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Opioid Free Total Intravenous Anesthesia in Major Abdominal Surgeries

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ABSTRACT

Background: Major abdominal surgeries encompass all gastrointestinal (colorectal, gastric, small bowel, hepatic, pancreatic resections), urological (nephrectomy, cystectomy, prostatectomy), and gynecological (uterine and ovarian resections, pelvic floor reconstructions) procedures performed for any indication, their duration is more than 1 hr. Pain control in major abdominal surgeries is a big deal for patient satisfaction, especially for anesthetic benefits.

Objective: To compare the effects of intravenously administered opioids and non-opioids on pain relief in major abdominal surgeries.

Patients and Methods: This study is a prospective comparative randomized trial. Two equal groups; opioid free anesthesia (OFA) group and opioid based anesthesia (OBA) group, of thirty patients each were randomly selected from a total of sixty adult patients of both sexes, ASA I, II, and III ranging in age from 30 to 70, scheduled for elective major abdominal surgeries under general anesthesia between August 2023 and April 2024 at Menoufia University hospitals.

Results: OFA group had lower VAS scores than OBA group at 30, 60, 90 min. postoperatively ($p < 0.05$). While there were higher statistically significant, but clinically insignificant changes in MAP and heart rate (HR) in OBA group ($p<0.05$ for both). The mean Drug dose (mg) and 1st call for rescue analgesia (Hr.) were lower in the OBA group ($p<0.05$). Both groups had no statistically difference regarding postoperative complications.

Conclusion: OFA, compared to OBA, is associated with lower postoperative VAS scores and less analgesic consumption when used to control postoperative pain in major abdominal surgeries.

Keywords: OFA, OBA, Pain, Major abdominal surgeries, Visual analogue scale.

INTRODUCTION

Major abdominal surgery involves a variety of surgical techniques on diverse patient groups, resulting in a wide range of pain and analgesic needs. Therefore, the surgical process and patient characteristics should be taken into account while developing analgesic methods [(1)].

Although opioids are linked to negative side effects as nausea, vomiting, constipation, excessive sedation, and respiratory depression, they can effectively manage pain after major abdominal procedures [(2)].

In essence, intraoperative anesthesia without the use of intraoperative opioids is known as OFA. It may be seen as a "radical" variation of the opioid sparing strategy. The way that opioids are prescribed has changed as more information about their negative effects has become available [(3)].

Non-steroidal anti-inflammatory drugs (NSAIDs) are integrated into many regimens as part of multimodal analgesia [(4)]. In addition to reducing the host stress response, pain severity and distress, and adverse effects of high single-dosage analgesia (usually an opioid), effective multimodal analgesia also seeks to speed up postoperative mobility and the return to self-care activities. Enhanced Recovery After Surgery (ERAS) programs are based on the fundamental idea of multimodal, opioid-sparing, effective analgesia [(5)].

Ibuprofen is an analgesic, antipyretic, and anti-inflammatory NSAID that is typically well tolerated [(6)]. As a non-selective inhibitor of COX-1 and COX-2, ibuprofen is the most widely used over-the-counter and prescription NSAID worldwide [(7)].

In an effort to enhance sedative/analgesic usage and give a medication with the properties listed in, dexmedetomidine (DEX), an α 2-agonist, was developed. It increases α 2-adrenergic receptors in the spinal cord to improve analgesia and in the locus coeruleus to produce sedation. Through both central and peripheral pathways, it also induces sympatholysis [(8)]. Recent research has demonstrated that perioperative DEX has positive benefits on individuals having aortic or cardiac surgery [(9)].

The aim of the current study was to compare the effects of intravenously administered opioids and non-opioids on pain relief in major abdominal surgeries.

The primary aim of this work was to asses postoperative pain using the VAS static at rest and dynamic at ambulation at 1, 6,12, 24 hrs. in patients undergoing elective major abdominal surgeries.

The secondary aims were to assess intraoperative analgesia and hemodynamic parameters, the requirement for postoperative rescue analgesia, and the incidence of adverse effects.

PATIENTS AND METHODS

The study included sixty adult patients, of either sex, with ASA grades I–II and III, aged from 30 to 70, who underwent elective major abdominal surgeries under general anesthesia at Menoufia University Hospitals in Menoufia, Egypt, between August 2023 and April 2024.

