

## EFFICACY OF PREEMPTIVE DEXAMETHASONE ADDED TO BUPIVACAINE IN ULTRASOUND GUIDED TRANSVERSUS ABDOMINUS PLAIN BLOCK FOR POSTOPERATIVE ANALGESIA AFTER INGUINAL HERNIORRAPHY

Hisham Ahmed Fouad, Amal Mohammed Sabry Ahmed, Yasser Mohammed Mohammed Osman, Gamal Mohammed Taha Abouelmagd

Anaesthesia and Surgical Intensive Care Department, Faculty of Medicine, Alexandria University

### ABSTRACT

**Purpose:** Different adjuvants have been used to improve the quality and increase the duration of local anesthetics during various nerve block techniques. The aim of the present work is to evaluate the effect of preemptive dexamethasone added to bupivacaine on postoperative pain in patients receiving transversus abdominis plain block (TAPB) guided with ultrasound for inguinal hernia repair as regard the time of the first request for additional analgesia, Pain scores, total analgesic consumption and analgesic efficacy.

**Patients and Methods** the present study was carried out in the Main Alexandria University Hospital on 50 adult male patients aged 20 to 60 years, American Society of Anesthesiologists (ASA) class I or II. patients were randomly allocated to receive TAP block with ultrasonography in. using 20 mL of bupivacaine hydrochloride 0.5% + 2 mL saline 0.9% (control group, n=25) or 20 mL of bupivacaine hydrochloride 0.5% + 2 mL dexamethasone “8 mg” (dexamethasone group, n=25). The primary outcome was postoperative pain, as evaluated by visual analog scale (VAS) for pain scoring at 1, 2,,3, 4, ,12, 16,20and24 hr postoperatively, whereas the secondary outcomes were time to duration of analgesia , first analgesia (TFA), morphine consumption and the occurrence of nausea, vomiting.

**Results:** The pain VAS score was significantly lower at the postoperative 4 h ( $4.72 \pm 0.84$  vs.  $2.96 \pm 0.45$ ,  $P < 0.001$ ), 8h ( $5.0 \pm 0.58$  vs.  $3.56 \pm 0.65$ ,  $P = 0.001$ ), 12 h ( $5.20$  vs.  $4.24 \pm 0.83$ ,  $P = 0.001$ ), 16h ( $5.32 \pm 0.69$  vs.  $4.84 \pm 0.55$ ,  $P = 0.009$ ) and 20 ( $5.40 \pm 0.76$  vs.  $4.96 \pm 0.61$ ,  $P = 0.037$ ). Furthermore, TFA was significantly longer in the dexamethasone group ( $438.2 \pm 24.95$  min vs.  $272.04 \pm 37.51$  min,  $P = 0.002$ ), with lesser nalbuphine requirements in the postoperative 24 h ( $15.20 \pm 4.16$  vs.  $24 \pm 4.16$  mg nalbuphine,  $P < 0.001$ ) and lower incidence of nausea and vomiting (2 vs. 8,  $P = 0.034$ ). No complications attributed to the block were recorded.

**Conclusion:** Addition of Preemptive dexamethasone to bupivacaine in patients receiving transversus abdominis plain block (TAPB) guided with ultrasound for inguinal hernia repair result in ,longer time till first opioids requirement , prolonged the duration of the block, less requirement for opioids, patients more satisfied and decreased the incidence of nausea and vomiting.

{**Citation:** Hisham Ahmed Fouad, Amal Mohammed Sabry Ahmed, Yasser Mohammed Mohammed Osman, Gamal Mohammed Taha Abouelmagd. Efficacy of preemptive dexamethasone added to bupivacaine in ultrasound guided transversus abdominus plain block for postoperative analgesia after inguinal herniorrhaphy. American Journal of Research Communication, 2016, 4(5): 27-42} [www.usa-journals.com](http://www.usa-journals.com), ISSN: 2325-4076.

## INTRODUCTION

Inguinal hernia considered the third common disease in surgeries for adult after acute appendicitis and proctologic disorder. Inguinal hernia incidence shows a bimodal peaking prevalence at early childhood and old age especially after age 55. It estimated that 20 millions of inguinal hernia repairs are performed globally every year. <sup>(1)</sup>

Inguinal herniorrhaphy can be performed under different anesthetic techniques as general anesthesia and regional anesthesia which is frequently associated with persistent postoperative pain. <sup>(2)</sup> A significant proportion of pain experienced by patients undergoing abdominal surgeries is related to somatic pain signals derived from the abdominal wall. <sup>(3)</sup> The anterior abdominal wall components are supplied by sensory neurons derived from the anterior rami of spinal nerves T6 to L1, which include intercostal nerves (T6 to T11), subcostal nerve (T12) and ilioinguinal and iliohypogastric nerves (L1). These neurons traverse through the neurofascial plane between the internal oblique and the transversus abdominis muscles. <sup>(4)</sup>

