard analgesics after surgery.

The study had a total of 50 individuals with obesity, who were separated into two groups. Group A consisted of 25 patients who received treatment by the administration of IPL, whereas group B consisted of 25 patients who received treatment solely with analgesics. In relation to demographic data, our analysis revealed that the age range of the patients spanned from 16 to 52 years. Additionally, it was observed that females constituted around 80% of the participants in both groups, with no statistically significant distinction observed between the two groups. Furthermore, no statistically significant disparity in anthropometric measurements was seen between individuals who received Lidocaine treatment and those who received analgesics.

Extensive research has been conducted on IPLA in the fields of non-bariatric general surgery and gynecology. Previous research has shown that using IPLA with bupivacaine, an amide local anesthetic, can effectively decrease discomfort and reduce the need for analgesics in bariatric surgery. However, there is a lack of studies examining the use of lidocaine intraperitoneally in laparoscopic bariatric surgery[18].

The findings of the present study indicate a statistically significant reduction in pain scores during recovery, at the 4 h mark, and at the 24 h mark among patients who received lidocaine treatment compared with those who received analgesics. There is a lack of statistical significance observed in the pain scores of patients who received lidocaine treatment throughout time. Nevertheless, individuals who get analgesics experience a statistically significant decrease in pain levels as time progresses. The observed phenomenon can be attributed to the fact that intraperitoneal administration of lidocaine resulted in both immediate and sustained alleviation of pain, in contrast to analgesics which exhibited greater pain scores during the initial stages of treatment. Additionally, it was shown that there was no statistically significant association between age, BMI, and pain levels among patients who received lidocaine treatment. Furthermore, a statistically significant inverse relationship has been observed between BMI and pain level after 12 h of analgesic treatment in patients. Unlike analgesics, the impact of lidocaine was not influenced by age and BMI.

According to a study conducted by Ustun and colleagues the inclusion of lidocaine in multimodal analgesia demonstrated superior pain management during the initial postoperative phase when compared with the administration of dexmedetomidine and ketamine in the management of Sleeve Gastrectomy[10].

Several studies have shown evidence of the advantageous impacts of intraperitoneal lidocaine in mitigating pain during the initial hours following surgical procedures. For instance, Sorouri and colleagues conducted a study whereby 50 ml of 0.8% lidocaine was administered to patients undergoing total abdominal hysterectomy. A notable reduction in pain scores was observed following the intraperitoneal administration of lidocaine[19].

Studies found that the intraperitoneal administration of bupivacaine was more pertinent. The findings of these studies are subject to debate. The administration of intraperitoneal bupivacaine in several investigations did not yield a statistically meaningful impact on postoperative pain. According to the findings of Saafan and colleagues it was determined that the administration of intraperitoneal bupivacaine

resulted in enhancements in both pain scores and postoperative analgesia[16]. In 2020, a randomized controlled experiment was undertaken by Safari and colleagues to evaluate the effectiveness of bupivacaine in bariatric surgeries. The study involved a sample size of 106 participants. The research encompassed a diverse cohort of bariatric patients, incorporating a combination of laparoscopic sleeve gastrectomy, laparoscopic RYGB, and laparoscopic one anastomosis gastric bypass procedures. The findings of the study indicated positive results, as evidenced by an improvement in the postoperative pain score and a decrease in postoperative analgesia[15].

In contrast, Schipper and colleagues found that administering 20 ml of intraperitoneal bupivacaine 2.5% (20 ml) sprayed over the diaphragm before laparoscopic RYGB did not have a significant impact on patients. The disparity in the outcomes could be attributed to variations in the employed methodologies[20].

CONCLUSION

The findings of our study indicate that intraperitoneal lidocaine injection reduced pain scores and showed superior efficacy compared with analgesics only in management of postoperative pain in laparoscopic bariatric procedures. Furthermore, intraperitoneal lidocaine reduced postoperative opioid consumption in comparison to the infusion of saline intraperitoneally. Furthermore, a statistically significant inverse relationship has been observed between BMI and pain level after 12 h of analgesic treatment in patients. Unlike analgesics, the impact of lidocaine was not influenced by age and BMI.

RECOMMENDATIONS

Research on extended-release local anesthetics' effectiveness and impact on patients with higher pain likelihood could support the evidence for intraperitoneal lidocaine instillation in laparoscopic bariatric procedures.

CONFLICT OF INTEREST

There are no conflicts of interest.

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