Randomized Trial

Dexmedetomidine Added to Bupivacaine versus Bupivacaine in Transincisional Ultrasound-Guided Quadratus Lumborum Block in Open Renal Surgeries: A Randomized Trial

Amin M. Alansary, MD[1], Atef Badawy, MD[2], and Marwa A.K. Elbeialy, MD[1]

From: : [1]Department of Anesthesiology, Intensive Care and Pain Management, Faculty of Medicine, Ain Shams University, Cairo, Egypt; [2]Department of Urology, Faculty of Medicine, Menoufia University, Menoufia, Egypt

Address Correspondence: Marwa A.K. Elbeialy, MD Department of Anesthesiology, Intensive Care and Pain Management, Faculty of Medicine, Ain-Shams University Abbassia 11591 Cairo, Egypt E-mail: mar_khairy@yahoo.com

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Background: General anesthesia (GA) is the preferred anesthetic modality for open renal surgeries to ensure a patent airway while the patient is in the lateral decubitus position. However, these surgeries are usually accompanied by severe postoperative pain with increased requirements for multimodal pain management strategies. Regional blocks provide better postoperative pain control with less systemic opioid consumption.

Objectives: The aim of this study was to describe the ultrasound (US)-guided transincisional quadratus lumborum block (TiQLB) as a new approach, and to compare the addition of dexmedetomidine to bupivacaine versus bupivacaine alone for TiQLB in combination with GA regarding postoperative analgesia and adverse effects in open renal surgery.

Study Design: A prospective, randomized, double-blind, controlled trial.

Setting: Ain Shams University Hospitals.

Methods: Eighty patients who were scheduled for an elective open renal surgery, aged 20 to 65 years, of either gender, and American Society of Anesthesiologists physical status I to II were enrolled in the study. They were randomly allocated into 2 equal groups: group dexmedetomidine-bupivacaine (DB) (n = 40) in which patients received combined GA plus TiQLB with 30 mL bupivacaine 0.25% plus 1 µg/kg dexmedetomidine, and group bupivacaine (B) (n = 40) in which patients received combined GA plus TiQLB with 30 mL bupivacaine 0.25% only. The primary outcome was the total morphine consumption among both groups, whereas the secondary outcomes were the Visual Analog Scale (VAS) scores and the time to first analgesic requirement during the first 24 hours. Postoperative side effects, such as sedation, nausea, vomiting, shivering, pruritus, bradycardia, hypotension, and respiratory depression, were also recorded.

Results: Patients in the DB group experienced lower total morphine consumption and lower VAS scores when compared with patients in the B group ($P < 0.001$). Time to first analgesic requirement was prolonged in patients in the DB group (18.6 ± 2.4 hours) in comparison to patients in the B group (7.3 ± 1.1 hours). Ten minutes after the block there was a significant reduction in mean blood pressure and heart rate in the DB group than in the B group. Regarding postoperative adverse effects, sedation scores were higher in the DB group than in the B group, postoperative nausea, vomiting, and shivering were significantly higher in the B group than in the DB group. Bradycardia was significantly more frequent among the DB group. Although nonsignificant, pruritus was more frequent in the B group than in the DB group. No cases of respiratory depression were reported in both groups.

Limitations: The used technique US-guided TiQLB could be performed in open renal surgeries only.

Conclusions: The new approach US-guided TiQLB was effective and easy to be performed. Adding dexmedetomidine to bupivacaine in TiQLB was associated with potent and prolonged postoperative analgesia with fewer postoperative adverse effects.

Key words: Quadratus lumborum block, dexmedetomidine, open renal surgery, postoperative pain, bupivacaine

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Endourologic and laparoscopic techniques have become the most common approaches for renal surgeries. However, there are still indications for open renal surgery, such as complex renal stone, presence of contraindications to percutaneous nephrolithotomy (PCNL), retro-renal colon (1), nephrectomy after the failure of laparoscopic progress, large impacted upper ureteric stone after failure of extracorporeal shock wave lithotripsy and endoscopic removal (2), or in renal transplant surgery (3).

General anesthesia (GA) is the most frequently used modality for open renal surgery to ensure a patent airway while the patient is in the lateral decubitus position. However, these surgeries under GA are usually accompanied by severe postoperative pain with increased need for multimodal pain management strategies (4).

Quadratus lumborum block (QLB) was first described by Blanco (5) in 2007 to improve postoperative pain in various surgeries, including renal surgeries. Currently there are 4 approaches for QLB: lateral (6), posterior (7), anterior (8), and intramuscular block (9).

Dexmedetomidine is a highly selective α-2 agonist known to decrease sympathetic central nervous system outflow and to provide sympatholytic sedative, anxiolytic, hypnotic, and analgesic effects (10). The analgesic effect of dexmedetomidine is mediated by its effect on α-2 receptors within the locus coeruleus and spinal cord. Additionally, dexmedetomidine lacks most of the side effects of opioids, such as respiratory depression, nausea, vomiting, urine retention, and pruritus (11).

The aim of this study was to describe the ultrasound (US)-guided transincisional quadratus lumborum block (TiQLB) as a new approach, and to compare the addition of dexmedetomidine to bupivacaine versus bupivacaine alone for TiQLB in combination with GA in elective open renal surgery regarding postoperative analgesia, hemodynamic stability, and adverse effects.

