

## Comparison of Posterior and Subcostal Ultrasound-Guided Transversus Abdominis Plane Block Approaches for Postoperative Analgesia in Laparoscopic Cholecystectomy

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### Abstract

**Background:** Pain after LC is complex and characterized by various components with different intensities and time courses. The establishment of LC as an outpatient procedure has accentuated the clinical importance of proper post-operative pain control.

**Aim:** Our aim is to compare between US posterior and subcostal approaches TAP block for post-operative analgesia in LC.

**Material and Methods:** This study was carried out on 60 patients, ASA I-II, scheduled for elective laparoscopic cholecystectomy under general anesthesia. Patients were randomized into three equal groups (20 patients in each group): Group I (control group): Received standard general anesthesia. Group II (posterior TAP group): Received standard general anesthesia and bilateral US guided posterior TAP block with 15ml bupivacaine 0.25% on each side just before extubation. Group III (subcostal TAP group): Received standard general anesthesia and bilateral US guided subcostal TAP block with 15ml bupivacaine 0.25% on each side just before extubation. All groups received post-operative analgesia in the form of IV paracetamol 1gm every 6 hours and rescue analgesic in form of morphine 2mg IV. The following parameters were compared: Post-operative vital signs (HR & MAP), post-operative pain (using 10 point Visual Analogue Scale (VAS) where (0) no pain and (10) most intense pain), time for first post-operative required analgesia and 24-hour morphine consumption were measured in the 3 groups immediately after full recovery of anesthesia, 1h, 2h, 4h, 6h, 8h, 12hr & 24hr.

**Results:** In our study the mean values of HR and MAP were lower in Group II and Group III than Group I & that of Group III were lower than that of Group II at all times after recovery. The mean values of pain assessment by VAS in Group II and Group III were lower than that of Group I at all times after recovery. The VAS in Group III were lower than that of Group II insignificantly immediately after recovery, 1h, 2h, 12h and 24 hours and significantly at 4h, 6h and 8 hours. Also the mean time to the first request of morphine, was longer in Groups II and III than in Group I. Group III

was significantly longer than Group II. The total dose of post-operative morphine consumption in Group II and Group III were lower than that in Group I. There was significantly lower total dose of post-operative morphine consumption in Group III than Group II.

**Conclusion:** Both the posterior and subcostal US TAP block provides superior analgesia than the standard IV regimen. However, beyond the initial 4 hours after recovery, patients in the subcostal TAP group had significantly lower pain scores than did patients from the other groups.

**Key Words:** Laparoscopic cholecystectomy (LC) – Ultrasound guided (US) – Posterior transversus abdominis plane (TAP) block – Subcostal transversus abdominis plane (TAP) block.

### Introduction

**ALTHOUGH** Laparoscopic Cholecystectomy (LC) is performed on an ambulatory basis, it is not pain free. Post-operative pain in laparoscopic surgery is less severe compared to an open procedure, but is still considerable. The most effective pain relief can be obtained by combining opioids, local anesthetics, and NSAIDS into balanced analgesia. This approach at least allows the opioids dose to be reduced by the use of multimodal analgesia, thereby limiting side effects, reducing post-operative pain and analgesics, and facilitating an earlier return to normal activities [1,2].

In the last years, there has been growing interest in the use of peripheral regional anesthesia such as Transverses Abdominis Plane (TAP) blocks as an alternative to high-dose Intravenous (IV) analgesics for managing pain after abdominal surgeries [3-5].

The Transversus Abdominis Plane (TAP) block involves the sensory nerve supply of the anterior-lateral abdominal wall, where the T7-12 intercostal

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nerves, the ilioinguinal and iliohypogastric nerves, and the lateral cutaneous branches of the dorsal rami of L1-3 are blocked with an injection of local anesthetic between the Internal Oblique Abdominal Muscle (IOAM) and the Transversus Abdominus Muscle (TAM). More studies need to be conducted to provide conclusive evidence in favor of use of transversus abdominis plane block in LC [6].