We excluded patients with active bleeding disorders (peptic ulcer), morbid obesity, renal

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impairment, diabetes mellitus (DM), pregnancy, trauma, psychiatric illness, drug addiction, or allergy from any drug used.

Major abdominal surgeries were performed in all patients using the same technique by the same surgical team of General Surgery Department. Eligible participants were randomly assigned in two equal groups utilizing SPSS version 26.0 on an IBM-compatible PC.

Neither the patients nor the investigator knew the medication used. Preoperative assessments in all patients included medical history, physical examination, a thorough assessment of the airway, and the regular laboratory tests including hemoglobin, platelets count, bleeding time, and s. creatinine that used to calculate the eGFR. After fasting of 8 hrs and on arrival to the operating room, all patients were monitored with pulse oximetry, ECG and NIBP during the procedure and surgery. A 20-gauge cannula was inserted in a peripheral vein. 500 ml lactated ringer (L.R) was given, sedation with intravenous 0.03 mg/kg midazolam (dormicum). Thereafter, standardized anesthetic technique was used in all patients, which included 1 mg/kg of 2% xylocaine (lidocaine HCL) solution about 50 mg (to prevent propofol-induced pain), propofol 2 mg/kg and atracurium 0.5 mg/kg to facilitate endotracheal intubation when TOF count was zero. Following intubation, 0.1 mg/kg atracurium was administered when necessary for muscle relaxation guided by N.M monitoring train of four (TOF) when TOF count was 2 or more. Meanwhile, the patients were mechanically ventilated targeting $ETCO_2$ of 35-40 mmHg. The surgeons employed lidocaine (10 mg) and epinephrine (0.00625 mg) intraoperatively to create a local infiltrate at the site of the incision.

All patients were intubated and ventilated with tidal volume of 6-8 ml/kg and inspiration/expiration ratio 1:2. After induction, anesthesia was maintained with TIVA in OBA group and OFA group. The level of anesthesia was adjusted manually to BIS values ranging from 45 to 55 using propofol infusion. An appropriate intraoperative analgesia was obtained with DEX infusion (the OFA group) or fentanyl boluses (the OBA group), based on the patients' clinical signs and surgical plethysmographic index objectives within 20-50.

A warming blanket was placed over the patients to keep their nasopharyngeal temperature between 36 and 37 degrees Celsius. Warm lactated Ringer's solution was used to replenish the intravenous fluid supply. For PONV prevention, all patients received intravenous dexamethasone 5 mg following anesthesia induction, and intravenous ondansetron (0.1 mg/kg) was delivered half an hour before the predicted conclusion of the surgery.

All patients were given 1 gm paracetamol (perfalgan 1 gm/100ml sol. For i.v. vial, Upsa france subsidiary of bms, Bristol-myers squibb) intravenously around 30 minutes before the completion of operation.

For anesthesia induction:

The OFA group received 800 mg ibuprofen (ibuprofen Arabcomed, Egypt 100 mg/ml vial) diluted with 250 ml saline) 30 minutes before incision through IV infusion over 30 minutes, (labeled as "Study medication 1") followed by three total scheduled doses of IV ibuprofen infusion every eight hours for 24 hours, lidocaine 1 mg/kg (designated as "Study medication 2"), and propofol 2.0 mg/kg.

The OBA group received fentanyl (Fentanyl- hameln 0.1 mg/2 ml amp., Sunny Pharmaceuticals) 1 μg/kg diluted with 250 ml saline (designated as "Study medication 1"), lidocaine 1 mg/kg (designated as "Study medication 2"), and propofol 2.0 mg/kg.

For anesthesia maintenance:

The OFA group received DEX (Precedex 200 mcg 2 ml vial, Hospira, Pfizer) infusion 0.5 μg/kg for 10 min+0.2 μg/kg/h (designated as "Study medication 3"), TIVA with propofol 100 μg/kg/min.

The OBA group received normal saline infusion (designated as "Study medication 3") at the same rate as DEX, TIVA with propofol 100 μg/kg/min.

At the end of surgery, fresh gas flow was changed to 4 L/min, the remaining neuromuscular block was reversed with neostigmine (0.05 mg/kg) and atropine (0.01 mg/kg) IV, then the endotracheal tube was removed after attaining the accepted global and respiratory requirements for extubation. Then the patients were transferred to the PACU 1 hr for assessment. Postoperative pain was managed with paracetamol (1 g) every 8 h for the first 24 hr. as rescue analgesia and repeated after 30 min if required if VAS >4 for both groups and for the patients with unrelieved pain in OBA group with paracetamol 1 mg/kg intravenous pethidine was given.

