INTRAOPERATIVE SUPERIOR HYPOGASTRIC PLEXUS BLOCK, TO RELIEVE POSTOPERATIVE PAIN IN ABDOMINAL HYSTERECTOMIES

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ABSTRACT

Objective: To study the efficacy of superior hypogastric block as a method of pain relief for abdominal hysterectomy performed under spinal anaesthesia for benign indications.

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

Place and Duration of Study: Military Hospital Rawalpindi Pakistan, from Jan 2017 to Sep 2017.

Population: Sixty-two women scheduled for total abdominal hysterectomy for a benign indication.

Material and Methods: We carried out a double blind randomized placebo controlled trial on 62 patients from January 2017 to September 2017. Patients were randomly grouped into group A (RG) where 20 ml of ropivacaine 0.25% was used and group B (SG) where 20 ml saline was used. Opioid analgesia in the form of nalbuphine was used in all the patients as per requirement and patients were followed for 12 hours. Patients, staff and assessors were blinded to group assignment. Superior hypogastric plexus block performed during abdominal hysterectomy lowers opioid consumption postoperatively. Main outcome measures: Primary outcome measures included amount of opioid consumption and visual analogue score (VAS) for pain. Secondary endpoints were the requirement of backing up opioid with diclofenac and presence of opioid related side effects like sedation, vomiting and itching

Results: The study was performed with 31 women randomized each to ropivacaine and saline group. Analysis was performed on 31 women in the ropivacaine group and 30 women in the saline group. The postoperative opioid consumption was significantly lower in the ropivacaine group than in the placebo group (median 3.13 and 3.80, respectively, p=0.01). Similarly, median VAS score was significantly less in ropivacaine group (3.4 in ropivacaine group compared to 4.7 in saline group with p<0.01). No side effects or important adverse events occurred during the study.

Conclusion: The superior hypogastric plexus block was found an effective new tool to manage postoperative pain after abdominal hysterectomy. It can be considered as a part of multi modal analgesia technique.

Keywords: Hysterectomy, Nerve block, Pain, Randomized clinical trial, Superior hypogastric plexus block.

INTRODUCTION

Post-operative pain even in modern era, is inadequately treated despite great advancements in the understanding of mechanisms and methods of pain relief. There is evidence that inadequate pain relief not only delays mobilization and recovery, but may also result in chronic pain, which is often misdiagnosed[1]. In addition to increased patient sufferings, it entails an extra cost as well. Nerve blocks have been shown to be a safe and effective tool in pain relief, decreasing opioid consumption and their related complications, allowing earlier mobilization and functional recovery, shorten hospital stay[2] and improved sleep[3]. Diminished opioid related side effects lead to early recovery that translates into decreased hospital stay and heightened patient satisfaction. Opioid-based methods of pain relief give excellent pain relief at the cost of opioid related side effects like nausea, vomiting and delayed recovery of bowel function. Some patient populations like the elderly, are at greater risk for respiratory depression with opioids. An optimal strategy for multimodal analgesia entails maximizing the use of non-opioid analgesics to reduce the patient's exposure to opioids. Combining opioids with techniques where non-steroidal anti-inflammatory drugs or local anesthetics are

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used, have produced a decrease in opioid-related side effects and an increase in analgesic quality[4]. Clinicians have many options for providing multimodal analgesia including patient control analgesia, epidural or intrathecal local anesthetics/opioids, local anesthetic wound infiltration, nonsteroidal anti-inflammatory drugs (NSAIDS) and adjuvant drugs. NSAIDS have their own limitations with injection site pain and renal dysfunction and other contraindications.

Nerve blocks such as ileo-inguinal or ileohypogastric, relieve somatic pain, some randomized controlled trials have shown that local anesthetic injection around small incision sites reduces postoperative somatic pain but is inadequate for visceral pain. Although somatic pain due to Pfannenstiel incision in the abdominal wall is prevented by ilioinguinal/ iliohypogastric block, it is clear that this would not be effective for the visceral component of postoperative intra-abdominal pain. Thus, these blocks may only partially reduce the amount of opioid used[4].