Post-operative pain after inguinal hernia lead to the increased consumption of analgesics, delayed bowel function <sup>(5)</sup> and increase the requirement for rescue analgesics which raises the risk of adverse effects especially respiratory depression, emesis and sedation, which can lead to increased duration of hospital stay and thereby reduce the advantages of fast-track surgery. <sup>(6,7)</sup>

Appropriate pain treatment protocols to reduce postoperative morbidity, improve the results of the surgery and decrease hospital costs. Adequate postoperative pain relief is associated with positive long-term effects for patients such as; reduced postoperative cognitive changes, better quality of life and reduced risk of chronic or persistent postoperative pain. <sup>(8)</sup>

Treatment for postoperative pain after abdominal surgical procedure (inguinal herniorrhaphy) based on conventional drugs with pain escape (consisting of maximal doses of paracetamol, non-steroidal anti-inflammatory drugs, and oral or intravenous opioid). Nonetheless, this is associated with adverse effects, such as nausea, sedation hypotension, reduced lung capacity increased cardiac load. All these effects impede rehabilitation and early discharge. Here appear the role of transversus abdominis plane block (TAPB) with local anesthetic and adjuvants may also added to it for postoperative pain relief. <sup>(9,10)</sup>

Transversus abdominis plane block (TAP block) was firstly described by Rafi in 2001 <sup>(11)</sup>. It enables pain control through blocking sensory nerves by injecting local anesthetics into abdominal muscle. <sup>(12,13)</sup> This blinded technique may cause an inappropriate block since the location of the needle may not precise. Fatal complications such as bowel puncture and liver injury have been also reported. <sup>(14)</sup> Recently, ultrasound guided technique TAP block have been used successfully to avoid the problem of the blind technique and provided better control of a variety of postoperative pain after cholecystectomy, cesarean section, or hernia repair. <sup>(15,16)</sup> Now it is more frequently used as an alternative modality in lower abdomen surgery.

Bupivacaine Hydrochloride is used as a local anesthetic and is available in sterile isotonic solutions for injection via local infiltration, peripheral nerve block, caudal, lumbar epidural blocks and TAP block. <sup>(17)</sup> Continuous research is being done to identify the effect of various adjuvants in improving the quality and increase the duration of the local anesthetic action in different peripheral nerves and regional block techniques. <sup>(18)</sup> The addition of adjuvant substances as Alpha-2 adrenoreceptor agonists (clonidine, Dexmedetomidine), adrenaline, tramadol, midazolam, ketamine, opioids, adenosine, non-steroidal anti-inflammatory and steroid to the local anesthetic drugs in TAPB and their efficiency have been studied. <sup>(19-22)</sup>

The analgesic effects of spinal and systemic corticosteroids in combination with local anesthetics have been approved in human studies. <sup>(23)</sup>

Methyl prednisolone addition to local anesthetic has increased the duration of axillary brachial plexus block, whereas dexamethasone microspheres have increased the block duration in both human and animal studies.<sup>(24)</sup> Furthermore, Dexamethasone has a long and efficient glucocorticoid structure and also offers anti-inflammatory properties. When added to local anesthetics as an adjuvant in peripheral blocks, it increases the action time. It may also prolong the analgesia time and contribute to the TAP block.<sup>(25-27)</sup>

## PATIENTS

After approval of local Ethics Committee, and with a written informed consent from each patient, the present study was carried out in the Main Alexandria University Hospital on 50 adult male patients aged 20 to 60 years, American Society of Anesthesiologists (ASA) class I or II scheduled for elective primary unilateral open inguinal hernia repair.

The sample size was approved to be sufficient by the Department of Biostatistics, Medical Research Institute, University of Alexandria.

### Exclusion criteria

1. Patient refusal.
2. Long term steroid therapy.
3. BMI  $\geq 25$ kg/ m<sup>2</sup>.
4. Patients with diabetes mellitus.
5. Patient inability to properly describe postoperative pain to investigator (dementia, delirium, psychiatric and Neurological disorder).
6. Coagulopathy.
7. Preoperative opioid or non-steroidal anti-inflammatory drugs.
8. Allergy or contraindication to studied medication or anesthetic agents.

Patients will be randomized, double blind controlled into two equal groups (twenty five male patients each) according to the adjuvant added to the local anesthetic in a TAP block performed with ultrasonography.

**Group I:** The patients were received 20 ml of 0.5% bupivacaine with 2 ml 0.9% NaCl which were administered in a TAP block performed with ultrasound guided at same side of the operation.

**Group II:** The patients were received 20 ml of 0.5% bupivacaine with 2 ml dexamethasone (8 mg) which were administered in a TAP block performed with ultrasound guided at side of the operation.