The patients were ready to be discharged from PACU when modified Aldrete score was > 9, then the patients were discharged to ward or ICU.

Patients' pain score was assessed using VAS, which is a score from 0-10, with two endpoints representing 0 (Not in pain) to 10 (Maximum pain conceivable). Time to initial analgesic request, frequency of patient demand, and total doses of rescue analgesia were all documented. Regarding the other side effects of drugs, we documented the incidence of its occurrence for 24 hours post-surgery.

Sample size calculation:

Based on review of past literature by **Salem *et al.*** [(10)] who concluded that mean (SD) of the period until first ambulation was substantially shorter with OFA compared to OBA (95.3±11.7, 85.4±14.7 respectively). The minimal sample size calculated was 60 individuals divided into 2 equal groups, at 80% power and 95% CI.

Ethical approval:

This study received ethical approval from Menoufia University Research Committee (IRB Approval No.

and date 8\2023ANET 31). Each subject provided written informed permission. The Helsinki Declaration was followed throughout the course of the investigation.

Statistical analysis:

On a PC that was compatible with IBM, SPSS version 26.0 was used to tabulate and analyze the data. Categorical variables, which are expressed as percentages, were analyzed using the X^2-test or Fisher exact test, while numerical data that was normally distributed, mean±SD, was compared across groups using the independent Student's t-test. Assuming normality at $P > 0.05$, the Shapiro-Wilks test was used to check quantitative data for normality. P-values less than 0.05 were considered statistically significant.

RESULTS

This study was conducted on 60 patients undergoing elective major abdominal surgery divided into two groups; 30 in the OBA using fentanyl (FEN) and the OFA using ibuprofen to compare between them and evaluate the benefits of OFA**.**