Methods

After approval of the study by the research ethical committee of the Faculty of Medicine, Ain-Shams University (FMASU R14/2019), its registration in the Clinical Trials.gov (registration no. NCT03869047), and obtaining full written informed consent with full explanation of the procedure from all the patients, this prospective, randomized, double-blinded, controlled trial was conducted at Ain-Shams University hospitals from March 2019 to August 2019. Eighty patients who were scheduled for elective open renal surgery in the lateral decubitus position (e.g., nephrectomy, complex renal stone, impacted large upper ureteric stone, donors of renal transplant), aged 20 to 65 years, of either gender, and physical status American Society of Anesthesiologists (ASA) physical status I to II were enrolled in the study.

Exclusion criteria included patients who refused to participate, had a body mass index (BMI) > 30 kg/m^2, ASA physical status > II, or had major illnesses (e.g., cardiac, respiratory, renal, hepatic, or neurologic), anticoagulant use or history of coagulopathy, infection at the injection site (e.g., psoas abscess), an allergy or contraindications to the drugs used in the study, a history of drug addiction or alcohol abuse or a psychiatric illness, or mental retardation interfering with the evaluation of pain scores or the use of patient-controlled analgesia (PCA) programs.

Patients were randomly allocated by computer-generated lists and the closed-envelope method into one of the following groups in a 1:1 ratio: group DB (dexmedetomidine plus bupivacaine) (n = 40) in which patients received combined GA and US-guided TiQLB with 30 mL of bupivacaine 0.25% plus 1 µg/kg of dexmedetomidine (Precedex 200 µg/2 mL vial; Hospira, Inc., Lake Forest, IL), and group B (bupivacaine) (n = 40) in which patients received combined GA and US-guided TiQLB with 30 mL of bupivacaine 0.25%.

All patients were assessed preoperatively by routine evaluation on the day before surgery and were instructed about the usage of PCA. On arrival to the operating room, an intravenous (IV) access was secured in the hand of the operated side, and 1 to 2 mg midazolam was given and standard ASA monitoring, including electrocardiography, noninvasive blood pressure, and pulse oximetry (SpO_2), were established. Baseline heart rate (HR), mean blood pressure (MBP), and SpO_2 readings were recorded.

Ringer's acetate 10 mL/kg was started for all patients, then in both groups, GA was induced. After preoxygenation, IV fentanyl 1 to 2 µg/kg was given slowly, followed by IV propofol 1.5 to 2 mg/kg, which was slowly injected and titrated until the loss of verbal contact with the patient, then IV rocuronium 0.9 mg/kg was given to facilitate endotracheal intubation. Once the endotracheal tube had been secured carefully in place, end-tidal CO_2 monitoring was established using capnography, and ventilation was adjusted to maintain normal end-tidal CO_2.

Anesthesia was maintained with sevoflurane, with end-tidal sevoflurane at 2%. Rocuronium was supplemented at 0.15 mg/kg according to nerve stimulator monitoring. The patient was carefully and gradually

rolled on to the lateral position with surgical side up and supported so as not to impede the arterial or venous circulation of the lower side. The HR, MBP, and SpO_2 were monitored closely just before and after positioning to avoid significant adverse events.

Intraoperatively, the depth of anesthesia was monitored by the bispectral index, which was maintained within 40 to 60 by IV fentanyl supplementation and regulating the sevoflurane concentration as needed. The hemodynamic parameters (HR, MBP) were monitored continuously, and recordings were collected every 5 minutes. Hypotension (defined as MBP falling more than 20% mm Hg from baseline) was treated with 250 mL of normal saline solution and/or 3 to 6 mg of IV ephedrine in bolus doses, and an HR < 50 beats/min was treated with 0.5 mg of IV atropine.

Technique of US-Guided TiQLB

After completing the renal procedure and before wound closure, TiQLB was performed as follow: while the patient is still on the lateral side where the surgical side is up, the surgical field was opened by retractors to allow direct visualization of the quadratus lumborum muscle (QLM) and the psoas major muscle (PMM) (Fig. 1), then a sterilized and insulated US convex probe (5-8 MHz) (model USAP-770A; Toshiba, Tokyo, Japan) was positioned 1 cm from the lateral edge of the wound, above the level of the QLM (just below the costal margin at the level of L1-2), this was followed by insertion of an 18-guage Tuohy needle from the anteromedial side to the posterolateral side in the junction between the PMM and QLM penetrating the thoracolumbar fascia, then the local anesthetic solution was injected slowly after careful aspiration to avoid inadvertent administration of the drugs into vessels. This was evident by observing hydrodissection of local anesthetic between QLM and PMM on US (Fig. 2). In group DB, an injection of 30 mL of 0.25% of bupivacaine including 1 μg/kg of dexmedetomidine was applied. In group B, an injection of 30 mL of 0.25% of bupivacaine only was applied. Patients were closely monitored during the injection for signs of local anesthetic toxicity.