The conventional method of giving a TAP block using ultrasound guidance has been the posterior TAP block. The ultrasound probe is placed in a plane transverse to the lateral abdominal wall in the anterior axillary line, between the lower costal margin and iliac crest. At this site, the TAP is identified and the drug is injected by direct vision [7,8].

Hebbard [9] described a new technique called the subcostal TAP block, which involves the use of ultrasound to deposit local anesthetic in a more cephalad position, with the probe being placed immediately inferior to the costal margin on the anterior abdominal wall. The drug is injected at this location, immediately lateral to the linea semilunaris in the TAP [10].

#### *Aim and objectives:*

The aim of this study is to compare between ultrasound guided posterior and subcostal approaches transversus abdominis plane block for post-operative analgesia in laproscopic cholecystectomy.

#### **Material and Methods**

This study was carried out in Tanta University Hospitals in General Surgery Department for eight months from February 2016 to September 2016 on 60 adult patients of both sex scheduled for elective laparoscopic cholecystectomy under general anesthesia with ASA physical status I or II. After approval from Institutional Ethics Committee, an informed consent was taken from each patient. All data of patients was confidential with secret codes and private file for each patient, all given data was used for current medical research only. Any unexpected risks appearing through course of research were cleared to participants and Ethical Committee on time.

*Exclusion criteria include:* Patient refusal, history of allergy to local anesthetics, local infection, patients with coagulopathies and impaired platelet function.

Patients was randomly classified using sealed envelope into three equal groups each of 20 patients. Group I (control) received standard general

anesthesia, Group II (posterior TAP) received standard general anesthesia as in Group I and bilateral US guided posterior TAP block with 15ml bupivacaine 0.25% on each side just before extubation and Group III (subcostal TAP) received standard general anesthesia as in Group I & II and bilateral US guided subcostal TAP block with 15ml bupivacaine 0.25% on each side just before extubation. The three groups received post-operative analgesia in the form of IV paracetamol 1gm every 6 hours and rescue analgesic in form of morphine 2mg IV.

#### *Anesthetic technique:*

##### • Pre-operative:

Medical and surgical histories of the patient was evaluated, clinical examination of the patient was performed, routine laboratory investigations was evaluated including complete blood picture, prothrombin time and activity.

##### • Intraoperative:

Routine monitoring of heart rate by ECG, Non-Invasive Blood Pressure (NIBP) including systolic, diastolic and mean arterial blood pressure, oxygen saturation (SPO<sub>2</sub>) using pulse oxymeter was performed, an Intravenous (I.V) line was established with an 18G cannula.

General anesthesia was induced IV using 2 gg/kg of fentanyl and 2.0mg/kg of propofol. Tracheal intubation was facilitated by 0.15mg/kg cisatracurium and muscle relaxation was maintained with additional doses 0.02mg/kg. An orogastric tube was inserted, and anesthesia was maintained with isoflurane MAC 1.5. Intraoperative monitoring will include electrocardiography, pulse oximetry, non-invasive blood pressure, end-tidal carbon dioxide concentration (EtCO<sub>2</sub>).

Isoflurane concentration was adjusted to maintain the Mean Arterial Pressure (MAP) within 20% of the pre-induction value.

Intra-abdominal pressure was limited to 14 mmHg, and minute ventilation was adjusted to maintain EtCO<sub>2</sub> between 35 and 40mmHg.

At the end of surgery, the inflated carbon dioxide was carefully evacuated by manual compression of the abdomen and residual neuromuscular blockade was antagonized with neostigmine 0.05mg/kg and atropine 0.01mg/kg.

#### *Technique of posterior TAP block:*

A high-frequency (5- 10MHz) ultrasound probe was placed transversely along the anterolateral

abdominal wall on one side at the level of the anterior axillary line, between the iliac crest and the subcostal margin, to identify the external oblique, internal oblique, and transversus abdominis muscles. After identification of the neurofascial plane between the internal oblique and the transversus abdominis muscle, A 23-gauge (G) spinal needle was introduced anteriorly in the plane of the ultrasound beam and directed towards this plane. Once the tip of the needle was placed in the space between the IOM and TAM and negative aspiration was done, 15ml bupivacaine 0.25% was administered under direct US guidance on each side.

