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## Original article

# Ultrasound-Guided Ilioinguinal/Iliohypogastric Nerve Block versus Ultrasound-Guided Transversus Abdominis Plane Block for Lower Abdominal Surgeries: A Comparative Clinical Study

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## ABSTRACT

**Background:** Effective pain relief is of utmost importance to anyone undergoing surgery. Postoperative pain relief increases patient comfort and satisfaction. This is best accomplished with a multi-modal approach. Recent trends in minimally invasive surgery and improved recovery protocols have addressed pain treatment in light of these goals.

**Aim of the work:** Comparison between ultrasound-guided Ilioinguinal and Iliohypogastric nerve block with ultrasound-guided transversus abdominis plane block regarding postoperative analgesia in patients scheduled for lower abdominal surgeries.

**Patients and methods:** Seventy patients of ASA I or II, aged 21-50 years, who planned for elective open lower abdominal surgeries were included. They signed an informed consent and were randomly classified into two groups: [Group I] scheduled for Ilioinguinal and Iliohypogastric nerve block, and [Group II] scheduled for transversus abdominis plane block guided by ultrasound. Postoperative pain assessment was conducted by numerical rating score.

**Results:** In inguinal hernia repair, pain score at rest was significantly reduced in the TAP group when compared to Group-I at 30 minutes till the seventh hour postoperatively and at 12 up to 15 hours postoperatively. Also, in the CS group, the pain score was significantly decreased in TAP block when compared to nerve block at 90, 105 minutes, and from 4 up to seventh postoperative hours. With movement, pain scores were significantly lower at the 4, 5, 6, 7, 8, 9, 10, and 11 -hours in group II in inguinal hernia. It was significantly decreased at the 90 minutes to 2 -hours in group II in the CS subgroup. The total analgesic requirements were significantly lower in group II.

**Conclusion:** Ultrasound-guided TAP block tended to be more effective than Ultrasound-guided II/IH nerve block in lowering postoperative pain scores and decreasing the need for rescue analgesia in lower abdominal surgeries.

**Keywords:** Ilioinguinal; Iliohypogastric; Transversus Abdominis Plane; Lower abdominal; Surgery.

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\* Main subject and any subcategories have been classified according to the research topic.

## INTRODUCTION

The chief goal in the treatment of post-operative pain is to reduce the dose of analgesic drugs to decrease the incidence of side effects while still providing satisfactory analgesia. Different interventions were in use to control postoperative analgesia. They include systemic drugs, topical analgesics, epidural analgesia, and non-pharmacological approaches. However, the ideal approach is not yet determined<sup>[1]</sup>.

Regional analgesic techniques are widely accepted [from patients and physicians' points of view]. It is now a significant part of multi-modal analgesic modalities. Different techniques [e.g., Ilioinguinal/ Iliohypogastric nerve block, transversus abdominis plan [TAP] block, rectus sheath, and paravertebral blocks] had been used to deliver postoperative analgesia after abdominal surgeries. TAP, Ilioinguinal nerve block [IINB], and Iliohypogastric nerve block [IHNB] are frequently used for the provision of intra-and postoperative analgesia after lower abdominal surgeries<sup>[2-3]</sup>. However, IHNB and IINB were performed blindly with a high failure rate [up to 30%]. The use of ultrasound guidance seems to provide more effectiveness and safety when used with nerve block techniques<sup>[4]</sup>.

The transversus abdominis plane [TAP] block is an innovative, rapidly growing regional anesthesia maneuver that offers analgesic effects to the parietal peritoneum, the skin, and muscles of the anterior abdominal wall after abdominal surgery. It has gained wide acceptance worldwide, as it is simple and effective. Ultrasound guidance is associated with an increased rate of success and effectiveness<sup>[5]</sup>.

The optimal, evidence-based approach to provide postoperative analgesia after lower abdominal surgeries is still controversial. Thus, we conducted the current study to compare between ultrasound-guided TAP and Ilioinguinal/ iliohypogastric nerve blocks as a sole intervention for postoperative analgesia after lower abdominal surgery.