After skin closure, patients were returned to the supine position with head up slightly. Oral suction was performed under vision, and reversal agents (atropine 0.02 mg/kg and neostigmine 0.04 mg/kg) were given after adequate recovery of the neuromuscular blockade. Patients were extubated when they were able to open their eyes on verbal command, and the T4/T1 ratio was ≥ 90%. After extubation, all patients received an IV PCA

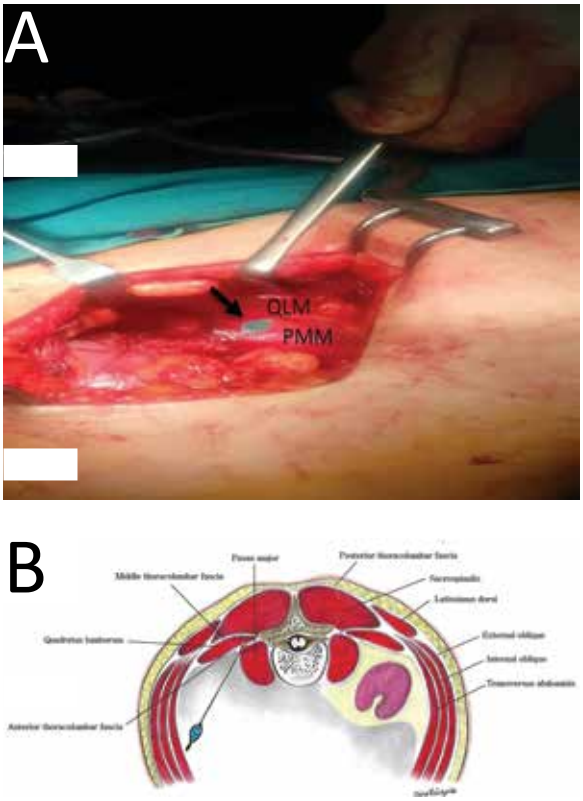

Fig. 1. *TiQLB. (A) Arrow points to the needle between the QLM and PMM, piercing the anterior thoracolumbar fascia. (B) The yellow circle in the diagram illustrates the position of the needle in TiQLB.*

system (Accufuser Plus, 100 mL; Woo Young Medical Co., Chungcheongbuk-do, Korea). PCA was prepared with 60 mL of normal saline solution containing 60 mg of morphine, and the system was programmed to give a 0.5 mL bolus dose with a lockout interval of 8 minutes without basal rate infusion. PCA was discontinued at 24 hours after surgery, and at that time, oral analgesics were started.

All patients were then transmitted to the postanesthesia care unit (PACU), where an anesthetist and a nurse unaware of the study protocol observed the patients. The hemodynamic parameters were recorded in the PACU at 0, 5, 10, 20, and 30 minute intervals. The patients were transferred to the ward after achieving standard discharge criteria. The time to the first analgesic requirement and the total morphine consumption over the first 24 hours postoperatively were recorded. Pain scores were evaluated by a blinded observer anesthesiologist at the time of arrival in the PACU and

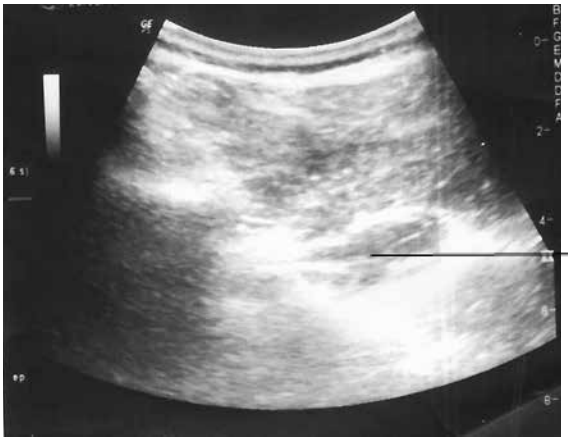

Fig. 2. *Ultrasound image shows hydrodissection of local anesthetic between the QLM and PMM.*

Table 1. *Ramsay sedation scale (12).*

1. Anxious and agitated or restless or both
2. Cooperative, oriented, and tranquil
3. Responds to commands only
4. Brisk response to a light glabellar tap or loud auditory stimulus
5. Sluggish response to a light glabellar tap or loud auditory stimulus
6. No response to a light glabellar tap or loud auditory stimulus

at 1, 2, 4, 6, 8,10, 12, 16, 20, and 24 hours thereafter using a Visual Analog Scale (VAS) (ranging from 0-10 cm: where 0 = no pain, 10 = worst pain). The patients were instructed about the usage of the PCA system and the VAS preoperatively. When the patient developed a breakthrough pain, a 2.5 mg IV morphine was given.

The Ramsay sedation scale (12) was used to assess postoperative sedation, immediately after extubation and 2,4, 6, 12, and 24 hours postoperatively (Table 1).

Postoperative nausea and vomiting (PONV) during the first 24 hours were recorded, and PONV was treated with 0.1 mg/kg of IV ondansetron. Other adverse events, such as pruritus, shivering, hypotension, bradycardia, and respiratory depression (respiratory rate < 10/min), were recorded. The primary outcome was the total morphine consumption among both groups, whereas the secondary outcomes were the VAS scores, the time to first analgesic requirement, and the incidence of postoperative adverse effects related to study drugs during the first 24 hours.