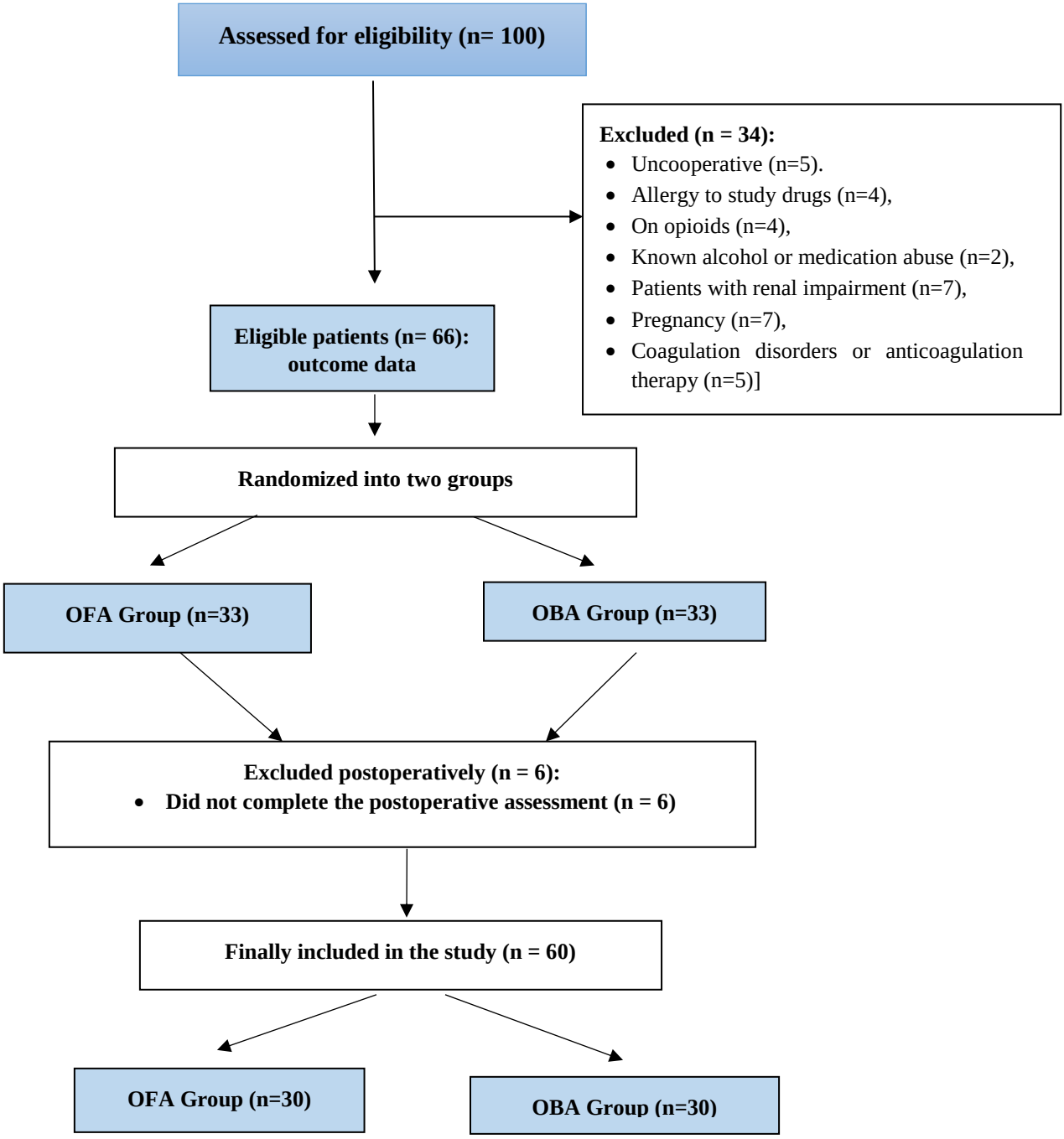

Figure (1): CONSORT flowchart of the enrolled patients.

Table (1) shows that the mean age of the OFA group was 55.1 ± 10.8, while the mean age of the OBA group was 56.2 ± 11.8 years. The two groups did not differ statistically significantly regarding age, sex, BMI, type or time of operation or ASA, p>0.05.

Table (1): Sociodemographic and baseline clinical characteristics of the studied patients (N=60).

		OFA (n =30)	OBA (n=30)	P value
Age (Years)	Mean ± SD	55.1 ± 10.8	56.2 ± 11.8	0.716@
Gender	Male	12 (40 %)	11 (36.7 %)	0.791#
	Female	18 (60 %)	19 (63.3 %)	
Operation	Pan-hysterectomy	7 (23.3 %)	7 (23.3 %)	0.640#
	Fundoplication	2 (6.7 %)	2 (6.7 %)	
	Colectomy	11 (36.7 %)	13 (43.3 %)	
	Unilateral Nephrectomy	8 (26.7 %)	5 (16.7 %)	
	Splenectomy	1 (3.3 %)	2 (6.7 %)	
	Abdominal mass	0	2 (6.7 %)	
	Gastric bypass	1 (3.3 %)	0	
ASA	Class I	23 (76.7 %)	20 (66.7 %)	0.390#
	Class II	7 (23.3 %)	10 (33.3 %)	
Time of operation (hr.)	Mean ± SD	2.4 ± 0.6	2.5 ± 0.5	0.811@
BMI (kg/m^2)	Mean ± SD	30.1 ± 4.1	28.8 ± 5.4	0.298@

@: Student's t test, #: Chi squared test

When comparing OBA group to OFA group, there was higher VAS in the opioid group at baseline, 45, 60, 90 min. postoperatively. While there wasn't difference at other measurements (Table 2).

Table (2): VAS score measurements of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
At 30 min. postoperatively	Mean ± SD	2.2 ± 0.4	3.0 ± 0.0	<0.001*
At 60 min. postoperatively	Mean ± SD	3.0 ± 0.2	3.1 ± 0.3	0.134
At 90 min. postoperatively	Mean ± SD	3.1 ± 0.3	4.0 ± 0.0	<0.001*
At 2h. postoperatively	Mean ± SD	2.5 ± 0.7	2.5 ± 0.7	1.000
At 4h. postoperatively	Mean ± SD	2.4 ± 0.7	2.4 ± 0.7	1.000
At 6h. postoperatively	Mean ± SD	2.1 ± 0.3	2.1 ± 0.3	1.000
At 12h. postoperatively	Mean ± SD	2.4 ± 0.7	2.4 ± 0.7	1.000
At 18 h. postoperatively	Mean ± SD	2.4 ± 0.7	2.4 ± 0.7	1.000
At 24h. postoperatively	Mean ± SD	2.1 ± 0.3	2.1 ± 0.3	1.000

*Significant; @: Student's t test

This study demonstrates that, in terms of intraoperative hemodynamic parameters, the mean MAP was statistically significantly higher in the opioid group at 45, 60, 75, 90, 105, and 135 min. intraoperatively, and at 30, 90, min, postoperatively. while the difference wasn't significant at other measurements (Figure 2).