## METHOD

### Preoperative evaluation and preparation

Evaluation of patients were carried out through proper history taking, clinical examination and routine laboratory investigations (complete blood count, bleeding time, clotting time, PT, PTT, INR, urea, creatinine, AST, ALT, and blood sugar level). ECG for patients above 40 years.

All patient were informed with the procedure US guided TAP block and were trained to use the visual analogue scale (VAS).

### **Pre anesthetic preparation and premedication**

- Nothing per mouth for 6 hours before surgery
- All patients were premedicated with midazolam (0.02 mg/kg) IV 2 Minute before anesthesia.
- After admission to the operating theater a peripheral line (20G) were inserted in all patients. A multichannel monitor (Vamos-Drager-Germany)were be connected to the patient to display Continuous Electrocardiography monitoring for heart rate (beat/min) and detection of dysrhythmias (lead II), Noninvasive arterial blood pressure (NABP) and Peripheral oxygen saturation (SPO2%). Baseline monitoring data (blood pressure, heart rate and oxygen saturation) were taken.

### **Intraoperative procedure**

All surgical procedures were performed by the same surgeons, using the Lichtenstein's technique (open repair of inguinal hernia with a mesh). Ultrasound guided TAP blocks with the same technique were done for all patients after induction of general anesthesia.

### **Anesthetic technique**

Genral anaesthesia was indused in both groups as following: Patients were put in supine position and Pre-oxygenated with 100% oxygen by a facemask for 3 minutes. Induction of anaesthesia were done with intravenous fentanyl ( $1\mu\text{g}\cdot\text{kg}^{-1}$ ) and propofol ( $2\text{mg}\cdot\text{kg}^{-1}$ ) injected slowly till loss of communication and cisatracurium ( $0.15\text{mg}\cdot\text{kg}^{-1}$ ) IV to facilitate endotracheal intubation using a proper size Macintosh laryngoscope. The patients were mechanically ventilated and anesthesia were maintained with isoflurane (1.2–1.5%) using 100% oxygen and incremental doses of cisatracurium ( $0.03\text{mg}\cdot\text{kg}^{-1}$ ). Then ultrasound guided TAP block were performed to all patients at the same side of inguinal hernia repair according to the group.

### **Technique of ultrasound guided TAP block:** <sup>(28, 29)</sup>

All Patients were put in the supine position. After skin disinfection the abdominal wall was scanned using a linear array transducer probe (6–13 MHz) in the multibeam mode, connected to a portable ultrasound unit (Sonosite M-Turbo). The edge of the probe was covered by a sterile plastic transducer sheath (Tegaderm) and a sterile gel was applied on the skin. The ultrasound probe was initially positioned on the anterior wall with the medial head of the probe at the level of umbilicus. Adjustment was made to obtain optimal images until rectus abdominis muscle was observed. Then, the probe was placed transverse to abdominal wall between the iliac crest and the subcostal margin to obtain a transverse view of the abdominal layers. The probe was tilted, rotated, or both to improve visualization of the three layers of the lateral abdominal wall, respectively, from superficial to the depth, external oblique, internal oblique, transversus abdominis, and, most deeply, peritoneal cavity.

A 60- 80 mm, 22 G short-bevel needle was advanced from an anterolateral to a medial direction using the in-plane insertion with ultrasound real-time assessment. The entry point is distant of the lateral side of the probe to obtain a needle-beam angle of more than  $45^\circ$  insuring visibility of the entire needle during the procedure. The progression of the needle, visible as a bright hyperechoic line, was being assessed under direct ultrasonography. The injection site was defined between aponeurosis of the internal oblique and the transversus abdominis muscles. During insertion, the transducer was moved with careful manipulation to continuously visualize the shaft and the tip of the needle and the aforementioned structures. <sup>(28, 29)</sup> Saline 0.9% (1 ml) was injected to optimize the tip location with small in-and-out

movements. When the tip was being correctly located in the targeted plane, 20ml bupivacaine 0.5% (1.5 mg.kg<sup>-1</sup>) plus 2ml normal saline 0.9% or plus 2ml dexamethasone were injected with intermittent aspiration and the correct placement of the needle was confirmed by expansion of the LA solution as a dark shadow between aponeurosis of the internal oblique (which moved anteriorly) and the transversus abdominis muscles pushing the muscle deeper.

At the end of the surgery, inhalational anesthesia was stopped, residual neuromuscular block was antagonized with atropine 0.01mg kg<sup>-1</sup> and neostigmine 0.04mg kg<sup>-1</sup> then patients was extubated and will be transferred to the post-operative care unit. Analgesia was controlled postoperatively in the two groups of patients with ketorolac 30 mg intravenously every 6 hours. A rescue dose of nalbuphine 4mg was given in a case of visual analogue scale (VAS)  $\geq 4$ .