Sample Size Calculation

We used the Stata program version 10 (StataCorp LLC, College Station, TX), setting an α error of 5% and a power of 90%. Results from a previous study by Bakr et al (13) showed that the mean standard deviation (SD) morphine consumption in group B was 12 ± 3.6 compared with 9 ± 3.6 in group DB. Based on this, with considering a 20% drop out rate, the needed sample size was 40 patients per group, for a total of 80 patients.

Statistical Methods

The collected data were coded, tabulated, and statistically analyzed using SPSS statistics software version 18.0 (SPSS Inc., Chicago, IL).

Descriptive statistics were done for quantitative data as mean ± SD for quantitative normally distributed data, median and first and third interquartile range for quantitative nonnormally distributed data, whereas they were done for qualitative data as number and percentage.

Inferential analyses were done using the Shapiro–Wilk test for testing normality, independent t-test in cases of 2 independent groups with quantitative data groups with normally distributed data, and the Mann–Whitney U in cases of 2 independent groups with nonnormally distributed data. In qualitative data, inferential analyses for independent variables were done using the chi-square test for differences between proportions, and the Fisher exact test for variables with small expected numbers. The level of significance was taken as a P value < 0.05 was significant, P value < 0.001 was highly significant, otherwise it was nonsignificant.

Results

A total of 97 patients were recruited for the study, 14 patients were excluded because they did not meet the inclusion criteria, and 3 patients refused to

participate. Finally, 80 patients matched the study criteria and successfully completed the study after they provided their consent. They were randomly allocated into 2 groups (40 patients in each group) (Fig. 3). The 2 groups were not statistically different for demographic data (age, gender, BMI, ASA), type and the duration of operation (Table 2).

Regarding the hemodynamic parameters (MBP, HR), there were no significant differences at basal, postintubation, and intraoperative time until minute-5 before block. After the block, MBP and HR showed initial reduction in both groups at minute-10, followed by elevation at minute-20, and this continued postoperatively with significantly lower MBP and

Table 2. *Demographic and operative characteristics of the study groups.*

Variables		Group DB (n = 40)	Group B (n = 40)	*P* Value
Age (years)		41.0 ± 9.2	38.7 ± 9.3	*0.268
BMI (kg/m^2)		24.4 ± 2.0	24.8 ± 1.9	*0.276
Gender	Male	26 (65.0%)	28 (70.0%)	†0.623
	Female	14 (35.0%)	12 (30.0%)	
ASA	I	36 (90.0%)	33 (82.5%)	†0.330
	II	4 (10.0%)	7 (17.5%)	
Surgery	Nephrectomy	23 (57.5%)	22 (55.0%)	‡1.000
	Nephrolithotomy	10 (25.0%)	9 (22.5%)	
	Pyelolithotomy	5 (12.5%)	6 (15.0%)	
	Impacted upper ureteric stone	2 (5.0%)	3 (7.5%)	
Operation duration (minutes)		146.9 ± 11.8	145.5 ± 13.3	*0.633

Data presented as mean ± SD or n (%) as indicated. *Independent t-test; †chi-square test; ‡Fisher exact test.

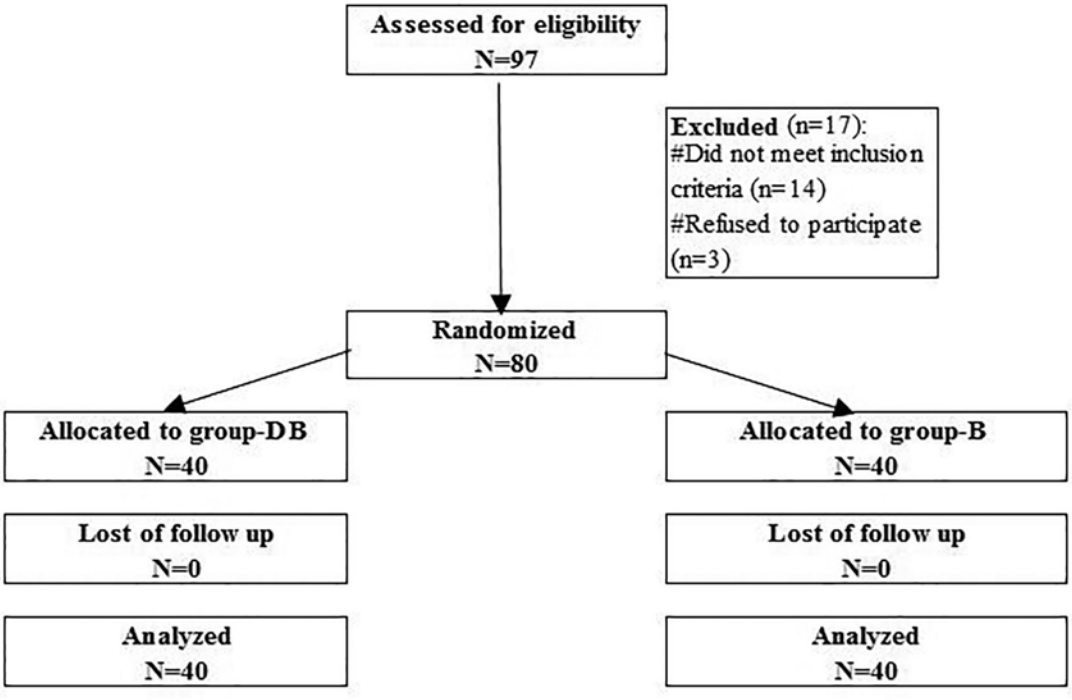

Fig. 3. *CONSORT patient flowchart.*

HR noticed among the DB group (Tables 3 and 4; Figs. 4 and 5).

