OPEN AIMJ ORIGINAL ARTICLE

Anesthesia and Intensive Care

Opioid Free Multimodal Analgesia Versus Opioid Based Analgesia In Bariatric Surgery Outcome

Zeinab Abdo Ibrahim [1] MD; Gehan Abdelrhman Eldosoky [1] MD; kamal Abdelrhaman Abosonna [2] MD.

** Corresponding Author:*
Zeinab Abdo Ibrahim
drzenibabdo@gmail.com

Received *for publication August 15, 2021;* ***Accepted*** *October 16, 2021;* ***Published online*** *October 16, 2021.*

doi: 10.21608/aimj.2021.90926.1550.

[1.]Anesthesia and Intensive Care Department, Faculty of Medicine , Al-Azhar University, Cairo, Egypt.

[2.]General surgery Department, Faculty of Medicine , Al-Azhar University, Cairo, Egypt.

ABSTRACT

Background: Combined Opioid-free analgesia (OFA) and thoracic epidural (TE) by ultrasound is the technique that may have an enhanced recovery after surgery (ERAS), decrease perioperative opioid consumption and more improved positive outcomes than balanced general anesthesia with use of opioid after bariatric surgery. The Opioid free analgesia includes local anesthetics (Na channel blocker), alpha-2 receptor agonists (dexmetedomidine), NMDA antagonists (ketamine, lidocaine, magnesium sulfate), anti-inflammatory drugs (NSAID) and dexamethasone.
Aim of the study: To evaluate the effect of opioid free analgesia with thoracic epidural as a multimodal analgesia versus balanced general analgesia on outcome of bariatric surgery on total opioid requirements, pain scores, and complications.
Patients and Methods: The current study recruited sixty patients aged 20-50 years, ASA I, II, under bariatric surgery. 30 patients received OFA with Ultrasonic guided thoracic epidural with pre-induction by precedex, ketamine, xylocaine, esmolol, dexamethasone, paracetamol, and magnesium. Then propofol, and atracurium to insert (ETT), 30 patients received balanced general anesthesia (BGA), patients received fentanyl, propofol, atracurium.
Results: There was significant decrease in pain scores within 24-hour postoperative *p*- value < 0.05 and there was a clinically significant reduction in time for outcome from the recovery room for OFA & TE group. The number of satisfied was higher in the OFA& TE group (60%) than BGA group (30%) (p=0.037).
Conclusion: Ultrasonic-guided TE block combined with Opioid free analgesia (OFA) is an option with a better ERAS pathway for pariatric surgery to decrease consumption of opioid perioperativly with no effect on recovery or pain control, better efficiency, and patient satisfaction.

Keywords: *Ultrasound-guided Thoracic epidural block, Opioid free analgesia; balanced general anesthesia; pariatric surgery; opioid consumption..*

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*
Authorship: *All authors have a substantial contribution to the article.*

INTRODUCTION

Multimodal mechanisms of action by different agents minimize doses of individual drugs resulting in less the side effects and affects different pain pathways in the nervous systems[1,2]. This result in good quality general anesthesia, enhances outcomes, and saves doses of opioid especially after surgery. This association can combine sodium channel blockers, NMDA antagonists, anti-inflammatory drugs and alpha-2 agonists[3]. Lignocaine is sodium channel blocker, with analgesic, anti-inflammatory, and anti-arrhythmic effects. Intravenous infusion of lidocaine reduces intraoperative anesthetics consumption, postoperative analgesic usage, pain score and length of hospital stay. Low to moderate plasma levels of lidocaine are associated with vasoconstriction, therefore blood pressure monitoring is essential during lidocaine infusion and anti-hypertensive agents should be available[4, 5]. Magnesium sulphate (NMDA) receptor antagonist non competitively, with an anticonvulsant, anti-inflammatory and muscle relaxant effects. Consequently, it has an opioid sparing effect and reduce postoperative pain scores [6].