We wanted to investigate superior hypogastric plexus (SHP) block as it would target visceral component of pain[5]. Somatic nerve blocks like TAP block have been shown to be effective in post-operative pain relief. We wanted to investigate if SHP block could be added to the multimodal tool kit for postoperative pain relief. To our knowledge superior hypogastric block as a method of pain relief has only been used in one centre for hysterectomy under general anaesthesia[6]. We wanted to establish its efficacy for hysterectomy under spinal anaesthesia encompassing its cost efficacy. Our department performs a large percentage of hysterectomies under spinal anaesthesia. A single-centre, randomized, double blind, placebo-controlled clinical trial studying the effect of intraoperative superior hypogastric block was hereby undertaken.

MATERIAL AND METHODS

This was a randomized controlled trial. Women scheduled for benign abdominal hysterectomy from January 2017 to September 2017 were asked to participate. After taking permission from hospital ethical committee, women scheduled for abdominal hysterectomy were enrolled. Informed verbal consent was taken a day before surgery. Exclusion criteria was, women booked for hysterectomy for malignancy, pelvic mass more than the size of 20 weeks' uterus, women suffering from any other disorder requiring daily consumption of pain relief medications, depression medication, patients with ischemic heart disease or valvular heart disease and allergy to either local anaesthetic. All women received oral and written information on the study. Only ASA 1-2 patients were included in this trial. Randomization was done by the member who was not included in the assessment postoperatively. An anesthesiologist blinded to the study groups prepared all solutions for study injections. Randomization was done using table of randomization and it was not disclosed to surgeons and staff involved in post- operative care till the study was complete.

Following written informed consent, women were randomized to the injection of either ropivacaine or saline in the area of SHP. Member of the administrative staff not involved in data collection filled the injection and gave it to the trolley assistant. Hysterectomy was performed according to surgeon's discretion. Vault was closed but neither visceral nor parietal peritoneum was closed. Spinal anesthesia was used in each case using 25 Gauge Quincke needle (Beckton Dickinson Spain) and 25 Gauge Pencil Point needle (Unisis Corp Japan). Bupivacaine 0.5% hyperbaric 15mg (Brooke's Pharma) was used as spinal anesthetic agent. No additive was administered in the spinal anesthetic. Sedation or analgesia required intra-operatively was recorded in the study Performa. The drug used for the SHP block was ropivacaine 0.25% (Ropicain 0.5% Lahore Pharma). About 20 ml of 0.25% (diluted in normal saline) or 20 ml of normal saline was given to the operating surgeon for the block in the respective groups.

Sample size calculation and statistical analysis: The sample size was estimated using open Epi sample size calculator for RCT version 3.01. About 63% proportion of women with VAS estimated pain 4 or less {8} at 95% confidence interval, we get n=62 (31 in each sample).

Procedure for SHP block: block was administered after performing hysterectomy. About 20 ml of 0.25% Ropivacaine or saline was injected retroperitoneally in front of L5-S1, the area just below bifurcation of aorta after identifying and packing sigmoid colon to the left hemipelvis[6]. For the 1st 20 cases the principal investigator performed all the blocks thereafter 4 more consultants were trained and were able to perform the block under supervision/ independently.

At post-anaesthesia care unit (PACU) patients were monitored according to standard protocol.

In the post-operative ward, all patients were administered a nurse controlled analgesia with 4.0 mg nalbuphine every 2 hours unless patient was comfortable, after that it was administered at 4.0 hours interval. If patient was in pain despite 2 hourly nalbuphine dose then Injection diclofenac 75 mg IM was added to the regimen. In case of vomiting, Injection ondansetron 8mg was administered intravenously.

Post-operative pain was assessed by visual analogue scale (VAS) with scores from 0 to 10, with 0 depicting no pain and 10 the worst imaginable pain.

The primary end point of study was postoperative opioid consumption and pain scores that were assessed upto 12 hours. The secondary end points were opioid related side-effects namely vomiting, sedation and itching which were recorded upto 24 hours. Staff recording data were completely blinded to study group.

Table-I: Demographic data.