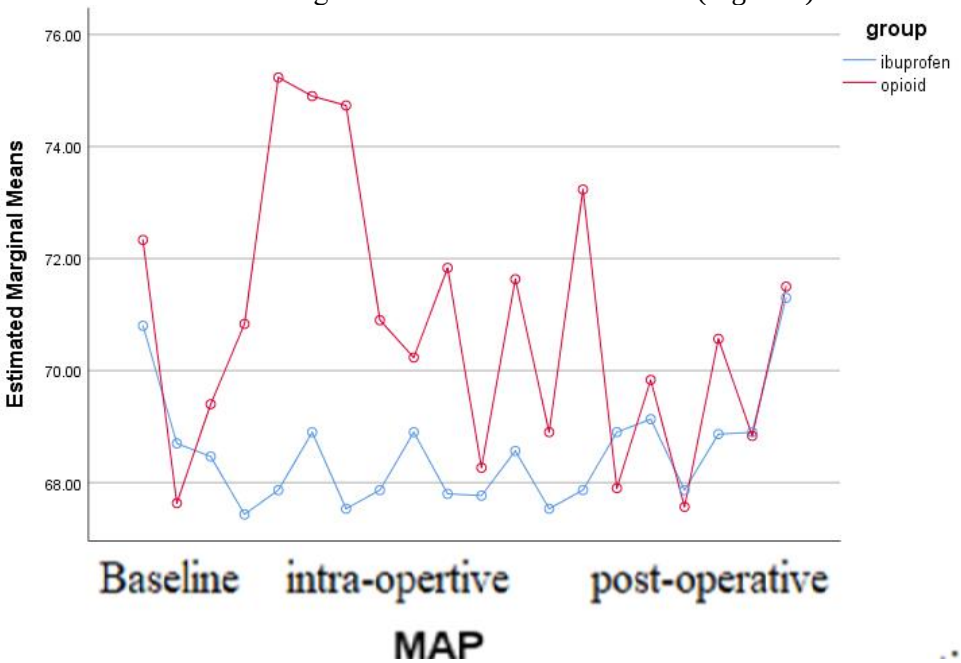

Figure (2): Mean arterial pressure (MAP) measurements of the studied group (N=60).

The mean HR was statistically significantly higher in the opioid group at all measurements, except at baseline, at 4, 6, 12, 18, 24 h postoperatively (Figure 3).

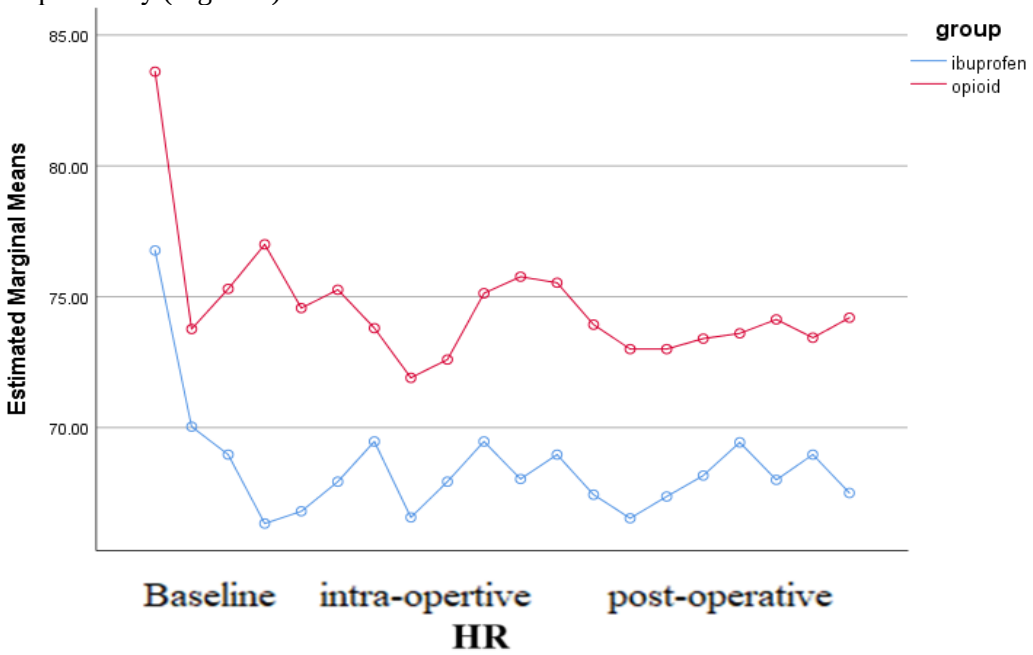

Figure (3): Heart rate (HR) measurements of the studied group (N=60).