## Measurements

The following parameters will be measured:

### 1. Vital signs

- Heart rate (beat per minute)
- Mean arterial blood pressure (MABP) in mmHg was recorded before induction of anesthesia and every 15 minute intraoperative then immediately postoperative, 1, 2, 3, 4 and every 4 hours for the rest 24 postoperative hours constituting the study period.
- Peripheral o<sub>2</sub> saturation (SPO<sub>2</sub>%).

### 2. Pain assessment

#### A. Visual analogue scale during rest (VAS<sub>R</sub>) and movement (VAS<sub>M</sub>).<sup>(30)</sup>

- Rescue analgesia in the form of nalbuphine 4mg was given IV when VAS scores  $\geq 4$  at any time post-operative in first 24 hours

#### B. Duration of analgesia.

- Duration of analgesia defined as the time interval from completion of local anesthetic administration till first need of rescue analgesic.

#### C. Total dose of opioids analgesic requirements

#### D. Time to the first Rescue opioid analgesic dose

#### E. Patient satisfaction

### 3. Patient ambulation time

### 4. Postoperative complications

- Any postoperative complications occurring at any time in the 24 hours of the study were spotted, recorded and treated accordingly such as:
  - a. Local anesthetic toxicity (tinnitus, peri-oral numbness and seizures)
  - b. Post-operative nausea and vomiting (PONV):
    1. None
    2. Yes, and relieved by treatment.
    3. Yes, but not relieved by treatment.
  - c. Hemodynamic instability (blood pressure  $\leq 20$  % of normal, tachycardia  $\geq 100$  beats/minute and bradycardia  $< 60$  beats/minute).
  - d. Arrhythmias.
  - e. Hematoma at site of injection.

## Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 2010.

Qualitative data were described using number and percent. Quantitative data were described using median, minimum and maximum as well as mean and standard deviation.

For qualitative variables, Chi-square test was used. When more than 20% of the cells had expected count less than 5, correction for Chi-square was conducted using Fisher's Exact test or Monte Carlo correction. The distribution of quantitative variables was tested for normality using Kolmogorov-Smirnov test and Shapiro-Wilk test. D'Agostino test was used if there was a conflict between the two previous tests. Mann-Whitney test (for data distribution that were significantly deviated from normal) was used to analyze two independent populations, while for multi-group comparisons, Kruskal-Wallis one-way analysis of variance was applied. All statistical tests were two-tailed. Receiver operating characteristic (ROC) curves were used to plot sensitivity (Y-axis) versus the proportion of false positive readings (1 – specificity) (X-axis), establishing the cutoff point corresponding to maximum diagnostic discrimination of the scale, together with its global assessment as expressed by the area under the curve (AUC). The diagnostic characteristics were estimated from the calculation of sensitivity and specificity, with determination of the positive and negative predictive values of the optimum cutoff point. The statistical analysis was carried out using the MedCalc 11.4.2.0 statistical package.

## RESULTS

1. As regarding patient demographic data (age, sex, and BMI) was matched between the two groups.
2. As regarding patient hemodynamics (MABP, HR, SPO2%) at different intervals showed no statistical difference between both groups.
3. The pain VAS score was significantly lower at the postoperative 4 h ( $4.72 \pm 0.84$  vs.  $2.96 \pm 0.45$ ,  $P < 0.001$ ), 8h ( $5.0 \pm 0.58$  vs.  $3.56 \pm 0.65$ ,  $P = 0.001$ ), 12 h ( $5.20$  vs.  $4.24 \pm 0.83$ ,  $P = 0.001$ ), 16h ( $5.32 \pm 0.69$  vs.  $4.84 \pm 0.55$ ,  $P = 0.009$ ) and 20 ( $5.40 \pm 0.76$  vs.  $4.96 \pm 0.61$ ,  $P = 0.037$ ). Furthermore, TFA was significantly longer in the dexamethasone group ( $438.2 \pm 24.95$  min vs.  $272.04 \pm 37.51$  min,  $P = 0.002$ ), with lesser nalbuphine requirements in the postoperative 24 h ( $15.20 \pm 4.16$  vs.  $24 \pm 4.16$  mg nalbuphine,  $P < 0.001$ ) and lower incidence of nausea and vomiting (2 vs. 8,  $P = 0.034$ ). No complications attributed to the block were recorded.