Characteristics		Ropivacaine				*p*-value
		Yes (n=31)		No (n=30)		
		n	%	n	%	
Age group (Years)	35-40	4	12.9	4	13.3	0.53
	41-50	19	61.3	15	50.0	
	51-55	5	16.1	4	13.3	
	56-60	3	9.7	7	23.3	
Duration of surgery	less than 60 minutes	4	12.9	13	43.3	0.03*
	60-120 minutes	24	77.4	17	56.7	
	121-180 minutes	1	3.2	-	-	
	more than 180 minutes	2	6.5	-	-	
Body mass index kg/m^2		Median	range	Median	range	*p*-value
		23	14	23	17	0.97

*$p<0.05$ was considered significant using Pearson Chi-Square test.

Statistical Methods

This was performed using SPSS. Mann–Whitney's U-test was used to assess differences in opioid intake and operation time, Fisher's exact test was used to compare VAS assessments at PACU, after 2 hours, 4 hours, 6hours and 12 hours after the injection of the study drug.

Data were stored and analyzed using IBM-SPSS version 23.0, counts and percentages were reported for age group, duration of surgery, use of diclofenac, vomiting, and sedation while median and range were reported for, BMI,

nalbuphine and VAS scores at 2nd, 4th, 6th and 12th hours, independent sample t-test was done to compare these parameters between ropivacaine and saline group, *p*-values less than 0.05 were considered significant.

Association between VAS values and opioid intake was assessed using Spearman's rank correlation.

RESULTS

Demographic data is presented for the two groups. Both the groups were comparable in terms of mean age and weight/BMI, except duration of surgery which was slightly longer in ropivacaine group. The ropivacaine group experienced less pain as evidenced by low VAS scores and less nalbuphine consumption (table-I). One woman was excluded from study due to technical difficulty in performing block. We compared the groups in terms of time to first analgesic demand and nalbuphine consumption, we found the difference among the groups to be significant ($p<0.05$). When compared the control and block groups, we found the ropivacaine-block group (RG) to be lower in terms of nalbuphine consumption ($p<0.05$). When we compared the groups in terms of the time to first analgesic demand, we found the ropivacaine-block group to be significantly higher than the control group ($p<0.05$) (table-II).

Data were stored and analyzed using IBM-SPSS version 23.0, counts and percentages were reported for age group, duration of surgery, use of diclofenac, vomiting, and sedation while median and range were reported for, BMI, nalbuphine and VAS scores at 2nd, 4th, 6th and 12th hours, independent sample t-test was done to compare these parameters between ropivacaine and saline group, *p*-values less than 0.05 were considered significant.

Age group and BMI were comparable in both groups. In ropivacaine group, 77.4% patients were found within 60-120 minutes duration of surgery group.

Table-II reports the association of ropivacaine using pearson chi square test. It was found that, use of ropivacaine gives significant association with diclofenac need, vomiting, and sedation requirement, 32% samples of ropivacaine group required diclofenac, 35.5% reported for vomiting, and 29% required sedation.

Table-II: Association of ropivacaine with studied parameters (Secondary outcome measures).

Characteristics		Ropivacaine				*p*-value
		Yes (n=31)		No (n=30)		
		n	%	n	%	
Diclofenac	Yes	10	32.3	27	90.0	<0.001*
	No	21	67.7	3	10.0	
Vomiting	Yes	11	35.5	20	66.7	0.015*
	No	20	64.5	10	33.3	
Sedation	Yes	9	29.0	19	63.3	0.01*
	No	22	71.0	11	36.7	

*$p<0.05$ was considered significant using Pearson Chi Square test.

Table-III: Comparison of median outcomes (Primary outcome Measures).

Parameters	Ropivacaine				*p*-value
	Yes		No		
	Median	Range	Median	Range	
Nalbuphine total in 12 Hours	3.13	0.67	3.80	0.81	<0.01*
Median VAS	3.40	3.40	4.70	5.60	<0.01*

*$p<0.05$ was considered significant using Mann Whitney U-test.

Table-III gives the median comparison of total Nalbuphine tablets in 12-hours, and mean VAS between two studied groups, the median use of Nalbuphine in total 12-hours was significantly low in Ropivacaine group, and median VAS of Ropivacaine was significantly low with *p*-value less than 0.01.

Bar chart for mean VAS & Nalbuphine between two groups, showed the mean VAS & Nalbuphine consumption was low in Ropivacine group (fig-1).