We aimed evaluation of the OFA & TE technique in pathway of ERAS and comparison of patient hemodynamic (MABP) through operation, recovery

room and up to 24-hours postoperative. In addition to assessing total opioid requirements postoperatively, pain scores using the visual analogue scale (VAS) Postoperatively, and length of stay in the unit of anesthesia post care (PACU) and in hospital. Moreover, increased patient satisfaction and reduced complications such as hypoxia, nausea, vomiting and shivering during different phases of operations pre, intra, and postoperative with balanced general anesthesia.

PATIENTS AND METHODS

The study protocol was approved by the Ethics Committee of Al-Zahra hospital and informed written consent was obtained. The study recruited 60 patients ASA I, II, aged between 20-50 years, underwent bariatric surgery under their ERAS pathway. 30 patients who received OFA with thoracic epidural (OFA & TE; n=30) and 30 patients received traditional BGA regimen (BGA; n=30). In both groups standard monitors were applied (pulse oximetry, ECG, NIBP, and capnogram). 2 hours before the procedure clear liquids was allowed. Wide pore canula 18 gauge inserted, and Patients received midazolam IV 0.05 mg/kg as premedication, fluid solution as Ringer's lactate infused at rate 8 –12 ml/kg/hr. In Group OFA &TE while the patient was seated or on the lateral position after sterilization linear transducer was placed in a horizontal manner at the T5 spinous process corresponding to T4 transverse process. Three muscles were identified superior to the hyper echoic transverse process trapezius (uppermost), rhomboids major (middle), and erector spinae (lowest). Site of insertion, skin to epidural space distance, and direction were identified and marked before insertion of 18 Gauge Touhi needle (prefix epidural Catheter set, b Braun) (Figure 1), then a single injection with 20 ml Bupivacaine 0.25 % (0.25% BUPIVACAINE HClinj, USP HOSPIRA INC USA) was injected after negative aspiration. Then anesthesia pre-induction while providing 100% oxygen mask (8L/min) by 0.2 mcg/kg precedex, ketamine 0.25 mg/kg, xylocaine 1 mg/kg, esmolol 150 mcg/kg, 0.1 mg/kg dexamethasone, paracetamol 1g and magnesium sulfate 1 g, titrating all drugs as intravenous boluses. Then 1 to 1.5 mg/kg propofol titrated till sleep dose, 0.5 mg/kg atracurium thereafter inserted into an appropriately sized endotracheal tube (ETT). After intubation anesthesia maintained by the inhalational anesthetic agents, sevoflurane halved to (1/2 MAC) a bispectral target index of 55. Premixed IV infusion dexmedetomidine 0.1–2 ug/kg/h, lidocaine 1 mg/kg/h, 0.2 mg/kg/h ketamine esmolol 5–10 mcg/kg/min, and magnesium sulfate10 mg/kg/h. Mechanical ventilation was performed with oxygen 50% FiO_2 mixing air, tidal volume (TV) 4–10 ml/kg and RR 9–16 C/m to end-tidal CO_2 (30–35 mm). patients controlled analgesia (PCA) with a bottle filled by 0.2 mcg/kg precedex, ketamine 0.25 mg/kg, xylocaine 1 mg/kg, esmolol 150 mcg/kg, 0.1 mg/kg dexamethasone, paracetamol 1g and magnesium sulfate 1 g, titrating all drugs as intravenous infusion rate 6-hour limits, 5ml boluses as demand dose, and lock out interval 15 min to control post operative pain.

Balanced opioid based general anesthesia (BGA) group for induction of anesthetized patients received 1-2 ug/kg fentanyl, titrated propofol 1.5–2 mg/kg, 0.5 mg/kg atracurium for intubation. After endotracheal intubation 1–2 ug/kg boluses of fentanyl were given up to 2 mg total, MAC inhalational anesthetic with sevoflurane to maintain anesthesia. Mechanical ventilation with a volume of 4–10 ml/kg and RR 9–15C/min, with FiO_2 50% oxygen: air to achieve $ETCO_2$ = 30–35 mm. PCA used with 200 ug fentanyl, paracetamol 1gm as intravenous infusion rate 4hour limits, 5ml boluses as demand dose, and lock out interval 20 min to control post operative pain.