There was a significant decrease in the number of patients who needed morphine in the DB group (62.5% [n = 25]) compared with the patients in the B group (100% [n = 40]) ($P < 0.001$). The mean time to the first analgesic requirement was significantly prolonged in the DB group (18.6 ± 2.4 hours) compared with the B group (7.3 ± 1.1 hours), and there was a significant decrease in the total morphine consumption among patients in the DB group (3.0 ± 2.9) compared with the patients in the B group (11.1 ± 3.5) in the first 24 hours postoperatively (Table 5).

Postoperative sedation scores were higher among group DB throughout the study duration, but the differences were statistically significant only from the second hour postoperatively (Fig. 6).

Table 3. *MBP (mm Hg) among the studied cases.*

Time	Group DB (n= 40)	Group B (n = 40)	†*P* Value	Difference (DB-B)	
				Mean ± SE	95% CI
Operative					
Base	91.1 ± 3.4	92.3 ± 3.9	0.146	−1.2 ± 0.8	−2.8 to 0.4
After intubation	100.0 ± 4.1	101.2 ± 5.0	0.274	−1.1 ± 1.0	−3.2 to 0.9
Midoperative	89.9 ± 3.4	91.4 ± 3.8	0.077	−1.5 ± 0.8	−3.1 to 0.2
Minute-5 before block	89.1 ± 3.4	90.3 ± 3.9	0.139	−1.2 ± 0.8	−2.9 to 0.4
Minute-10 after block	64.1 ± 3.7	68.8 ± 3.9	< 0.001*	−4.7 ± 0.8	−6.4 to −3.0
Minute-20 after block	62.0 ± 3.7	69.3 ± 3.4	< 0.001*	−7.3 ± 0.8	−8.8 to −5.7
Postoperative					
Minute-0	64.0 ± 3.8	72.1 ± 2.9	< 0.001*	−8.1 ± 0.8	−9.6 to −6.6
Minute-5	66.9 ± 3.8	74.3 ± 2.8	< 0.001*	−7.4 ± 0.8	−8.9 to −5.9
Minute-10	68.8 ± 3.9	76.1 ± 3.0	< 0.001*	−7.3 ± 0.8	−8.9 to −5.7
Minute-20	70.8 ± 3.8	77.7 ± 2.8	< 0.001*	−6.8 ± 0.7	−8.3 to −5.3
Minute-30	72.8 ± 3.9	79.8 ± 2.8	< 0.001*	−7.0 ± 0.7	−8.5 to −5.5

*Highly significant *P* value; †independent t-test; CI, confidence interval.

Table 4. *HR (beat/minute) among the studied cases.*

Time	Group DB (n = 40)	Group B (n = 40)	†*P* Value	Difference (DB-B)	
				Mean ± SE	95% CI
Operative					
Base	81.5 ± 4.1	80.8 ± 3.5	0.462	0.6 ± 0.8	−1.1 to 2.3
After intubation	96.2 ± 5.7	95.6 ± 4.4	0.647	0.5 ± 1.1	−1.7 to 2.8
Midoperative	78.3 ± 2.0	78.1 ± 1.8	0.642	0.2 ± 0.4	−0.7 to 1.1
Minute-5 before block	78.3 ± 2.3	77.9 ± 2.1	0.442	0.4 ± 0.5	−0.6 to 1.3
Minute-10 after block	60.0 ± 3.1	69.1 ± 2.1	< 0.001*	−9.1 ± 0.6	−10.2 to −7.9
Minute-20 after block	58.2 ± 3.2	69.9 ± 2.2	< 0.001*	−11.7 ± 0.6	−13.0 to −10.5
Postoperative					
Minute-0	59.1 ± 3.4	71.0 ± 2.3	< 0.001*	−11.9 ± 0.6	−13.1 to −10.6
Minute-5	62.1 ± 3.7	72.1 ± 2.5	< 0.001*	−10.0 ± 0.7	−11.4 to −8.6
Minute-10	65.2 ± 3.8	73.1 ± 2.6	< 0.001*	−7.9 ± 0.7	−9.4 to −6.5
Minute-20	67.1 ± 4.0	74.9 ± 2.6	< 0.001*	−7.8 ± 0.8	−9.3 to −6.3
Minute-30	71.1 ± 4.3	77.8 ± 3.0	< 0.001*	−6.7 ± 0.8	−8.3 to −5.0

*Highly significant *P* value; †independent t-test; CI, confidence interval.