#### *Technique of subcostal TAP block:*

A high-frequency (5-10MHz) ultrasound probe was placed in the midline of the abdomen 2cm below the xiphisternum and was moved laterally along the subcostal margin to the anterior axillary line. The transversus abdominis muscle was identified lying beneath and extending lateral to the rectus abdominis muscle. A 23-gauge (G) spinal needle was then guided, in plane, to a point just inferior to the costal margin at the anterior axillary line such that the tip lay between the transversus abdominis and internal oblique muscle within the neurovascular fascial plane. Once the tip of the needle was placed in the space between the IOM and TAM and negative aspiration was done, 15ml bupivacaine 0.25% will be administered under direct US guidance on each side.

#### *The following data was recorded:*

- 1- Vital signs (heart rate & MAP) were recorded immediately after full recovery then at 1, 2, 4, 6, 8, 12 and 24 hours post-operatively.
  - 2- Post-operative Visual Analogue Score (VAS) was recorded immediately after full recovery and at 1, 2, 4, 6, 8, 12 and 24 hours post-operatively.
    - VAS 0-3: Mild pain.
    - VAS 4-6: Moderate pain.
    - VAS more than 6: Severe pain.
- Patients with VAS score more than 4 received rescue analgesic in form of morphine 2mg IV with total dose not more than 6mg per hour.
- 3- Time for first post-operative analgesia required was recorded.
  - 4- 24-hour morphine consumption was recorded.
  - 5- Post-operative complications during first 24 hours.

The sample size calculation is performed using Epi-Info 2002 software statistical package designed by World Health Organization (WHO) and by Centers for Disease Control and Prevention (CDC). The sample size is calculated as  $N > 18$  with 10% variation based on the following considerations: 95% confidence limit, 80% power of the study.

Statistical presentation and analysis was conducted by SPSS V.24. Results were expressed as means  $\pm$  Standard Deviation (SD). Student paired *t*-test: For statistical analysis within the same group. Unpaired *t*-test: Used for comparison of parametric data between the three studied groups. Modified chi-square test for small numbers: For comparison between three groups as regards qualitative data. ANOVA test was used for comparison among different times in the same group in quantitative data. *p*-value  $< 0.05$  was considered significant.

## **Results**

There was no significant difference between the three groups as regard to age, weight and duration of surgery.

In our study the mean values of heart rate and mean arterial blood pressure were lower in Group II and Group III compared to Group I significantly immediately after recovery, 1h & 2h and insignificantly at 4h, 6h, 8h, 12h and 24h. The mean values of heart rate and mean arterial blood pressure of Group III were lower than that of Group II insignificantly immediately after recovery, at 1h and 2 hours and significantly at 4h, 6h, 8h, 12h and 24 hours after recovery.

The mean values of pain assessment by VAS in Group II were lower than that of Group I significantly immediately after recovery, 1h and 2 hours and insignificantly at 4h, 6h, 8h, 12h and 24 hours after recovery. Also the mean values of pain assessment by VAS in of Group III were lower than that of Group I significantly immediately after recovery, 2h, 4h, 6h, 8h, 12h and 24 hours after recovery. The mean values of pain assessment by VAS in Group III were lower than that of Group II insignificantly immediately after recovery, 1h, 2h, 12h and 24 hours and significantly at 4h, 6h and 8 hours.

Also we found that the mean time to the first request of morphine, was longer in Groups II and III than in Group I. Group III was significantly longer than Group II. The total dose of postoperative morphine consumption in Group II and Group III were lower than that in Group I. There was

significantly lower total dose of post-operative morphine consumption in Group III than Group II.

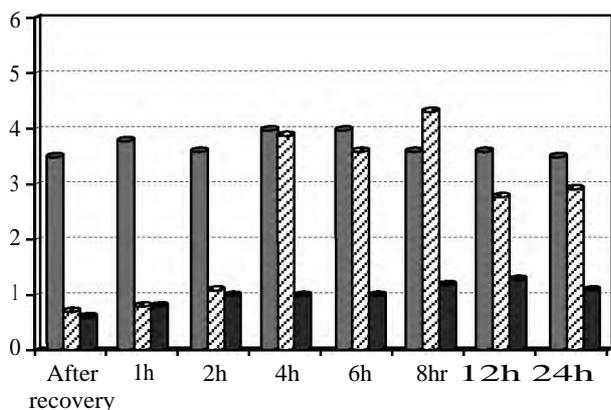


Fig. (1): Comparison of mean of pain assessment by VAS between three groups.