## AIM OF THE STUDY

This study was designed to compare between ultrasound-guided Ilioinguinal/Iliohypogastric nerve block and ultrasound-guided transversus abdominis plane block for adult patients scheduled for lower abdominal surgeries.

## PATIENTS AND METHODS

This is a prospective randomized comparative clinical trial. After approval of the local ethics and research institutional committee of Damietta Faculty of Medicine, seventy patients, aged 21-50 years, of both sexes and ASA class I or II, who scheduled for elective open lower abdominal surgery [cesarean section or inguinal hernia repair], were included. They were selected from Al-Azhar University hospitals [Damietta and Assiut] from March to December 2020. An informed consent was signed by all participants before inclusion in the study.

**Exclusion criteria included the following:** patient refusal, allergy to local anesthetic, coagulopathy, and skin or subcutaneous infection at the injection site.

Patients were randomly assigned by computer-generated and sealed opaque envelopes into one of two groups [35 patients in each group]. **Group I [I/IH]** [Inguinal hernia repair were 20 patients while cesarean section [CS] were 15 patients] underwent Ilioinguinal. Iliohypogastric nerve block guided by ultrasound whereas the patient in **group II [TAP]** [Inguinal hernia repair were 18 patients while CS were 17 patients] underwent transversus abdominis plane block guided by ultrasound.

**Group I [I/IH] Ilioinguinal and Iliohypogastric Block group:** After surgery, while the patient was anesthetized under complete aseptic technique, the linear 13 MHz probe of ultrasound machine [SonoSite M\_Turbo] was placed just medial and slightly cephalic to the upper aspect of the anterior superior iliac spine. Advancement of the needle was continued until a characteristic tenting of the interface between the internal oblique and transversus abdominis muscles in this plane. The two nerves were observed, and small vessels were seen close to them. At this point, 20 ml of bupivacaine 0.5% was injected.

**Group II [TAP] transversus abdominis plane Block group:** After the end of the surgery, the patient was anesthetized under complete aseptic the linear 13 MHz probe ultrasound machine [SonoSite M Turbo] was placed in the mid-axillary line just cephalad of the iliac crest in a transverse plane to the lateral abdominal wall. The needle was advanced posteriorly until the needle was observed to penetrate the interface between the internal oblique and transverses abdominis muscles. After that, 20 ml of bupivacaine 0.5% was injected.

The pain intensity was guided by the Numerical Rating Scale [NRS]. **The primary [main] Outcome** was postoperative analgesia regarding pain severity and duration of analgesia guided by the Numerical Rating Scale [NRS]. **The secondary outcomes were** postoperative use of analgesic [Ketorolac 30 mg], time to first dose analgesic requirement, the total dose of analgesic drugs, and any complications related to the procedure, e.g., vascular injury, intraperitoneal injection.

**Statistical analysis:** The findings were analyzed using SPSS [Statistics Kit of Social Sciences] version 23 [SPSS Inc., Chicago, IL, USA]. The normally distributed data is seen in mean and standard deviations, and qualitative data expressed in frequency and percentage distribution. Quantitative data were compared by the Independent sample t-test [student t-test] for normally distributed data and U-test [Mann-Whitney U-test] by abnormally distributed data. In

addition, Chi-square or Fisher exact test was used for comparison between the two categorical groups.

## RESULTS

Both groups were comparable regarding age, body weight, sex, ASA class, and type of operation, as shown in [Table 1].

In inguinal hernia repair, pain score at rest was significantly decreased in the TAP group when compared to group I at 30 minutes the seventh hour postoperatively, and at 12 up to 15 hours postoperatively. However, in the CS subgroup, the pain score was significantly reduced in TAP block when compared to nerve block at 90, 105 minutes, and from 4 up to seventh postoperative hours [Table 2].