**Table (1): Comparison between the two studied groups according to different parameters (n=25)**

	Group I	Group II	p
Age (years)	39.44 ± 11.12	39.68 ± 10.10	0.937
BMI	23.18 ± 1.12	22.60 ± 1.37	0.108
ASA			
I	19 (76.0%)	19 (76.0%)	1.000
II	6 (24.0%)	6 (24.0%)	
Duration of analgesia (min)	331.80 ± 37.44	499.40 ± 24.42	<0.001*
Time till 1st opioid dose	272.04 ± 37.51	438.20 ± 24.95	<0.001*
Total opioid dose (Mg)	24.0 ± 4.16	15.20 ± 4.16	<0.001*
Patient satisfaction score			
Excellent	2 (8.0%)	10 (40.0%)	<0.001*
Good	14 (56.0%)	15 (60.0%)	
Fair	8 (32.0%)	0 (0.0%)	
Poor	1 (4.0%)	0 (0.0%)	
Complications			
No	17 (68.0%)	23 (92.0%)	0.034*
Nausea and Vomiting	8 (32.0%)	2 (8.0%)	

Qualitative data was expressed using number and percent and was compared using Chi square or Fisher Exact test .Normally quantitative data was expressed in (Mean. ± SD) and was compared using Student t-test.

\*: Statistically significant at  $p \leq 0.05$

**Table (2): Comparison between the two studied groups according to VAS r and VAS m (n=25)**

	VAS r			VAS m		
	Group I	Group II	p	Group I	Group II	p
0 h	1.36 ± 1.04	1.12 ± 0.97	0.389	1.68 ± 0.90	1.44 ± 0.77	0.320
1 h	1.52 ± 1.05	1.40 ± 0.82	0.683	1.76 ± 0.83	1.72 ± 0.84	0.842
2 h	1.96 ± 1.02	1.80 ± 0.91	0.388	2.52 ± 0.77	2.36 ± 0.76	0.779
3 h	2.48 ± 1.0	2.20 ± 1.0	0.191	3.32 ± 1.07	2.80 ± 0.50	0.107
4 h	3.48 ± 1.0	2.36 ± 0.81	<0.001*	4.72 ± 0.84	2.96 ± 0.45	<0.001*
8 h	3.84 ± 0.85	3.40 ± 0.71	0.038*	5.0 ± 0.58	3.56 ± 0.65	<0.001*
12 h	4.12 ± 0.83	3.52 ± 1.0	0.037*	5.20 ± 0.41	4.24 ± 0.83	<0.001*
16 h	4.88 ± 0.60	4.40 ± 0.65	0.015*	5.32 ± 0.69	4.84 ± 0.55	0.009*
20 h	5.40 ± 0.76	4.72 ± 0.84	0.006*	5.40 ± 0.76	4.96 ± 0.61	0.037*
24 h	5.68 ± 0.69	5.44 ± 0.51	0.081	5.72 ± 0.68	5.52 ± 0.71	0.239

P: value for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$

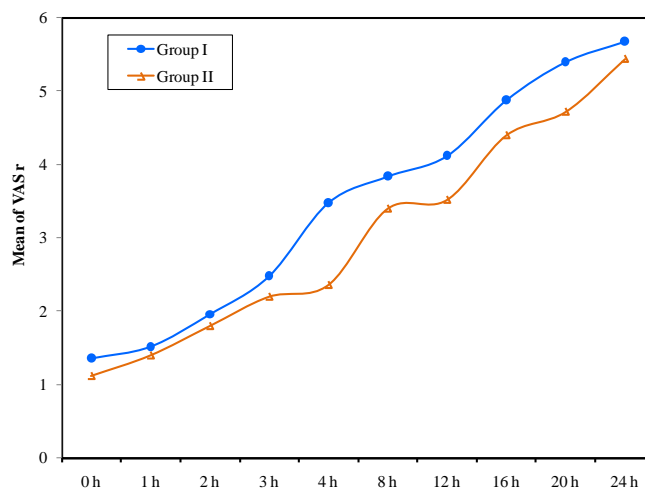


Figure (1): Comparison between the two studied groups according to VAS r.

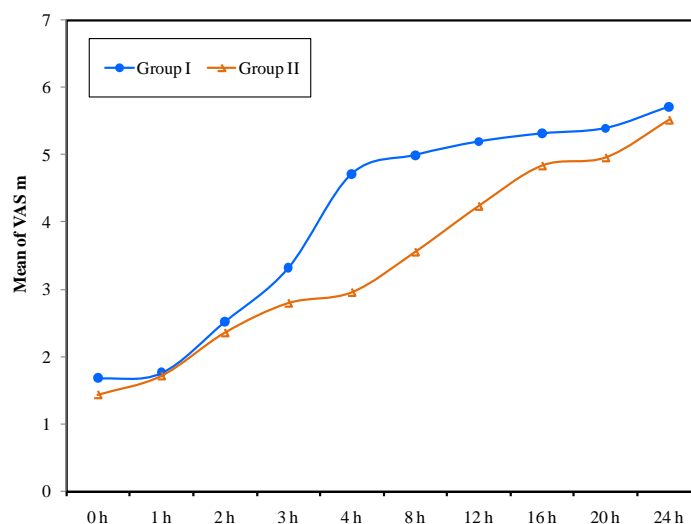


Figure (2): Comparison between the two studied groups according to VAS m.