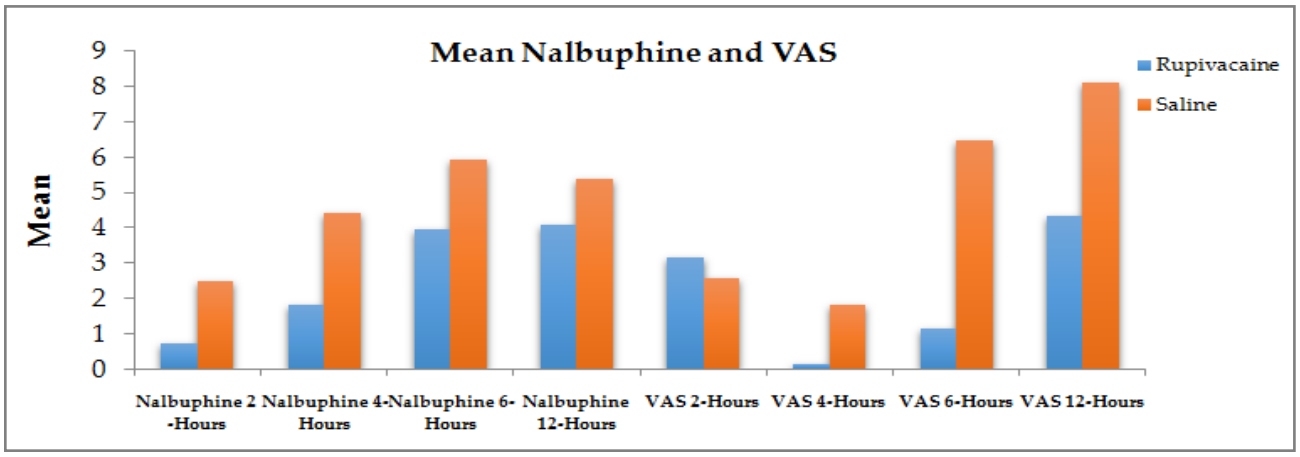

Figure-1: Bar chart for mean VAS & Nalbuphine consumption between two groups.

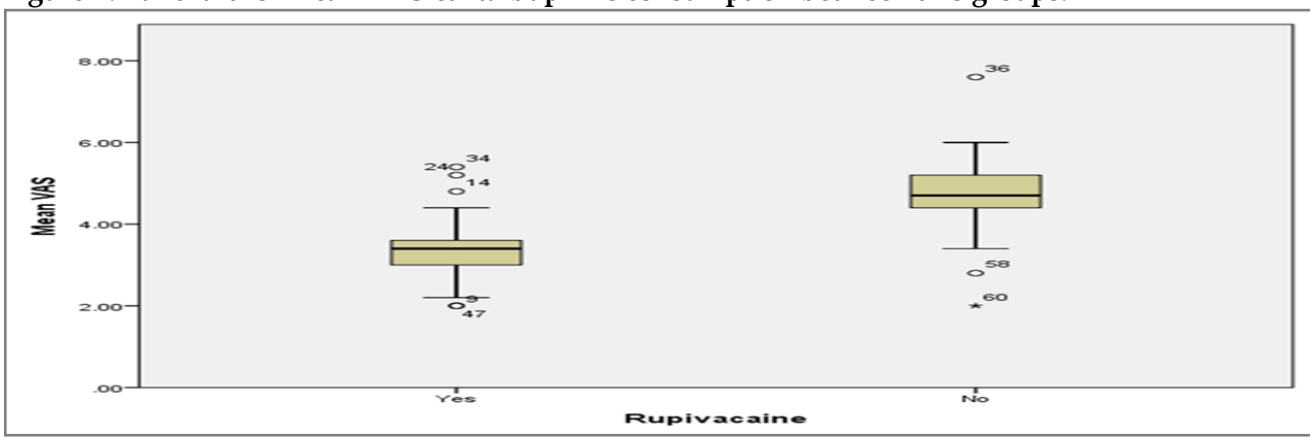

Figure-2: Box plot for mean VAS between two groups.

Box plot for mean VAS between two groups, showed that mean VAS was low in Ropivacaine group (fig-2).