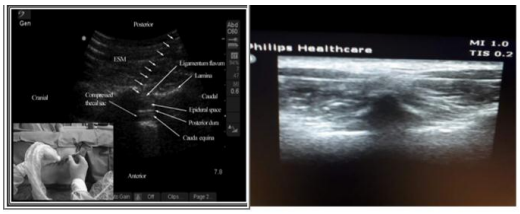

Fig 1: Ultra sonic guided thoracic epidural block.

Statistical analysis

Recorded data were analyzed using the statistical package for the social sciences, AS (SPSS Inc., Chicago, Illinois, USA) version 20.0. Qualitative data were expressed as percentage and frequency. Quantitative data were expressed as mean± SD. A 95% the confidence interval was set and 5% the margin of error was accepted. Therefore, up to *p*-value was considered significant as follows: up to *P* value 0.05 considered significant, up to *P*- value 0.001 was considered highly significant, and more than *P*- value 0.05 insignificant.

RESULTS

The demographic data including BMI, ASA status, and duration of surgery were compared among two groups statistically non-significant and p value (*P*>0.05) show (Table 1). There were no significant differences between the hemodynamic MABP, during operation, PACU and 24 hours postoperative at p value of (*P*>0.05) as shown in (Figure 2).

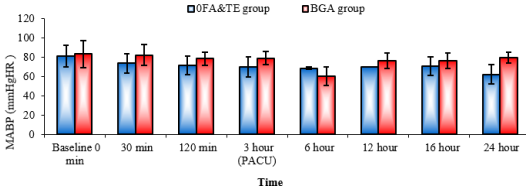

Fig 2: Hemodynamic (MABP) during operation, PACU and 24 hours postoperative in two groups (*P > 0.05: NS).

With regard to postoperative pain using VAS score, a statistically significant decrease was observing in (OFA & TE) group than the (BGA) group at p value of (P<0.005) as demonstrated in table (2). A significant reduction in total requirement of Opioid postoperatively in PACU in OFA & TE group was (5.28 ± 1.7), whereas it was (24.86 ± 5.5) in BAG and (p value < 0.001). In ward, there was also a significant difference regarding consumption of Opioid in group the OFA & TE (6.43±2.68) compared to BGA (23.68±4.6) and (p value< 0.001) as shown in table (3). Regarding patient satisfaction, more patients were not satisfied in the BGA group 11 (36.7%) compared to OFA & TE 4 (13.3%), while more patient partially satisfied in OFA &TE 10 (33.3%) compared to BGA group 8 (26.7%) at p-value 0.779 ($p < 0.05$). More patients 18(60%) were highly satisfied in the OFA &TE than the BGA group 9(30%) (p=0.037) as shown in table (4). With respect to postoperative complications in the PACU, regarding hypoxia there is no significant difference in OFA & TE (12%) and (15%) in BGA, there is no significant difference between two groups concerning to vomiting and nausea no patients in OFA & TE group compared with 18% and 12% respectively in BGA group and (p- value < 0.001). Finally, with regard to shivering there was a significant difference (15%) in OFA &TE group and 60% in BGA at (p- value < 0.05) as show (table 5).

	Group OF analgesia & TE	Group BGA	P- value
BMI	32.48±2.46	30.84±2.13	0.26
ASA I	17(65.7%)	21(70.0%)	0.422
ASA II	13 (43.3%)	9(30.0%)	
Duration of surgery (min)	64.4±11.3	64.9±12.0	0.869

Table 1: Demographic data of the two of studied groups.

Visual analogue scale (hour)	Group OFA &TE (n = 30)	Group BGA (n = 30)	P-value
0	0(0–1)	1(0–1)	<0.05*
2 hr.	1(0–1)	1(1–2)	<0.05*
4 hr.	1(1–1)	2(1–2)	<0.05*
6 hr.	1(1–2)	2(2–3)	<0.05*
12 hr.	2(1–3)	3(2–4)	<0.05*
24 hr.	2(1-3)	3(2-4)	<0.05*

Table 2: The visual analogue scale (VAS), significant (p < 0.05).

Postoperative Opioid consumption	Group OFA &TE	Group BGA	P-value
PACU	5.28 ± 1.7	24.86 ± 5.5	p < 0.001
In the ward	6.43±2.68	23.68±4.6	p < 0.001

Table 3: Postoperative opioid consumption (*p < 0.001, Highly Statistically significant).