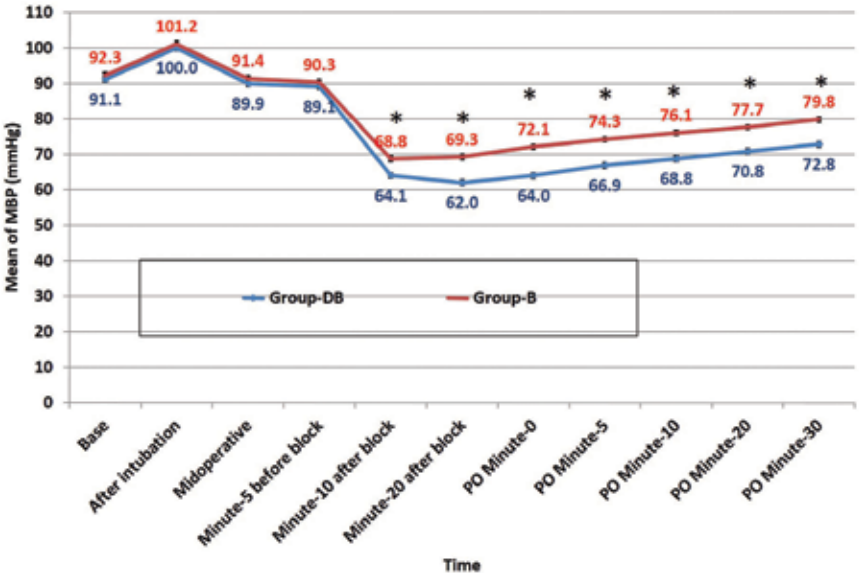

Fig. 4. *Intraoperative and postoperative MBP among the studied groups.*
*Highly significant *P* value.

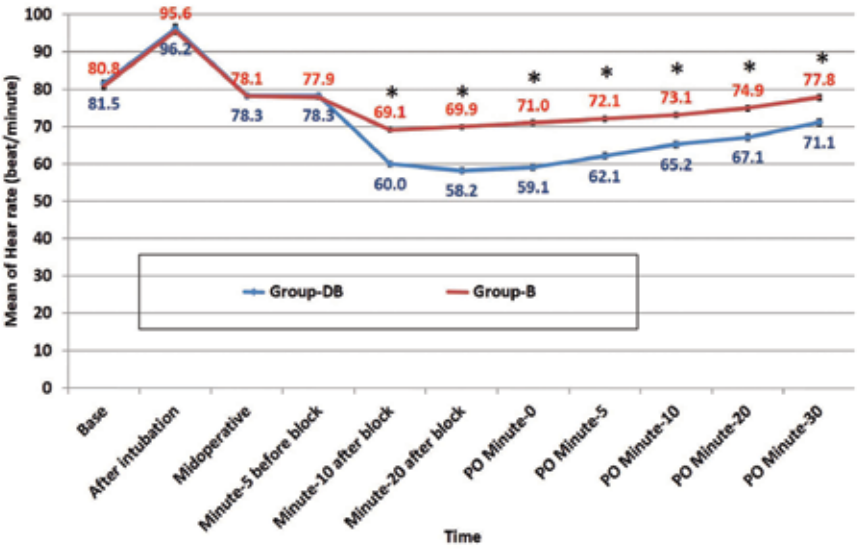

Fig. 5. *Intraoperative and postoperative HR among the studied groups.*
*Highly significant *P* value.

Regarding the mean VAS scores, there were no significant differences between the 2 groups from 0 to 4 hours, after which there was a significant reduction in the VAS scores in the DB group compared with the B group (Fig. 7).

PONV was more frequent and significantly higher in the B group (40.0% [n = 16]) than in the DB group (12.5% [n = 5]) (*P* = 0.005). Although nonsignificant, 9 patients (22.5%) in the DB group experienced hypotension compared with 4 patients (10.0%) in the B group (*P* = 0.130).

Regarding other adverse events, the incidence of intraoperative bradycardia was significantly higher in the DB group (30% [n = 12]) than in the B group (5% [n = 2]) (*P* = 0.003). There was a significant increase in the incidence of postoperative shivering in the B group

Table 5. *Analgesia among the studied groups.*

Time	Group DB (n = 40)	Group B (n = 40)	*P* Value	Difference (DB-B)	
				Mean ± SE	95% CI
Time to first analgesic requirement (h)†	18.6 ± 2.4	7.3 ± 1.1	‡< 0.001*	11.4 ± 0.4	10.5 to 12.2
Total morphine consumption (mg)	3.0 ± 2.9	11.1 ± 3.5	‡< 0.001*	–8.1 ± 0.7	–9.5 to –6.6