DISCUSSION

Abdominal hysterectomy is often a long duration procedure and warrants intense pain relief in the post-operative period. In addition to the humanitarian and economical aspects of effective pain relief, the optimal management of postoperative pain is essential for avoiding the development of chronic pain[1]. Though the pain can be offset by opioids, high doses are associated with undesirable side effects. Nevertheless, intense and prolonged pain transmission[2] as well as analgesic under-medication, can increase surgical/ postsurgical/ traumatic morbidity, delay recovery, and lead to development of chronic pain. Considering the impact of sensitization, an aggressive and early treatment plan to reduce pain will help in preventing development of chronic pain6[4]. Pain prevention is preferable to, and more efficacious than, treatment of established pain. Recent developments in our understanding of incisional pain have highlighted the complexity of perioperative pain and the need for optimal management

not only to provide rapid recovery but also to prevent long-term consequences.

Pain after hysterectomy arises from skin, subcutaneous tissues, muscles and deep viscera.

Multimodal analgesia is a rational approach to manage such complex pain. It is achieved by combining different analgesics that act by different mechanisms and at different sites in the nervous system, resulting in additive or synergistic analgesia with lowered adverse effects of sole administration of individual analgesics. Practically, multimodal analgesia is achieved by a combination of opioids, NSAIDS and regional blocks[7].

Post op pain relief using continuous epidural analgesia targets both visceral and parietal pain with high efficacy in pain relief. Patients receiving neuraxial analgesia must be monitored carefully for side effects and potential complications, which can rarely be life-threatening[8]. Systemic toxicity, hypotension, inadequate or failed block, pruritus, nausea and vomiting, and respiratory depression are all possible after administration of epidural or spinal local anesthetics and opioids[9,10]. Also in low resource settings, epidural block for post-op pain relief may not be available. Hence it is not an option for routine post op pain relief in our setting.

In the past nerve blocks like ileo-inguinal/ ileohypogastric and Transversus abdominis plane (TAP) block has been used with varying degrees of success[11]. These blocks only relieve somatic pain whereas our study targeted the visceral pain by using SHP block. Most of the pain fibres in the region of uterus traverse through this plexus. That is why presacral neurectomy has long been mentioned as a method of pain relief for chronic pelvic pain.

Widespread adoption of TAP block has been overwhelmingly underutilized, especially after TAH as it is technically challenging and labor intensive[12,13]. SHP block on the other hand is technically very straight forward with a steep learning curve. SHP block added only 3-5 minutes to the procedure and there were no side effects or complications of the block itself.

Thus the study confirmed the safety of block in addition to its efficacy in post-surgery pain relief. In some studies, combination of blocks were used. There is only limited evidence to suggest that use of perioperative TAP block reduces opioid consumption and pain scores after abdominal surgery when compared with no intervention or placebo[15]. Hence there is need for further research into other novel methods of pain relief. SHP block is a reasonable option. The advantages of SHP block like TAP block include preservation of lower limb motor and sensory functions, hemodynamic stability, and less invasiveness[14,15]. SHP block theoretically targets visceral pain around vault and thereby provides superior pain relief after abdominal hysterectomy compared to other nerve blocks. Our findings are consistent with, but less impressive than, studies of bilateral ilioinguinal nerve blocks for analgesia after Caesarean section[16,17]. Additional pain from deep pelvic dissection and suturing of the vaginal vault during hysterectomy may explain this more modest analgesic effect. There is no apparent reduction in postoperative nausea, vomiting or sedation from the small numbers of studies to date. In our study, sedation, nausea and vomiting were significantly decreased but there was no effect on itching. Bilateral ilioinguinal nerve blocks with 0.5% bupivacaine for analgesia after total abdominal hysterectomy are a useful supplement to PCA and we believe that the technique should be more widely practiced. Other multimodal forms of pain relief including continuous infusion of 0.5% levobupivicaine into the peritoneal cavity following laparoscopic hysterectomy does not have any opioid-sparing effects.

Many studies on ileo-inguinal and TAP blocks targeted to assess patient satisfaction in addition to VAS scores. In our study we did not assess patient satisfaction with pain relief. There is only limited evidence to suggest that use of perioperative TAP block reduces opioid

consumption and pain scores after abdominal surgery when compared with no intervention or placebo. No studies have compared TAP block with other analgesics such as epidural analgesia or local anaesthetic infiltration into the abdominal wall wound.