Patients satisfaction	Group OFA & TE	Group BGA	P-value
Not satisfied	4 (13.3%)	11 (36.7%)	0.072
Partially satisfied	10 (33.3%)	8 (26.7%)	0.779
Highly satisfied	18 (60.0%)	9 (30.0%)	0.037*

Table 4: Comparison Patients satisfaction in the two groups (*p < 0.05 significant).

complication in PACU	OF analgesia & TE group (n%)	BGA group (n%)	p- value
Hypoxia	3 (12.0)	4.3 (15.0)	0.468
Nausea	0	18 (60.0)	<0.001**
Shivering	4.3 (15.0)	18 (60.0)	0.009*
Vomiting	0	12 (40.0)	0.006*

Table 5: Postoperative complication (*P< 0.05, significant; **p <0.001, highly significant.

DISCUSSION

This study was designed to investigate the effects of OFA & TE group as well as BGA group in morbid obese patients body mass index (BMI) higher than 40 kg/m^2 scheduled for bariatric surgery at Al- Zahra hospital within a period 2019 to 2021, regarding hemodynamic (MABP), quality of pain relief using (VAS), total amount of Opioid consumption postoperatively, patient satisfactions and complications such as hypoxia, nausea, shivering and vomiting in PACU and postoperative.

Regarding demographic data include sex, BMI, and duration of surgery in the two groups were found to be similar.

Concerning the hemodynamic changes (MABP), there was no statistically significant difference in MABP in tow studied group postoperatively in the PACU.

The results of the current study are in agreement with Choi et al.[7] who compared the effect of Opioid-free analgesia with 80 patients, Opioid anesthesia techniques using fentanyl, dexmedetomidine and propofol total intravenous anesthesia (TIVA) and its effect on sedation, stability of hemodynamic, intensity of pain postoperatively and incidence of side effects on elective laparoscopic cholecystectomy.

The results of the present research are compatible with those of Lavand'homme et al. [8] who examined the effect of general anesthesia on hemodynamic response HR, SBP, DBP and MAP in upper abdominal surgery patients, they did not observe any significant hemodynamic changes except at the time corresponding to laryngoscopy and endotracheal intubation.

On contrast with current study the study done by Brandal et al.[9] on patients undergoing abdominal hysterectomy under balanced general anesthesia shows that opioid analgesic play an important role in attenuation of stress response. The patient was received fentanyl up to 250 mcg of and morphine 0.1 mg/kg before surgical incision.

In contrast to this stud, Hontoir et al.[10] measured the quality of recovery after OFA on 50 patients undergoing elective laparoscopic bariatric surgery[11].

Several studies in agreement with the current study demonstrated the advantages of Opioid free analgesia group in compared to the opioid- based groups reducing complications postoperatively as vomiting, opioid needs, pain score, depression of respiration and oxygen need[12,13].

In agreement of the results of the current study, Aronsohn et al [14] indicate that OFA with lidocaine, propofol infusion, and dexmedetomidine compared to high-dose balanced general anesthesia and fentanyl propofol infusions associated with low dose fentanyl requirements within early period (0–24h) postoperative after bariatric surgery[15].

OFA & TE may have complication such as blood pressure changes from increasing drug plasma levels up to toxic doses. Therefore, vasopressor is used as levophid when the use of propofol is increased. Blood pressure reducing agents that may be used for hypertension result from moderate dose of lidocaine [16].

In agreement with our study lidocaine as hypnotic agents is less significant than opioids, thus high propofol doses can lead to arterial hypotension. So, we did not observe a high incidence of syndrome of vasoplegia and signs of local anesthetic toxicity as heart block, and seizure[16, 17].

Landry et al.[18, 19] described using of OFA at multiple levels of lumbar disc prolapse surgery lidocaine and dexmedetomidine infusions and observe improving decreasing dose of analgesia within first hours after surgery.

In agreement with our results Grant et al[20, 21] described the need of ideal postoperative pain management in multiple levels spine surgery is crucial. In addition to OF analgesia & anesthesia, blockade of erector spinae muscle and a golden standard analgesia of thoracic epidural. Erector spinae plane (ESP) block is now a better alternative technique.