**DISCUSSION**

Hernia are abnormal protrusions of a viscus or part of it through a normal or abnormal opening in a cavity, usually the abdomen. They are most commonly seen in the groin; a minority are paraumbilical or incisional. In the groin, inguinal hernias are more common than femoral hernias.<sup>(31)</sup>

Inguinal hernia is one of the most common conditions met with in surgical practice. The male-female ratio is greater than 10:1. Life time prevalence is 25% in men and 2% in women. Two-thirds of inguinal hernias are indirect and nearly two-thirds of recurrent herniae are direct. Recurrence rates are < 1% in children and vary in adults according to the method of hernia repair Post-operative pain after inguinal hernia lead to the increased consumption of analgesics, delayed bowel function and increase the requirement for rescue analgesics which raises the risk of adverse effects especially respiratory depression, emesis and sedation, which



can lead to increased duration of hospital stay and thereby reduce the advantages of fast-track surgery.<sup>(32)</sup>

Appropriate pain treatment protocols to reduce postoperative morbidity, improve the results of the surgery and decrease hospital costs. Adequate postoperative pain relief is associated with positive long-term effects for patients such as; reduced postoperative cognitive changes, better quality of life and reduced risk of chronic or persistent postoperative pain.

Treatment for postoperative pain after abdominal surgical procedure (inguinal herniorrhaphy) based on conventional drugs with pain escape (consisting of maximal doses of paracetamol, non-steroidal anti-inflammatory drugs, and oral or intravenous opioid). Nonetheless, this is associated with adverse effects, such as nausea, sedation hypotension, reduced lung capacity increased cardiac load. All these effects impede rehabilitation and early discharge. Here appear the role of transversus abdominis plane block (TAPB) with local anesthetic and adjuvants may also added to it for postoperative pain relief.<sup>(9,10)</sup>

The present study was conducted on 50 adult male patients aged 20 to 60 years, American Society of Anesthesiologists (ASA) class I or II scheduled for elective primary unilateral open inguinal hernia repair.

The aim of the present work is to evaluate the effect of preemptive dexamethasone added to bupivacaine on postoperative pain in patients receiving transversus abdominis plane block (TAPB) guided with ultrasound for inguinal hernia repair as regard the time of the first request for additional analgesia. Pain scores, total analgesic consumption and analgesic efficacy. The demographic data (age, sex, and BMI) was matched between the two groups.

In the present study there was no significant change in the MABP, HR, SPO2%) intraoperative or postoperative in comparison to the preoperative value in each of the studied groups. Comparison of vital signs (MABP, HR, SPO2%) at different intervals showed no statistical difference between both groups.

The current study showed that preemptive addition of 8 mg dexamethasone to 20 mL bupivacaine 0.5% for TAP block guided with ultrasound for inguinal hernia repair on side of operation resulted in a significant reduction of VAS pain score over the postoperative 24 h, prolonged the duration of the block, longer time till first opioids requirement, reduction of postoperative nalbuphine requirements, more patients satisfaction, less incidence of nausea and vomiting and early ambulation.

In the current study no local anaesthetic toxicity, no hematoma or excessive tissue trauma had been developed at the site of injection in both group this result could probably due the guidance of u/s that enabled better visualization of the abdominal structure before injection

Increasing the duration of local anesthetic drugs often is a matter of concern for anesthesiologist. Epinephrine, phenylephrine, clonidine, opioids, etc. are used to increase the duration of spinal anesthesia.<sup>(33)</sup> Adding epinephrine to the local anesthetics may lead to tachycardia, pallor, and hypertension. The use of corticosteroid compounds increases the duration of anesthesia and analgesia in peripheral nerve blocks.<sup>(34)</sup> Dexamethasone has a long and efficient glucocorticoid structure and also offers anti-inflammatory properties when added to local anesthetics as an adjuvant in peripheral blocks, it increases the action time.<sup>(35)</sup> Dexamethasone has an analgesic action by inhibition of transmission in nociceptive C- fibers and neural discharge when given as an additive in peripheral nerve blocks or in intrathecal anesthesia, it prolongs the duration of anesthesia.<sup>(36)</sup> Dexamethasone significantly prolongs the duration of sensory block and decrease postoperative analgesic requirements. In addition unlike opioids, dexamethasone does not produce any unwanted postoperative side effects.<sup>(37)</sup>