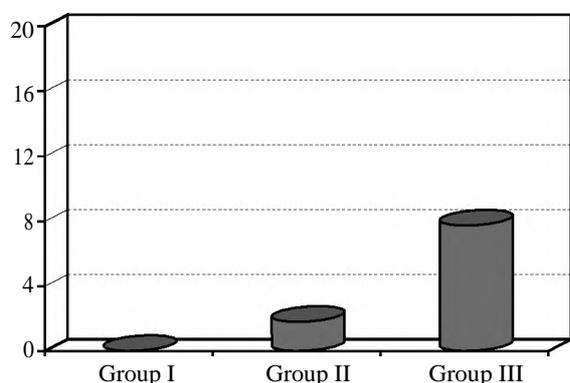


Fig. (2): Comparison of mean time to first request of analgesia between the three groups (hour).

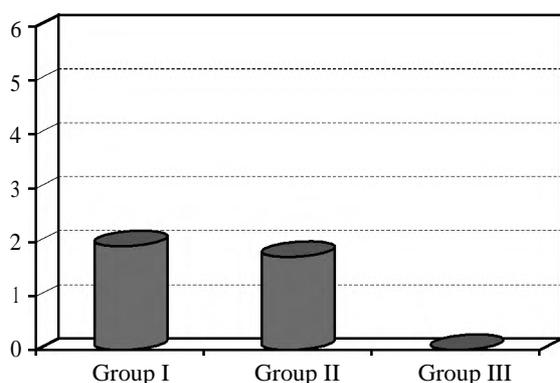


Fig. (3): Comparison of mean value of post-operative morphine dose consumption (mg) between the three groups.

**Discussion**

Despite all the benefits that have emerged with the introduction of laparoscopic surgery, post-operative pain remains an issue. Ineffectively treated post-operative pain is still one of the com-

mon problems that may result in clinical and psychological changes which increase morbidity and mortality as well as costs and may decrease the quality of life. Prevention and effective relief of acute pain may improve clinical outcomes, avoid clinical complications, save health care resources, and improve quality of life [11].

The Transverses Abdominus Plane (TAP) block is a regional analgesic technique which has an evolving role in post-operative analgesia for abdominal surgeries [12-14]. It is a simple and safe technique and is a potential alternative to opioid for analgesia after LC, whether guided by traditional anatomic landmarks or better by ultrasound which has two approaches: Posterior and subcostal approach [15,16].

As regard to post-operative hemodynamic changes, our result showed that the mean values of heart rate and mean arterial blood pressure were lower in Group II and Group III compared to Group I significantly immediately after recovery, 1h & 2h and insignificantly at 4h, 6h, 8h, 12h and 24h. The mean values of heart rate and mean arterial blood pressure of Group III were lower than that of Group II insignificantly immediately after recovery, at 1h and 2 hours and significantly at 4h, 6h, 8h, 12h and 24 hours after recovery.

This may be due to analgesic effect of TAP block that reduces pain intensity which stimulate sympathetic system and cause increasing in heart rate and mean arterial blood pressure of the patient.

Our results are in agreement with Niraj G et al., [17] who compared the analgesic efficacy of subcostal TAP blocks with epidural analgesia following upper abdominal surgery. They found that TAP blocks have minimal hemodynamic effects, making them an acceptable technique for the hypotensive patients. The motor and sensory functions of the lower limbs are spared and the technique is non sedating, resulting in earlier ambulation following abdominal surgery [17].

Also our results are in agreement with Sulagna B et al., [18] who conducted their study on 90 adult female patients ASA I or II were randomized to Group B receiving TAP block with 0.25% bupivacaine and Group N with normal saline followed by general anaesthesia. Hemodynamic responses to surgical incision and intraoperative fentanyl consumption were noted. They found that preincisional TAP block decreases intraoperative fentanyl requirements, prevents hemodynamic responses to surgical stimuli and provides effective post-operative analgesia [18].