The mean drug dose (mg) and 1st call for rescue analgesia (Hr.) were statistically significantly lower in the OBA group. The propofol infusion was 50–150 µg/kg/min in both groups. All the OFA group took a dexmedetomidine dose of 0.5 µg/kg (Table 3).

Table (3): Anesthesia -related data of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
Drug dose (mg)	Mean ± SD	800 ± 0.0	130 ± 24.9	<0.001*
1st call for rescue analgesia (Hr.)	Mean ± SD	2.7 ± 1.5	2.1 ± 0.8	0.034*

*Significant; @: Student's t test

Regarding patient satisfaction, there wasn't discernible difference between the 2 groups (Table 4).

Table (4): Patient satisfaction of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value
Patient satisfaction	2 3 4	2 (6.7%) 8 (26.7%) 20 (66.7%)	3 (10%) 8 (26.7%) 19 (63.3%)	0.893#

#: Chi squared test

Preoperative and postoperative eGFR did not differ significantly between the 2 groups (P >0.05); however, postoperative hemoglobin and bleeding time differed significantly (Table 5).

Table (5): eGFR data of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
eGFR preoperatively	Mean ± SD	106.5 ± 5.1	106.9 ± 4.8	0.757
eGFR postoperatively	Mean ± SD	106.8 ± 6.4	106.7 ± 6.5	0.952

@: Student's t test

Temperature and end tidal CO_2 did not differ statistically significantly between the two groups (Table 6).

Table (6): End tidal CO_2 and temperature measurement of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
End tidal CO_2	Mean ± SD	36.9 ± 0.4	37.0 ± 0.0	0.321
Temperature	Mean ± SD	35.1 ± 0.4	35.0 ± 0.0	0.321

@: Student's t test

The 2 groups did not differ statistically significantly regarding SPO_2 intraoperatively or postoperatively (Table 7).

Table (7): SpO_2 measurements of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
Intraoperatively	Mean ± SD	99.0 ± 0.2	99.0 ± 0.0	0.321
Postoperatively	Mean ± SD	89.0 ± 0.2	98.0 ± 0.0	0.321

@: Student's t test

The 2 groups did not differ statistically significantly regarding RR measurements at admission, or any time postoperatively (Table 8).

Table (8): Respiratory rate measurements of the studied group (N=60).

		OFA (n =30)	OBA (n=30)	P value@
At admission	Mean ± SD	13.7 ± 4.1	13.2 ± 1.1	0.525
At 2h. postoperatively	Mean ± SD	18.0 ± 1.6	18.2 ± 1.5	0.677
At 6h. postoperatively	Mean ± SD	13.2 ± 1.6	13.0 ± 1.0	0.558
At 12h. postoperatively	Mean ± SD	13.0 ± 1.0	13.0 ± 1.0	1.000
At 24h. postoperatively	Mean ± SD	13.0 ± 1.0	13.1 ± 1.0	0.696

@: Student's t test.

Table (9) shows that in neither group did any of the patients experience any complications.

Table (9): Complications in the studied group (N=60).

	OFA (n =30)	OBA (n=30)	P value
Nausea	0	0	-----
Vomiting	0	0	-----
Ileus	0	0	-----
Bradycardia	0	0	-----
Hypotension	0	0	-----
Allergy	0	0	-----
Shivering	0	0	-----
Bleeding tendency	0	0	-----

This table shows that the overall cost in all patients in the OFA group was 319 L.E. vs 31.5 L.E. in the OBA group (Table 10).

Table (10): Total cost (LE) in the studied group (N=60).

OFA (n =30)	OBA (n=30)	P value
319 ± 0.0	31.5 ± 0.0	-----

DISCUSSION

Pain relief and adequate analgesia are a major concern for patients undergoing surgeries [(11)]. Lack of adequate relief of postoperative pain increases the burden on patients and the risk of subsequent complications, including chronic pain syndromes. Furthermore, by contributing to early mobilization, it reduces the length of hospitalization and costs [(12)].