Brown et al [22].[23] showed that OFA & TE depend on analgesic use of different non-opioid effects and stabilization of haemodynamic. Alpha 2 agonist has sedative and analgesic properties and mild impact on respiration, nausea and decrease intensity of pain, analgesic doses, with decreasing recovery time [24, 25].

Panchgar et al.[26, 27] demonstrated the side effects of the drugs such as instability of haemodynamic as hypotension and bradycardia, as well as increased sedation that can avoided by decrease dose of infusion. In same case registered after anesthesia induction episode of hypotension transiently, no significant haemodynamic instability was observed when performing maneuver of lung recruitment during operation [28].

Supporting our study, the study of Suzan et al., [29] showed that OFA &TE group quite rare complication such as vomiting and nausea and that may be caused by hypotension. So, patients underwent hypotension treatment without the need for nausea treatment in similar cases [30].

CONCLUSION

The combination of Ultrasonic guided blockade thoracic epidural and opioid free analgesia have been a multimodal sedation and anesthesia approaches within an ERAS pathway for bariatric surgery, that can alleviate the needs for opioid as analgesic within PACU after surgery.

REFERENCES

1. Aronsohn J, Orner G, Palleschi G, et al. Opioid-free total intravenous anesthesia with ketamine as part of an enhanced recovery protocol for bariatric surgery patients with sleep disordered breathing. *J ClinAnesth.* 2019;52:65-6**.**
2. Vuyk J and Sitsen EandReekers M. Intravenous anesthetics. In: Miller RD, Cohen NH, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL, editors. Miller's anesthesia. *8th edition. Amsterdam: Elsevier*. 2015; 854– 9
3. Buvanendran AandKroin JS. Multimodal analgesia for controlling acute postoperative pain. *Curr Op in Anaesthesiol*.2009; 22: 588– 93 **.**
4. Kara H, Sahin N, Ulusan V, et al. Magnesium infusion reduces perioperative pain. *Eur J Anaesthesiol.* 2002; 19:52–6 **.**
5. VigneaultL, Turgeon AF, Côté D, et al. intravenous lidocaine infusion for postoperative pain control: A meta-analysis of randomized controlled trials. *Can Journal Anesth*. 2011; 58:22-37**.**
6. Mauermann E, Ruppen WandB and schapp O. Different protocols used today to achieve total opioid-free general anesthesia without locoregional blocks. *Best Pract Res ClinAnaesthesiol.* 2017; 31:533-45**.**
7. Choi JW, Joo JD, Kim DW, et al. Comparison of an intraoperative infusion of fentanyl, remifentanil, and dexmedetomidine on perioperative hemodynamics, sedation quality, and postoperative pain control. *J Korean Med Sci*. 2016; 31:85–90 **.**
8. Lavand'homme P. Opioid-free anesthesia: Pro: damned if you don't use opioids during surgery. *Er J Anaesthesiol.* 2019; 26:247-9**.**
9. Brandal D, Keller MS, Lee C, et al. Impact of enhanced recovery after surgery andopioid-free anesthesia on opioid prescriptions at discharge from the hospital: a historical-prospective study. *AnesthAnalg*. 2017;125:1784–92**.**
10. Hontoir S, Saxena S, Gatto P, et al. Opioid-free anesthesia: what about patient comfort? A prospective, randomized, controlled trial. *ActaAnaesthesiol Belg.* 2016; 67:183–190 **.**
11. De Oliveira GS Jr, Fitzgerald P, Streicher LF, et al. Systemic lidocaine to improve postoperative quality of recovery after ambulatory laparoscopic surgery. *AnesthAnalg.* 2012;115:262-7**.**
12. De Oliveira GS, Castro-Alves LJ, Khan JH, et al. Perioperative systemic magnesium to minimize postoperative pain a meta-analysis of randomized controlled trials. *Anesthesiology*. 2013;119:178-90**.**