With respect to postoperative pain level at movement, the current study showed that postoperative pain scores were significantly lower at the 4, 5, 6, 7, 8, 9, 10, and 11 -hour in group II in inguinal hernia [p-value < 0.05] while were significantly lower at the 90 minutes to 2 -hour in group II in CS as shown in [Table 3].

With respect to the time of the first rescue of analgesic, the current study showed that total rescue analgesia was significantly lower in group II [p-value < 0.05] [Table 4].

With respect to total rescue analgesia consumption, the current study showed that total rescue analgesia was significantly lower in group II [p-value < 0.05] [Table 5].

**Table [1]:** Demographic data of studied groups

		Group I [II/IH]	Group II [TAP]	P-value
Age [years]	Mean ± SD	35.7±8.6	37.2±8.7	0.07
	Range	20-49	22-53	
Weight [kg]	Mean ± SD	75.3±12.2	74±12	0.63
	Range	55-98	50-99	
Sex	Male	15[42.8%]	17[48.6%]	0.63
	Female	20[57.1%]	18[51.4%]	
ASA	I	22 [62.9%]	19[54.3%]	0.46
	II	13 [37.1%]	16[45.7%]	
Type of Operation	Inguinal hernia repair	20 [57.1%]	18 [51.4%]	0.33
	Caesarean section	15 [42.8%]	17 [48.6%]	

**Table [2]:** Comparison of the changes in the numerical rating score [NRS] at rest between the two groups

	Inguinal hernia repair			Cesarean Section		
	Group I [II/IH]	Group II[TAP]	P-value	Group I [II/IH]	Group II [TAP]	P-value
	Median [IQR]	Median[IQR]		Median [IQR]	Median [IQR]	
Baseline	1[0,2]	1[0,1]	0.395	1[0,2]	0[0,1]	0.061
15 Min	1[0,2]	1[0,1]	0.395	1[0,2]	0[0,1]	0.061
30 Min	2[1,2]	1[1,2]	<b>0.016*</b>	1[1,2]	1[1,1]	0.302
45 Min	2[1,2]	1[1,2]	<b>0.016*</b>	1[1,2]	1[1,1]	0.302
60 Min	2[1,2]	1[1,2]	<b>0.00*</b>	2[1,2]	1[1,2]	0.063
75 Min	2[1,2]	1[1,2]	<b>0.01*</b>	2[1,2]	1[1,2]	0.063
90 Min	2[2,3]	1[1,2]	<b>&lt;0.001*</b>	2[2,3]	1[0,2]	<b>0.006*</b>
105 Min	2[2,3]	1[1,2]	<b>0.012*</b>	2[2,3]	1[0,2]	<b>0.009*</b>
2 Hr	2[2,3]	1[1,2]	<b>0.00*</b>	2[2,3]	2[1,3]	0.229
3 Hr	2[2,3]	1[1,2]	<b>0.05*</b>	2[2,3]	2[1,3]	0.229
4 Hr	3[2,4]	2[2,3]	<b>0.00*</b>	3[3,4]	2[1,2]	<b>&lt;0.001*</b>
5 Hr	3[2,4]	2[2,3]	<b>0.02*</b>	3[3,4]	2[1,2]	<b>0.04*</b>
6 Hr	4[3,4]	2[2,3]	<b>0.00*</b>	3[3,4]	2[1,2]	<b>0.001*</b>
7 Hr	4[3,4]	2[2,3]	<b>0.01*</b>	3[3,4]	2[1,2]	<b>0.007*</b>
8 Hr	3[3,4]	3[2,4]	0.145	3[3,4]	3[1,3]	0.799
9 Hr	3[3,4]	3[2,4]	0.145	3[3,4]	3[1,3]	0.799
10 Hr	3[3,4]	3[2,4]	0.331	4[3,4]	3[3,4]	0.148
11 Hr	3[3,4]	3[2,4]	0.331	4[3,4]	3[3,4]	0.148
12 Hr	3[2,4]	2[2,3]	<b>0.014*</b>	3[2,3]	3[2,3]	0.831
13 Hr	3[2,4]	2[2,3]	<b>0.011*</b>	3[2,3]	3[2,3]	0.831
14 Hr	3[2,4]	2[2,3]	<b>0.017*</b>	3[2,3]	3[2,3]	0.831
15 Hr	3[2,4]	2[2,3]	<b>0.013*</b>	3[2,3]	3[2,3]	0.831
16 Hr	3[2,3]	3[2,3]	0.36	3[3,4]	3[3,4]	0.438
17 Hr	3[2,3]	3[2,3]	0.36	3[3,4]	3[3,4]	0.438
18 Hr	3[2,3]	3[2,3]	0.36	3[3,4]	3[3,4]	0.438
19 Hr	3[2,3]	3[2,3]	0.36	3[3,4]	3[3,4]	0.438
20 Hr	3[2,3]	3[2,3]	0.36	3[3,4]	3[3,4]	0.438
21 Hr	2[2,3]	2[2,3]	0.387	2[2,3]	2[2,3]	0.25
22 Hr	2[2,3]	2[2,3]	0.387	2[2,3]	2[2,3]	0.25
23 Hr	2[2,3]	2[2,3]	0.387	2[2,3]	2[2,3]	0.25
24 Hr	2[2,3]	2[2,3]	0.387	2[2,3]	2[2,3]	0.25