In this context, OFA tactics were researched to lessen the dangers and negative consequences connected with opioids. Ibuprofen, lidocaine, and DEX were used in this OFA regimen to give intraoperative anti-nociception. Ibuprofen is an analgesic, antipyretic, and anti-inflammatory NSAID that is typically well tolerated and effective. As a non-selective inhibitor of COX-1 and COX-2, ibuprofen is the most widely used over-the-counter and prescription NSAID worldwide. For anti-nociception, lidocaine, a local anesthetic, can be administered intravenously. According to studies, intravenous lidocaine decreased length of hospital stay, PONV, opioid use, and postoperative discomfort. Less than 1.5 mg/kg of intravenous lidocaine is the suggested starting dosage. DEX is an α-2 agonist that has analgesic, sedative, and sympatholytic properties. Perioperative DEX has been found to have positive benefits on patients having large abdominal operations in our recent investigations [(13)].

NSAIDs are integrated into many regimens as part of multimodal analgesia. NSAIDs have been used for a long time to alleviate inflammation and pain. These agents prevent the response of the pain receptors to tissue damage by blocking the transformation of arachidonic acid into prostaglandins. Ibuprofen is a well-known drug but IV form was FDA-approved lately in 2009 [(14)].

This study was a randomized controlled trial to compare opioid free anaesthesia versus opioid based anaesthesia in major abdominal surgeries.

According to demographic data, this study showed that the mean age of the OFA group was 55.1 ± 10.8, while the mean age of the OBA group was 56.2 ± 11.8 years. The two groups did not differ statistically significantly regarding age, sex, BMI, type or time of operation or ASA, $p>0.05$.

This study proved the use of OFA, compared to OBA, the affection of intraoperative hemodynamic parameters between two groups was comparable and no significant difference.

In this study, the mean heart rate was statistically significant, but clinically insignificant higher in the opioid group at all measurements, $p<0.05$, except at baseline, at 4, 6, 12, 18, 24 h postoperatively, $p>0.05$.

In line with our results, **An *et al.*** [(15)] included 102 individuals undergoing laparoscopic radical colectomy (LRC) with general anaesthesia and randomly assigned them to two groups: OFA (group OFA) with DEX and sevoflurane plus bilateral paravertebral blockade and OBA (group OA) with remifentanil, sevoflurane, and bilateral paravertebral blockade. The opioid group had substantially higher HR across all parameters ($P < 0.001$).

It is also supported by **Yu *et al.*** [16] whose study was patients who received OFA for pain management following laparoscopic cholecystectomy were randomized to either an OBA group that received remifentanil in conjunction with local anesthetic incision infiltration or an OFA group that received intravenous ketamine, DEX, and lidocaine. With the exception of HR, which was lower in the OFA group than in the OBA group (P = 0.016), hemodynamics remained steady in both groups.

Against our study, **Yaşar and Yıldız** [17] who conducted a study on 64 individuals, who were split into two groups for LSG. contrasting OFA and opioids in bariatric procedures. At the start of the procedure, patients were chosen at random and categorized by the kind of anesthetic used. Group I received remifentanil, an opioid, for analgesia. Group II received intravenous doses of magnesium sulphate, ibuprofen, ketamine, and paracetamol. HR did not change significantly (p value: 0,078). There wasn't significant difference in HR (p value: 0,078).

According to our study, the mean MAP was statistically significantly, but clinically insignificantly higher in the opioid group at 45, 60, 75, 90, 105, and 135 min. intraoperatively, and at 30, 90, min, postoperatively, $p<0.05$. While, the difference wasn't significant at other measurements, $p> 0.05$.

This was supported by **Salem *et al.*** [10] study, OFA for laparoscopic hysterectomy. Patients were randomly assigned to either the OFA or OBA groups based on the IV analgesic regimen that was supplied. REM infusion was used as maintenance analgesia for OBA patients, whereas FEN was used as loading. Preoperative DEX and LID were administered to OFA patients as loading and maintenance analgesics. Preoperative, pre-anesthesia, and post-intubation MAP measurements revealed no statistically significant differences between the patients in the two groups. At 45 minutes after insufflation and at the time of extubation, MAP measures were non-significantly higher in the OFA group than in the OBA group (p=0.467), but they were significantly higher in the OFA group than in the OBA group during and 30 minutes after abdominal insufflation (p=0.041 and 0.0002, respectively) [11].