13. GholipourBaradari A, Habibi MR, Habibi V, et al. Administration of lidocaine in patients undergoing coronary artery bypass grafting and valve plasty to prevent cognitive deficit: a systematic review and meta-analysis. *Expert Rev ClinPharmacol*. 2017; 10:179–85**.**
14. Hsu Y-W, Somma J, Newman MF, et al. Population pharmacokinetics of lidocaine administered during and after cardiac surgery. *J CardiothoracVascAnesth*. 2011; 25:931–6**.**
15. Cassuto J, Sinclair R and Bonderovic M. Anti-inflammatory properties of local anesthetics and their present and potential clinical implications. *ActaAnaesthesiol Scand*. 2006; 50:265–82 **.**
16. Cividjian A, Petitjeans F, Liu N, et al. Do we feel pain during anesthesia? A critical review on surgery-evoked circulatory changes and pain perception. *Best Pract Res ClinAnaesthesiol*. 2017; 31:445–67**.**
17. Manworren RC. Multimodal pain management and the future of a personalized medicine approach to pain. *AORN J.* 2015; 101: 308– 14 **.**
18. 18 **.**Landry E, Burns S, Pelletier MP, et al.A successful opioid-free anesthetic in a patient undergoing cardiac surgery. J CardiothoracVascAnesth. 2018; 18:1053–770**.**
19. 19 **.**Maze M, Scarfini CandCavaliere F. New agents for sedation in the intensive care unit. Crit Care Clin. 2001; 7: 221: 226 **.**
20. Grant MC, PioRoda CM, Canner JK, et al. The impact of anesthesia-influenced process measure compliance on length of stay: results from an Enhanced Recovery After Surgery for Colorectal Surgery cohort. *AnesthAnalg*. 2019; 128:68–74**.**
21. Mansour MA, Mahmoud AA and Geddawy M. Nonopioid versus opioid based general anesthesia technique for bariatric surgery: a randomized double-blind study. *Saudi J Anaesth*. 2013; 7:387–91**.**
22. Brown E and Oswald Kand Pellegrini J. Dexmedtomidine in bariatric surgery: A useful opioid adjunct? an evidence-based review. *BariatNursSurg Pat.* 2012; 7:70-4.
23. Mulier JP, Wouters R, Dillemans B, et al. A randomized controlled, double-blind trial evaluating the effect of opioid-free versus opioid general anesthesia on postoperative pain and discomfort measured by the QoR-40. *J ClinAnesth Pain Med*. 2018; 2:015.
24. Samuels D, Abou-SamraA and Dalvi P. Opioid-free anesthesia results in reduced post-operative opioid consumption. *J ClinAnesth Pain Med*. 2017; 1:13**.**
25. Shalaby M, Abdalla M and Mahmoud AS. Nonopioid versus opioid based general anesthesia technique for laparoscopic cholecystectomy. *Egypt J Hosp Med*. 2018; 73: 6206– 412**.**
26. Panchgar V, Shetti AN, Sunitha HB, et al. The effectiveness and side effects profile in patients undergoing laparoscopic surgery under general anesthesia of intravenous dexmedtomidine on perioperative hemodynamics, analgesic requirement. *Anesth Essays Res*. 2017; 11:72**.**
27. Vaughan-Shaw PG, Fecher IC, Harris S, et al. A meta-analysis of the effectiveness of the opioid receptor antagonist alvimopan in reducing hospital length of stay and time to GI recovery in patients enrolled in a standardized accelerated

recovery program after abdominal surgery. *Dis Colon Rectum.* 2012; 55:611–20 **.**

28. 28 **.**Ziemann-Gimmel, P, Goldfarb AA, Koppman J, et al. Opioid-free total intravenous anaesthesia reduces postoperative nausea and vomiting in bariatric surgery beyond triple prophylaxis. *Br J Anaesth*. 2014; 112:906-11 **.**
29. 29 **.**Suzan E, Pud D, Eisenberg E.A crucial administration timing separates betweenbeneficial and counterproductive effects of opioids on postoperative pain. *Pain.* 2018; 159:1438–40**.**
30. Kates SL, Wick E, Cannesson M, et al. Evidence review conducted for the Agency for Healthcare Research and Quality Safety Program for Improving Surgical Care and Recovery: focus on anesthesiology for total knee arthroplasty. *AnesthAnalg*. 2018.