As regard to post-operative analgesia in this study, it was evaluated by using VAS (primary outcome), the mean values of pain assessment by VAS in Group II were lower than that of Group I significantly immediately after recovery, 1h and 2 hours and insignificantly at 4h, 6h, 8h, 12h and 24 hours after recovery. Also the mean values of pain assessment by VAS in of Group III were lower than that of Group I significantly immediately after recovery, 2h, 4h, 6h, 8h, 12h and 24 hours after recovery. The mean values of pain assessment by VAS in Group III were lower than that of Group II insignificantly immediately after recovery, 1h, 2h, 12h and 24 hours and significantly at 4h, 6h and 8 hours.

Also we found that the mean time to the first request of morphine (secondary outcome), was longer in Groups II and III than in Group I. Group III was significantly longer than Group II. The total dose of post-operative morphine consumption in Group II and Group III were lower than that in Group I. There was significantly lower total dose of post-operative morphine consumption in Group III than Group II.

This may be due to the effect of TAP in blocking the sensory afferent nerves that supply the anterior abdominal wall including the skin, muscles, and parietal peritoneum.

In agreement with us, Laleh Eslamian [19] who performed TAP block with 30ml 0.25% bupivacaine in a group and no TAP in the other group, they found that there was a significantly longer time to the first request for analgesic in the TAP block group [210min vs. 30min in no TAP block group, and women in TAP block group had significantly less Tramadol than women in no TAP block group (50mg vs. 25mg).

In our study we use 15 ml bupivacaine 0.25% on each side as local anaesthetic and morphine as a rescue analgesia.

Similar results were found by Hebbard et al., [20] have shown the efficacy of TAP blocks in the reduction of post-operative pain intensity and analgesic requirement in patients who undergo radical prostatectomy, hysterectomy, Cesarean delivery, and laparoscopic surgery. In one study, blockade with 1.5mg/kg ropivacaine bilaterally in cesarean delivery parturients successfully decreased the post-operative patient-controlled IV morphine requirement. The authors of this study found that the TAP block was effective for 36h [20].

The possibility that the TAP region is relatively poorly vascularized was considered as a reason for this prolonged blockade.

In agreement with us Bhatia et al., [21] who conducted their study on 60 patients were they randomized into three groups of 20 patients each. Group 1 patients received standard general anesthesia (control group); Group 2 patients received an ultrasound-guided posterior TAP block using 15mL of 0.375% ropivacaine on each side; and Group 3 patients underwent a subcostal TAP block with 15mL of 0.375% ropivacaine on each side. The presence and severity of pain during rest and movement, as well as nausea or vomiting and sedation, were assessed in all patients post-operatively on PACU admission, then at 2, 4, 6, 8, 12, and 24-hour intervals. Patients with a Visual Analog Score (VAS) greater than 4, or those requesting analgesic were given intravenous tramadol 2mg/kg as an initial dose; subsequent 1mg/kg doses of tramadol, if needed, were given.

Patients who received a subcostal TAP block had significantly lower pain scores at rest and on movement than the control group at all times post-operatively. Although, in the initial post-operative measurement times, the subcostal and posterior TAP groups had comparable pain scores, after 4 hours these scores were significantly lower in patients who had received the subcostal TAP block [21].

But in our study we used 15ml bupivacaine 0.25% on each side as local anaesthetic and morphine as a rescue analgesia.

In agreement to our results McDonnell et al., [22] who performed TAP block with ropivacaine (150mg) vs placebo in addition to PCA morphine, diclofenac and acetaminophen after spinal anaesthesia, proved that the first request for analgesia in patients who did not have TAP was after 90 minutes, while in patients who received land mark TAP block, it was after 220 minutes [22].

In our study we use bupivacaine as local anaesthetic which is more potent than ropivacaine that may be the cause of less prolonged time of analgesia in TAP block group in McDonnell and curley study in comparison with our study.