**Table [3]** Comparison of the changes in the numerical rating score [NRS] at movement between the two groups

	Inguinal hernia repair			Cesarean Section		
	Group I[II/IH]	Group II[TAP]	P-value	Group I[II/IH]	Group II[TAP]	P-value
	Median[IQR]	Median [IQR]		Median[IQR]	Median [IQR]	
Baseline	1[1,2]	1[1,2]	0.328	2[1,2]	2[1,2]	1.0
15 Min	1[1,2]	1[1,2]	0.328	2[1,2]	2[1,2]	1.0
30 Min	2[1,2]	2[1,2]	0.98	2[1,2]	2[1,2]	1.0
45 Min	2[1,2]	2[1,2]	0.98	2[1,2]	2[1,2]	1.0
60 Min	2[1,2]	2[1,2]	0.741	2[2,2]	2[1,2]	0.693
90 Min	3[2,4]	3[3,4]	0.064	3[2,3]	2[2,3]	<b>0.030*</b>
120 Min	3[3,4]	2[3,4]	0.161	3[2,3]	2[2,3]	<b>0.032*</b>
150 Min	3[3,4]	2[3,4]	0.161	4[2,3]	3[2,3]	<b>0.036*</b>
180 Min	3[3,4]	2[3,4]	0.161	4[2,3]	3[2,3]	<b>0.036*</b>
4 Hr	5[4,5]	3[3,4]	<b>&lt;0.001*</b>	4[3,3]	4[3,4]	0.15
5 Hr	5[4,5]	3[3,4]	<b>&lt;0.001*</b>	4[3,3]	4[3,4]	0.15
6 Hr	5[4,5]	3[3,5]	<b>0.003*</b>	4[3,4]	4[3,4]	0.097
7 Hr	5[4,5]	3[3,5]	<b>0.002*</b>	4[3,4]	4[3,4]	0.097