*Highly significant *P* value; †in requested cases only; ‡independent t-test

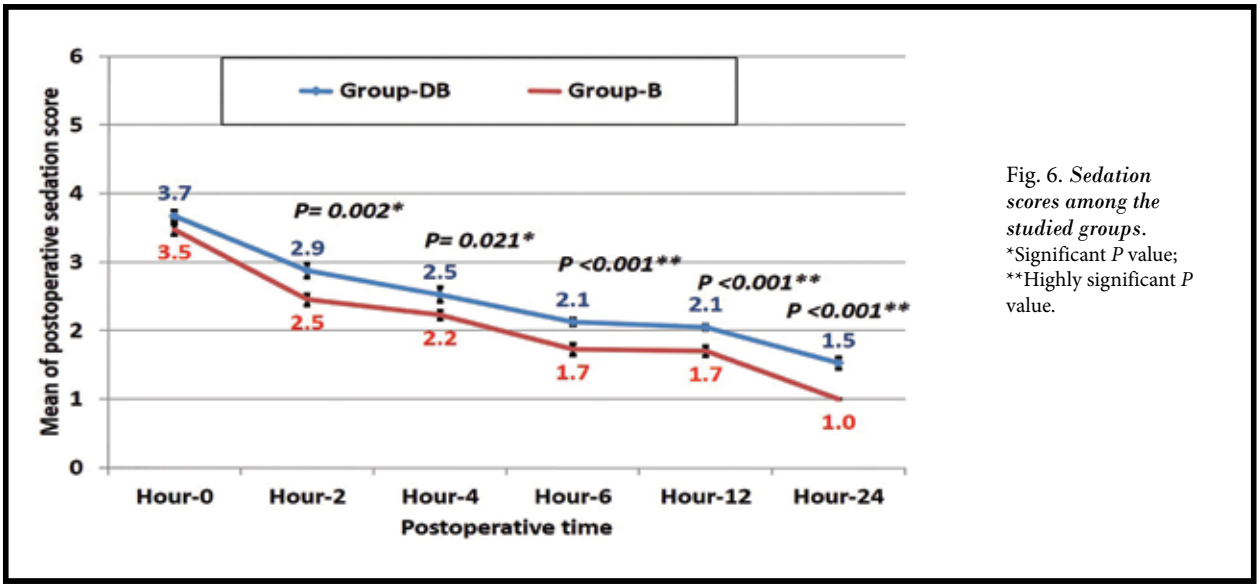

Fig. 6. *Sedation scores among the studied groups.* *Significant *P* value; **Highly significant *P* value.

(27.5% [n = 11]) than in the DB group (7.5% [n = 3]) (*P*= 0.019). Six patients (2.5%) in the B group complained from pruritus, whereas one patient had the same complaint in the DB group (15.0%) with nonsignificant difference (*P* = 0.108). All male patients in both groups experienced discomfort from the urinary catheter in the postoperative period.

Discussion

This prospective, randomized study demonstrates that US-guided TiQLB was a feasible and effective approach in reducing postoperative pain experienced by patients who underwent open renal surgeries. The anatomic landmarks were very clear and characteristic after completing the renal surgery, especially after nephrectomy. This makes TiQLB easy to be performed, especially when facilitated by US guidance.

To the best of our knowledge, this is the first randomized, clinical trial demonstrating the effect of anterior QLB (transincisional approach) and its postoperative analgesic effect after open renal surgeries.

In the current study, combination of GA and US TiQLB with bupivacaine plus dexmedetomidine had longer postoperative analgesic effect and less total morphine consumption than GA and US TiQLB with bupivacaine only, with fewer postoperative adverse events.

GA is the most common technique in open renal surgeries, as it provides better airway management in the lateral position, maintains depth of anesthesia, and there is no limit to the time as in regional routes.

However, GA has some drawbacks: large doses of opioids may be required to maintain intraoperative analgesia, opioids are usually associated with increased postoperative shivering, nausea, vomiting, and pruritus. Also, opioids could result in postoperative hyperalgesia with increased severity of pain and subsequent increased opioid consumption (14,15).

TiQLB represents anterior QLB, in which the local anesthetic mixture was infiltrated in the fascial plane between the QLM and PMM, where the branches of lumbar plexus run in-between the 2 muscles, to provide analgesia for the trunk and lower extremities.