Many relevant studies are currently underway or awaiting publication.

CONCLUSION

The superior hypogastric plexus block was found effective new tool to manage postoperative pain after abdominal hysterectomy. It can be considered as a part of multi modal analgesia technique.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. GP Joshi, BO Ogunnaike. Consequences of inadequate postoperative pain relief and chronic persistent postoperative pain. Anesthesiol Clin North America 2005; 23 (1): 21-36.
2. Vadivelu N, Whitney C, Sinatra R. Pain pathways and acute pain processing in: Sinatra R, De Leon Casadola O, Ginsberg B, VIscusi E. Acute Pain Management 2009.
3. Kerridge R. Perioperative patient management. Best Practice and Research Clinical Obstetrics and Gynaecology 2006; 20(1): 23-40.
4. Werawatganon T, Charuluxanun S. Patient controlled intra-venous opioid analgesia versus continuous epidural analgesia for pain after intra-abdominal surgery. Cochrane Database Sys Rev 2005; CD004088.
5. Gamal G, Helaly M, Labib YM. Superior hypogastric block: Transdiscal versus classic posterior approach in pelvic cancer pain. Clin J Pain 2006; 22(6): 544–47.
6. Loane H, Preston R, Douglas MJ, Massey S, Papsdorf M, Tyler J. A randomized controlled trial comparing intrathecal morphine with transversus abdominis plane block for post-cesarean delivery analgesia. Int J Obstet Anesth 2012; 21(2): 112-8.
7. Elia N, Lysakowski C, Tramèr MR. Does multimodal analgesia with acetaminophen, nonsteroidal antiinflammatory drugs, or selective cyclooxygenase-2 inhibitors and patient-controlled analgesia morphine offer advantages over morphine alone? Meta-analyses of randomized trials. Anesthesiology 2005; 103(6): 1296-1304.
8. Gwirtz KH, Young JV, Byers RS, Alley C, Levin K, Walker SG, et al. The safety and efficacy of intrathecal opioid analgesia for acute postoperative pain: seven years' experience with 5969 surgical patients at Indiana University Hospital. Anesth Analg 1999; 88(3): 599-604.
9. Niiyama Y, Kawamata T, Shimizu H. The addition of epidural morphine to ropivacaine improves epidural analgesia after lower abdominal surgery. Can J Anaesth 2005; 52(2): 181-5.
10. Wu CL, Hurley RW, Anderson GF, Herbert R, Rowlingson AJ, Fleisher LA. Effect of postoperative epidural analgesia on morbidity and mortality following surgery in medicare patients. Reg Anesth Pain Med 2004; 29(6): 525-33.
11. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: A prospective randomized controlled trial. Anesth Analg 2007; 104(1): 193-7.
12. McDonnell JG, Curley G, Carney J, Benton A, Costello J, Maharaj CH et al. The analgesic efficacy of transversus abdominis plane block after cesarean delivery: A randomized controlled trial. Anesth Analg 2008; 106(1): b186-91.
13. Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesth Analg 2008; 107(6): 2056-60.
14. Aveline C, Le Hetet H, Le Roux A, Vautier P, Cognet F, Vinet E, et al. Comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for day-case open inguinal hernia repair. Br J Anaesth 2011; 106(3): 380-6.
15. Charlton S, Cyna AM, Middleton P, Griffiths JD. Perioperative transversus abdominis plane (TAP) blocks for analgesia after abdominal surgery. Cochrane Database Syst Rev 2010; (12): CD007705.
16. Wehbe SA, Ghulmiyyah LM, Dominique EH. Prospective randomized trial of iliohypogastric-ilioinguinal nerve block on post-operative morphine use after inpatient surgery of the female productive tract. J Neg Res Bio Med 2008; 28: 7-11.
17. Abdallah FW, Laffey JG, Halpern SH, Brull R. Duration of analgesic effectiveness after the posterior and lateral transversus abdominis plane block techniques for transverse lower abdominal incisions: A meta-analysis. Br J Anaesth 2013; 111(5): 721-35.