Another study of McDonnell et al., [22] proved that TAP block reduced total morphine consumption in first 48 hours post-operatively ( $66 \pm 26$  vs  $18 \pm 4$ mg). The reason for less morphine consumption in this study is the use of multimodal analgesic drugs plus the use of spinal anaesthesia and high

concentration of local anaesthetic in the TAP block groups but in our study we use only morphine as a rescue analgesic, also the study period is different [22].

Kelly et al., [23] proved that TAP blocks have been shown to offer improved pain relief after cesarean sections when compared to a placebo, but have been shown to be inferior to subarachnoid morphine.

In consonance with our results Andrey [24] demonstrates the analgesic effectiveness of both Paravertebral Block (PVB) and TAP block after major gynecological cancer surgery. Both regional anaesthetic techniques demonstrated significant reductions in both opioid requirements and pain scores during early and late post-operative periods [24].

The results of this study support previous findings that TAP block performed preoperatively provides sufficient and long-lasting analgesia.

Hyun-Jung et al., [25] proved that US-TAP block with standard care provides more effective analgesia after gynecological surgery, their study was conducted on 32 patients randomized to undergo gynecological surgery with postoperative standard care such as PCA or to receive US-TAP block with standard care after general anaesthesia induction, bilateral US-TAP was performed using 0.375% ropivacaine 20ml on each side, the pain score was significantly lower in the US-TAP group [25].

H-Loane [26] disagreed with us in which TAP block was associated with greater supplemental morphine requirements than intrathecal morphine (7.5mg vs 2.7mg) in 24 hours, this study was conducted on 66 women undergoing elective caesarean delivery under spinal anaesthesia, they were randomized to receive either intrathecal morphine 100 microgram plus TAP or a TAP block with 0.5% ropivacaine 1.5mg/kg to each side [26].

The disagreement most probably due to the use of morphine intrathecally which increases the duration of analgesia.

Also in disagreement with our results, Puddy E et al., [27] who conducted their study on 48 elective caesarean section parturients who were randomly assigned to undergo TAP block with either bupivacaine (n=23) or saline (n=25). All patients received a spinal anaesthetic with 0.5% heavy bupivacaine and 300 µg diamorphine. All patients received a loading dose of rectal diclofenac and paracetamol. Standard post-operative analgesia

comprised regular diclofenac and paracetamol, and subcutaneous morphine on request. A blinded investigator assessed each patient post-operatively 2, 6, 24 and 48h post-operatively. There were no statistically significant differences in post-operative morphine requirement or visual analogue pain scores between the two groups [27].

However, their study were performed on parturients who underwent spinal anaesthesia and intrathecal diamorphine was used. It seems that the design of these study mainly differed from ours.

Also in disagreement with our results, Costello et al., [16] who conducted their study on 100 women undergoing elective CD under spinal anaesthesia. Patients were randomized to receive the TAP block with ropivacaine (n=50) or placebo (n=50), in addition to a standard post-operative analgesic regimen inclusive of intrathecal opioids. Each patient was assessed at 6, 12, 24, and 48hrs post-operatively. They found that the mean (SD) visual analog scale pain scores on movement at 24hrs were not different between the ropivacaine and placebo groups the pain scores at other times, and the supplemental opioid consumption, were also similar between the 2 groups [16].

However, their study were performed on parturients who underwent spinal anaesthesia which differed from our design.

Also in disagreement with our results, Ortiz et al., [28] who conducted their study on eighty patients undergoing laparoscopic cholecystectomy were randomized to receive either bilateral TAP blocks or local anesthetic infiltration of trocar insertion sites with ropivacaine 0.5%. Postoperative pain scores and analgesic use for the first 24hrs were recorded. They found that no statistically significant difference in pain scores on the numeric analog scale (0-10) between the groups at 4hrs after surgery or during the 24hrs after surgery [28].

As regard to post-operative nausea and vomiting, our results showed that its incidence was lower in Group II and Group III than Group I but it didn't reach significant values.

Also our results are in agreement with Carney et al., [29] who conducted their study on 15 females undergoing total abdominal hysterectomy. Patients were randomized into groups to undergo TAP vs placebo in addition to PCA morphine, diclofenac and acetaminophen post-operatively. They found that there was no significant difference in the incidence or severity of nausea between groups at any time point [29].