variety of animal studies have reported the analgesic effect of corticosteroids by adding microspheres of corticosteroids to local anesthetics for peripheral nerve blockade<sup>(38,39)</sup>. Droger and colleagues have shown that dexamethasone incorporation into bupivacaine microspheres caused prolongation of the intercostal nerve blockade in sheep<sup>(38)</sup>. Castillo and coworkers reported that addition of dexamethasone microspheres to bupivacaine resulted in prolongation of sciatic nerve blockade in rats<sup>(39)</sup>. These studies have attributed the prolongation the block duration to the anti-inflammatory effect of steroids. However, it should be noticed that microsphere technology is designed to provide sustained and prolonged release of the drug in contrast to the aqueous solutions used in our study. Several animal studies have addressed neural safety of corticosteroid use for nerve block<sup>(40)</sup>. Repeated intrathecal injection of triamcinolone diacetate in a dose of 0.8 mg/kg in rats was not accompanied with any spinal neurotoxic effect<sup>(40,41)</sup>. In another animal study in sheep, the histopathologic effect of intrathecal injection of betamethasone was evaluated, approving its safety and suggesting its possible use in humans.<sup>(41)</sup>

In agreement with the results of the present study, Amany S. Ammar, et al .Sixty adult patients undergoing elective open abdominal hysterectomy were randomly allocated to receive TAP block using 20 mL of bupivacaine hydrochloride 0.25% + 2 mL saline 0.9% (control group, n=30) or 20 mL of bupivacaine hydrochloride 0.25% + 2 mL dexamethasone "8 mg" (dexamethasone group, n=30) TFA was significantly longer in the dexamethasone group (459.8 vs. 325.4 min, P=0.002), with lesser morphine requirements in the postoperative 48 h (4.9 vs. 21.2 mg, P=0.003).<sup>(42)</sup>

Nurçin Gülhaş, et al. demonstrated that the addition of dexamethasone to ultrasound-guided TAP block was decreased postoperative pain scores, increased the time to first analgesic requirement, reduced postoperative narcotic requirements and adverse events. The rate of nausea or vomiting were also reduced with shorter length of hospital stay in patients undergoing total abdominal hysterectomy.<sup>(43)</sup>

Tandoc et al. demonstrated that addition of dexamethasone (4 or 8 mg) to bupivacaine significantly prolonged the duration of postoperative analgesia 4mg ( $21.6 \pm 2.4$  h) and 8 mg ( $25.2 \pm 1.9$  h) compared with the control ( $13.3 \pm 1.0$  h) after interscalene block.<sup>(44)</sup>

Naghipour et al .Seventy two adult patients scheduled for elective abdominal or thoracic surgery under epidural anesthesia were randomly allocated into two groups to receive either bupivacaine (0.5%) - fentanyl (50µg) and dexamethasone (8 mg) in lumbar or thoracic epidural anesthesia (Dexa group, n=36), or bupivacaine-fentanyl and saline normal (control group, n=36) via epidural catheter. This study revealed that dexamethasone added to bupivacaine-fentanyl solution in epidural analgesia prolongs the duration of analgesia in abdominal or thoracic surgery. The duration of analgesia ( $372 \pm 58.1$  vs.  $234.6 \pm 24.3$  min) was significantly longer and pain score and pentazocine use were less in the Dexa than the control group ( $37.1 \pm 19.7$  mg v.s.  $73.1 \pm 17.6$  mg, respectively; p=0.001).<sup>(45)</sup>

Also, Dikmen et al. have designed a study to compare the effect of epidural dexamethasone and morphine as analgesic agents for post lumbar laminectomy pain. Patients were divided into two groups: group M; they received epidural morphine 2mg, and group D; they received epidural dexamethasone 8mg at the end of surgery. Results revealed that time to first postoperative analgesic request was longer in group D than group M.<sup>(46)</sup>

Also, Parrington et al. studied 46 adult patients undergoing elective hand or fore arm surgery under supraclavicular brachial plexus blockade. They were randomized to receive either 30 ml mepivacaine 1.5 % plus dexamethasone 8mg, or 30ml mepivacaine 1.5% plus 2ml normal saline. Results showed that the median duration of analgesia was significantly

prolonged in the dexamethasone group (332 min) compared with the normal saline group (228 min).<sup>(47)</sup>

Also Cummings et al. In a double-blinded trial utilizing single injection interscalene block, patients were randomized to one of four groups: (i) ropivacaine: 0.5% ropivacaine; (ii) bupivacaine: 0.5% bupivacaine; (iii) ropivacaine and steroid: 0.5% ropivacaine mixed with dexamethasone 8 mg; and (iv) bupivacaine and steroid: 0.5% bupivacaine mixed with dexamethasone 8 mg. Results. Dexamethasone significantly prolonged the duration of analgesia of both ropivacaine [median (inter-quartile range) 11.8 (9.7, 13.8) vs. 22.2 (18.0, 28.6) h, log-rank P, 0.001] and bupivacaine [14.8 (11.8, 18.1) and 22.4 (20.5, 29.3) h, log-rank P, 0.001]. Dexamethasone prolonged analgesia more with ropivacaine than bupivacaine (Cox's model interaction term  $P=0.0029$ ). Conclusions. Dexamethasone prolong analgesia from interscalene blocks using ropivacaine or bupivacaine, with the effect being stronger with ropivacaine.<sup>(48)</sup>