On the other side, **Aboelela and Alrefaey**[18] whose study was anaesthesia based on opioids vs opioid-free anesthesia for abdominal gynecological surgery. Group O was given a loading dosage of 1 µg/kg of fentanyl under GA, and thereafter it was infused at a rate of 1 µg/kg/h. Group OF was given a loading dose of 1.5 mg/kg of lidocaine, followed by an infusion of 1.5 mg/kg/h, then a bolus of 0.5 mg/kg of ketamine. There wasn't discernible difference in the postoperative mean ABP between the groups under study (p=0.42).

Our investigation revealed that the mean VAS was statistically significantly higher in the OBA group at 30, 60, 90 min. postoperatively, $p<0.05$. While, the difference wasn't significant at other measurements, $p> 0.05$. This result was supported by **Aboelela and Alrefaey**[18] whose study was in order to compare opioid-free and opioid-based anesthesia in abdominal gynecological surgery, the 68 individuals who participated in this study were split into two groups of 34 each depending on the analgesics that were used: Group OBA and OFA. During the first four postoperative hours, Group OFA's VAS score was considerably lower: VAS0 at immediate postoperative time (p 0.001), VAS1 an hour later (p 0.001), VAS2 two hours later (p 0.001), and VAS4 four hours later (p 0.001).

However, **An *et al.*** [15] recruited 102 individuals who were undergoing radical colectomy by laparoscopy while under general anesthesia. Participants were divided into two groups at random to receive the aforementioned OFA (group OFA) and OBA (group OA) regimens. There wasn't significant difference in the VAS scores between the two groups ($P > 0.05$).

Our current study showed that the mean drug dose (mg) and 1st call for rescue analgesia (Hr.) were substantially reduced in the group using opioids ($p<0.05$).

So, postoperative pain was administered with paracetamol (1 mg) every 8 h for the first 24 hr. as rescue analgesia and repeated after 30 min if required if VAS >4 for both groups and for the patients with unrelieved pain in OBA group with paracetamol 1 mg /kg intravenous pethidine was given. 102 individuals were enlisted by **An *et al.*** [15] for LRC under general anesthesia. The OFA group consumed considerably less rescue analgesics ($P < 0.05$).

In the current study, estimated GFR was calculated using the MDRD study equation and compared preoperatively and postoperatively in both groups. The MDRD study equation is more accurate in estimation of GFR than CKD-EPI, and Cockcroft-Gault equations [19]. Neither ibuprofen nor opioids affected estimated GFR after 4 doses of each drug. The research by **Lee *et al.*** [20] found that in individuals with normal preoperative renal function, NSAIDs resulted in a temporary, clinically insignificant decrease in renal function in the early postoperative phase. Therefore, due to concerns regarding postoperative renal impairment, NSAIDs should not be denied to persons with normal preoperative renal function.

This study showed that all patients got intravenous dexamethasone 5 mg following anesthesia induction and 4 mg ondansetron at the conclusion of operation, therefore neither group experienced any complications like PONV.

According to **Ziemann-Gimmel *et al.*** [21] the incidence and severity of post-bariatric surgery PONV were decreased by their opioid-free TIVA method with DEX and propofol.

However, the two groups' methods of maintaining anesthesia (TIVA with propofol versus inhalational anesthetics) differed, which could have influenced the outcomes. OFA with DEX and sevoflurane did not lessen pain or PONV during gynecological laparoscopic surgery, according to a recent randomized research. The

fact that the OFA group utilized a greater concentration of sevoflurane than the OA group is a major drawback. In general, PONV is more likely to occur during inhalation anesthesia than during TIVA with propofol [22].

Concerning to the cost, in this study the overall cost in all patients in the OFA group was 319 L.E. vs 31.5 L.E. in the OBA group, so OFA may be unfavorable in the developing countries due to low socioeconomic patients.

CONCLUSION

In patients undergoing major abdominal surgeries, OFA and OBA were comparable. Compared to opioid-based TIVA with fentanyl and propofol infusions and opioid-free TIVA with DEX, ibuprofen, and propofol infusions, OFA is related with lower postoperative VAS scores. On the other hand, opioids associated with more changes in hemodynamics. Under the conditions of this study, OFA seems to be a better choice than opioids as a component of multimodal analgesia regimen in patients undergoing major abdominal surgery considering its efficacy and safety profile.

Conflict of interest: None.
Financial disclosures: None.

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