**Conclusion:**

We can conclude from this study that in patients undergoing laparoscopic cholecystectomy both the posterior and subcostal ultrasound-guided transversus abdominis block provides superior analgesia than the standard IV regimen. However, beyond the initial 4 hours after recovery, patients in the subcostal TAP group had significantly lower pain scores than did patients from the other groups.

So, for incisions mainly involving the supra-umbilical region, subcostal TAP block may be a better alternative than the posterior approach for providing post-operative analgesia as a component of a multimodal analgesic technique.

**Conflicts of interest:**

No conflicts of interest declared.

**Authors' contributions:**

All authors had equal role in design, work, statistical analysis and manuscript writing.

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## دراسة مقارنة بين الطريقة الخلفية وطريقة أسفل الضلوع في التخدير الموضعي لعضلات البطن المستعرضة باستخدام السونار لتسكين الألم بعد عملية إستئصال المرارة بالمنظار

المقدمة: بالرغم من أن إستئصال المرارة بالمنظار تعتبر من جراحات اليوم الواحد ولكنها مازالت مصاحبة بألم تثبيط الأعصاب بين العضلة المستعرضة البطنية إسترشادا بإستخدام جهاز الموجات الصوتية يتضمن تثبيط الأعصاب الحسية المغذية لجدار البطن الأمامي والتي تتضمن تثبيط العصب الحرقفي أربي والعصب الحرقفي خثلى والأعصاب الصدرية بين الضلوع من ٧-١٢ وهذا يتم بواسطة حقن المخدر الموضعي بين العضلة المائلة الداخلية والعضلة المستعرضة البطنية إسترشادا بإستخدام الموجات الصوتية أما عن طريق الطريقة الخلفية أو طريقة أسفل الضلوع.

الهدف من البحث: دراسة مقارنة بين الطريقة الخلفية وطريقة أسفل الضلوع في التخدير الموضعي لعضلات البطن المستعرضة بإستخدام السونار لتسكين الألم بعد عملية إستئصال المرارة بالمنظار.

المرضى وطرق التخدير: تم عمل دراسة على المرضى اللذين سيقومون بعملية إستئصال المرارة بالمنظار على ٣ مجموعات كل مجموعة ٢٠ مريض المجموعة الأولى : تخدير كلى بدون حقن عضلات البطن المستعرضة. المجموعة الثانية: سوف يتم حقن عضلات البطن المستعرضة بإستخدام بوبيفاكين ٠.٢٥ ٪/١٥ مل كل ناحية بإستخدام الطريقة الخلفية. المجموعة الثالثة: سوف يتم حقن عضلات البطن المستعرضة بإستخدام بوبيفاكين ٠.٢٥ ٪/١٥ كل ناحية بإستخدام طريقة أسفل الضلوع. تم إعطاء جميع المرضى مسكنات للألم بعد العملية وهي: عقار الباراسيتمول وريدي ومخدر المورفين إذا لزم الأمر مع حساب جرعته الكلية.

تم تسجيل القياسات التالية: الوظائف الحيوية مثل النبض ومتوسط ضغط الدم ودرجة الألم بإستخدام معامل قياس الألم ووقت إعطاء المسكنات لأول مرة والجرعة الكلية لمخدر المورفين خلال أول ٢٤ ساعة بعد العملية وحدث مضاعفات ما بعد العملية مثل القيء والغثيان.

النتائج والمناقشة: من خلال الدراسة وجد أن التخدير الموضعي للعضلة البطنية المستعرضة إسترشادا بالموجات فوق الصوتية بإستخدام عقار البوبيفاكين من خلال الطريقة الخلفية وطريقة أسفل الضلوع له دور هام في تسكين ألم ما بعد جراحة إستئصال المرارة بالمنظار ولكن يفضل طريقة أسفل الضلوع لأنها تقوم بتثبيط الألم الناتج عن جرح العملية الواقع أعلى سرية البطن ولكن الطريقتان أفضل في تسكين الألم من الطريقة التقليدية الوريدية.