In a study of Holte et al. on volunteer patients, dexamethasone was added to bupivacaine microcapsules by subcutaneous infiltration to obtain 50  $\mu\text{g}$  in 10 ml, and a significant increase in analgesia time was observed.<sup>(49)</sup>

Also Noha M. El Sharnouby, et al. A total of 111 bariatric patients, scheduled for laparoscopic vertical banded gastroplasty under ultrasound-guided TAP block, were randomized blindly into three parallel groups: Group BC that received TAP block using 20 ml of isobaric bupivacaine hydrochloride 0.25%+2 ml saline 0.9%; low-dose dexamethasone group (Group DB4) that received TAP block using 20 ml of isobaric bupivacaine hydrochloride 0.25%+4 mg dexamethasone; and high-dose dexamethasone group (Group DB8) that received TAP block using 20 ml of isobaric bupivacaine hydrochloride 0.25%+8 mg dexamethasone. Adding dexamethasone (4 or 8 mg) to isobaric bupivacaine TAP block reduces postoperative pain, reduces analgesic requirement, and Group BD8 ( $P = 0.0001$ ) and Group BD4 ( $P = 0.0001$ ) had a significantly longer time to first analgesic requirements than Group BC.<sup>(50)</sup>

Kotani et al. administered methylprednisolone with bupivacaine intrathecally in patients with post herpetic neuralgia. They concluded that this combination induced excellent and long-lasting analgesia.<sup>(51)</sup>

Vishnu Vardhan et al. Addition of Dexamethasone to local anesthetic drugs in supraclavicular brachial plexus block significantly prolongs the duration of analgesia and duration of motor block in patients undergoing upper limb surgeries.<sup>(52)</sup>

Also In agreement with the results of the present study, Bani-Hashem et al .studied the effect of adding dexamethasone to bupivacaine for spinal anesthesia in orthopedic surgery. 50 patients were randomly divided into 2 groups 25 of each. Group I received 15mg (3ml) of 0.5% hyperbaric bupivacaine plus 2ml normal saline (total 5ml). Group II received 15mg (3ml) of 0.5% hyperbaric bupivacaine and 8mg preservative free dexamethasone (2ml) total volume 5ml. Results found that total dose of rescue analgesic requirements was less in dexamethasone group.<sup>(3)</sup>

Also, Bisgaard et al. have investigated the effect of intravenous dexamethasone 8 mg, administered 90 minutes before the operation to 40 patients scheduled for laparoscopic cholecystectomy. At the end of the study, results showed a significant decrease in pain and total requirements of morphine in the first 24 hours postoperatively.<sup>(53)</sup>

Also, Pace et al. have designed a study to evaluate the effect of a single intravenous pre-anesthetic dose of betamethasone (4mg) on intraoperative and postoperative pain in 380 woman, 18 to 75 years old, undergoing gynecological and obstetric surgery in an outpatient

service. In the betamethasone group, pain was significantly less frequent than in placebo group and fewer women requested additional analgesic drugs.<sup>(54)</sup>

The results of the above mentioned studies revealed that corticosteroids may have a systemic analgesic effect

The prolonged analgesia and lower needs of rescue analgesia could be due to the use of bupivacaine long acting local anaesthetic, and the use of a large dose of dexamethasone (8mg) which seems to improve the quality of the block and decrease the analgesic requirements postoperative.

There are several theories to explain this effect of dexamethasone. Firstly, the degree of vasoconstriction produced by steroids and this in turn decrease the absorption of local anesthetics. Secondly theory indicates that dexamethasone increases the inhibitory activity of potassium channels on pain sensory nerves. Another theory refers to anti-inflammatory action of dexamethasone and blocking transmission of nociceptive C-fibers.<sup>(55)</sup>

In the current study no local anaesthetic toxicity, no hematoma or excessive tissue trauma had been developed at the site of injection in both group this result could probably due the guidance of u/s that enabled better visualization of the abdominal structure before injection

## CONCLUSION

Addition of Preemptive dexamethasone to bupivacaine in patients receiving transversus abdominis plain block (TAPB) guided with ultrasound for inguinal hernia repair result in ,longer time till first opioids requirement , prolonged the duration of the block, less requirement for opioids, patients more satisfied and decreased the incidence of nausea and vomiting

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