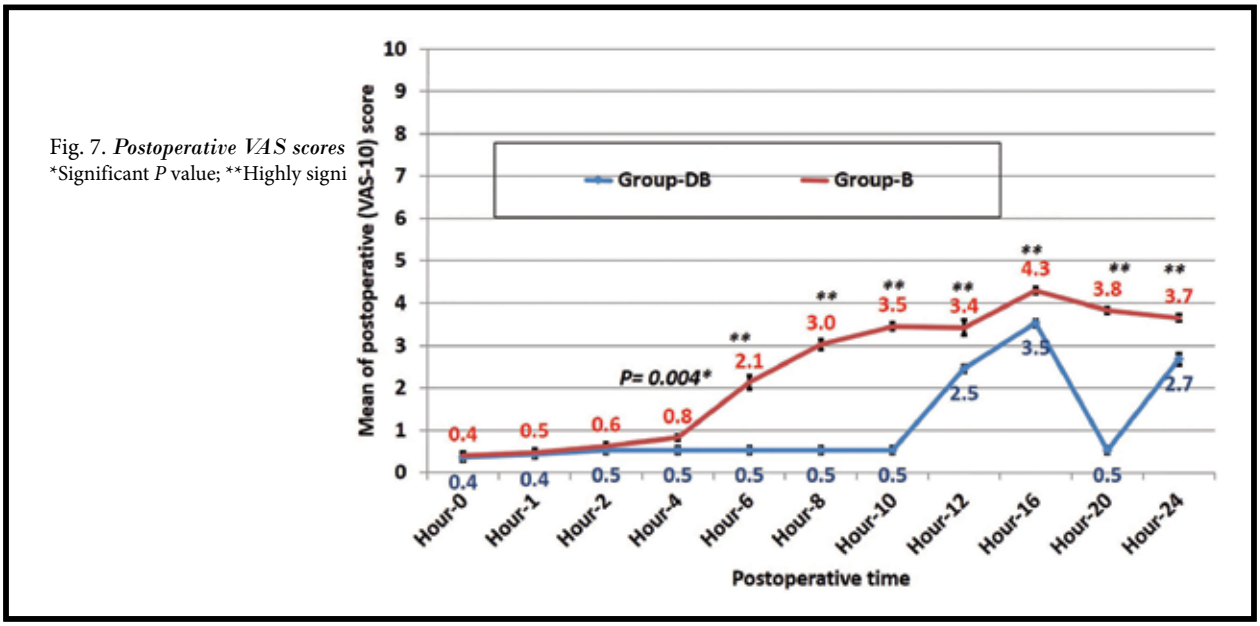

Fig. 7. *Postoperative VAS scores*
*Significant *P* value; **Highly signi

In a cadaveric study, anterior QLB with a dye revealed dyed lumbar nerve roots and sometimes nerves within the transversus abdominis plane (TAP) region (16), therefore anterior QLB can generate analgesia from T10 to L4. Some studies showed that anterior QLB has a cephalad spread through the arcuate ligaments to reach T7-T12 spinal nerve roots (17-19).

In a study performed by Blanco et al, (19) they found that QLB was superior to TAP block after cesarean section, QLB was associated with longer pain-free time, and less opioid consumption. In addition, Baidya et al (20) found that single injection transmuscular QLB was associated with satisfactory postoperative analgesia in pyeloplasty surgery in pediatric patients. Another study done by Murouchi (21) reported that bilateral intramuscular QLB in pediatric patients undergoing laparoscopic appendectomy was associated with prolonged postoperative analgesia. Kilic and Bulut (22) demonstrated that QLB was better for postoperative analgesia after PCNL.

Dexmedetomidine is selective α-2 adrenergic receptors agonist with an 8-fold higher affinity to α-2 adrenoreceptor than clonidine (23). Dexmedetomidine has also been reported to enhance neuraxial and peripheral neural blockades by local anesthetics (24-32). The peripheral analgesic effect of dexmedetomidine is mediated by α-2 receptors via reducing release of norepinephrine and causing α-2 receptor-independent inhibitory effect on nerve fiber action potentials. Its central analgesic effect is mediated through inhibition of substance *P* release in the dorsal root neuron in the locus coeruleus (33).

This study shows that patients in the DB group had a significantly longer time of postoperative analgesia and lower or no morphine consumption than patients in the B group. Also, VAS scores were significantly lower in the DB than in the B group.

Several studies revealed that perineural dexmedetomidine was associated with prolonged postoperative analgesia duration compared with placebo (27-32). Moreover, Bakr et al (13) reported that the addition of 1 µg/kg dexmedetomidine to US-guided modified pecs block was associated with prolonged postoperative analgesia without serious adverse events.

There were no significant differences regarding the intraoperative hemodynamic variables (MBP and HR) in both groups until the block time. Ten minutes after the block, patients in both groups experienced a decrease in MBP and HR followed by improvement at 20 minutes. This improvement continued postoperatively. However, MBP and HR were significantly lower in the DB group than in the B group.

The intraoperative decrease in the hemodynamic variables after the block may be because of the additive effects of GA and the QLB analgesia. The significant reduction of MBP and HR among patients who received dexmedetomidine may be because of the central inhibition of the sympathetic outflow with suppression of noradrenaline release (34). However, these effects were

transient and treated promptly with IV fluids, ephedrine, and atropine, as indicated.

Studies by Mohamed et al (35) and Al-Ghanem et al (36) showed similar findings, however, Shukla et al (37) and Gupta et al (38) reported that the addition of dexmedetomidine to bupivacaine was associated with nonsignificant hemodynamic changes.

Postoperative sedation scores within 24 hours were higher in the DB group than in the B group; this is because of the central effect of dexmedetomidine on presynaptic α-2 receptors. Similar results were reported by Xiang et al (39) and Elhakim et al (40).

A significant reduction in PONV and shivering was found among patients in the DB group compared with patients in the B group. Additionally, the incidence of pruritus was not significantly higher in the B group compared with the DB group.

Several studies have demonstrated similar results (41-43), in general, the lower incidence of the previously mentioned side effects in the DB group may be attributable to the reduction of systemic opioid consumption. In addition, the antiemetic characteristics of dexmedetomidine could be explained by its action on locus coeruleus, which inhibits the sympathetic outflow and may affect the extracellular dopamine regulation (44). Although the anti-shivering property of dexmedetomidine may be because of the inhibition of vasoconstriction and threshold of shivering (45).

Limitations

This study has some limitations. US-guided TiQLB can be used only for patients with open renal surgeries, as this approach needs an incision so it cannot be generalized for all patients. In our study, we did not assess the postoperative effects of dexmedetomidine beyond the first 24 hours.

Conclusions

US TiQLB was an effective and easy to be performed approach in open renal surgery. Adding dexmedetomidine to bupivacaine in TiQLB was associated with prolonged postoperative analgesia with fewer postoperative adverse effects.

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Authors' contributions: Dr. Amin Alansary had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analyses. Drs. Amin Alansary, Atef Badawy, and Marwa Elbeialy designed the study protocol. All authors managed the literature searches and summaries of previous related work and wrote the first draft of the manuscript. All authors provided revision for intellectual content and final approval of the manuscript.

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