	Inguinal hernia repair			Cesarean Section		
	Group I [II/IH]	Group II [TAP]	P-value	Group I [II/IH]	Group II [TAP]	P-value
	Median [IQR]	Median [IQR]		Median [IQR]	Median [IQR]	
8 Hr	4[4,5]	3[4,5]	<b>0.001*</b>	4[3,4]	4[2,5]	0.158
9 Hr	4[4,5]	3[4,5]	<b>0.002*</b>	4[3,4]	4[2,5]	0.158
10 Hr	4[4,5]	3[4,5]	<b>0.014*</b>	4[3,4]	4[2,5]	0.158
11 Hr	4[4,5]	3[4,5]	<b>0.017*</b>	4[3,4]	4[2,5]	0.158
12 Hr	4[3,4]	4[3,4]	0.414	3[3,4]	3[3,4]	0.278
13 Hr	4[3,4]	4[3,4]	0.414	3[3,4]	3[3,4]	0.278
14 Hr	4[3,4]	4[3,4]	0.414	3[3,4]	3[3,4]	0.278
15 Hr	4[3,4]	4[3,4]	0.414	3[3,4]	3[3,4]	0.278
16 Hr	5[4,5]	4[4,5]	0.075	5[3,5]	5[4,5]	0.499
17 Hr	5[4,5]	4[4,5]	0.075	5[3,5]	5[4,5]	0.499
18 Hr	5[4,5]	4[4,5]	0.075	5[3,5]	5[4,5]	0.499
19 Hr	5[4,5]	4[4,5]	0.075	5[3,5]	5[4,5]	0.499
20 Hr	5[4,5]	4[4,5]	0.075	5[3,5]	5[4,5]	0.499
21 Hr	4[3,4]	3[3,4]	0.953	3[3,4]	3[3,3]	0.32
22 Hr	4[3,4]	3[3,4]	0.953	3[3,4]	3[3,3]	0.32
23 Hr	4[3,4]	3[3,4]	0.953	3[3,4]	3[3,3]	0.32
24 Hr	4[3,4]	3[3,4]	0.953	3[3,4]	3[3,3]	0.32

**Table [4]:** Comparison of the changes in the Time of the first rescue of analgesic between the two groups

	Inguinal hernia		P value	CS		P value
	Group I [II/IH]	Group II [TAP]		Group I [II/IH]	Group II [TAP]	
<b>Median</b>	4	8	0.044*	5	8	0.009*
<b>IQR</b>	4,8	5,8		4,6	5,8	

**Table [5]:** Comparison of the changes in the total rescue analgesia consumption between the two groups.

Ketorolac [mg]	Inguinal hernia		P-value	CS		P-value
	Group I	Group II		Group I	Group II	
<b>Median</b>	100	60	0.02*	90	75	0.05*
<b>IQR</b>	90 -100	60-90		90-100	60-90	

## DISCUSSION

Results of the current study revealed that TAP block is superior to Ilioinguinal or iliohypogastric nerve block either for inguinal hernia repair or cesarean section. These results agree with **Carney et al.**<sup>[6]</sup> who performed a study for fifty females undergoing total abdominal hysterectomy and compared blind TAP with the control group and found that the pain was reduced in the TAP group than in the control group at postoperative 4, 6, 12, 24, and 36 hours. However, they followed their patients for a longer duration than the current study and could be attributed to the use of different local anesthetic in the form of ropivacaine 0.75%. In addition, they used basic analgesia in the form of paracetamol one gram/6 hours and rectal

diclofenac 100 mg 16 hours on admission to the post-anesthesia care unit [PACU]. **Aveline et al.**<sup>[7]</sup> additionally, compared ultrasound-guided transverses abdominis plane block with conventional II/IH nerve blocks after inguinal hernia repair on 273 patients and reported that patients undergoing TAP block expressed significantly lower pain at rest at 4, 12, and 24 postoperative hours. However, the longer duration of analgesia than the present study may be related to the basic analgesia given to all patients in the form of a combination of paracetamol 1 g/ 6 hours and ketoprofen 150 mg/12 hours postoperatively. Furthermore, **Bhatia et al.**<sup>[8]</sup> studied ultrasound-guided Ilioinguinal-Ilioypogastric [II/IH] nerve block compared with medial transversus abdominis plane [TAP] block for inguinal hernia repair

under spinal anesthesia on 50 patients and showed good pain relief seen in 58.3% patients in the TAP group compared to 45.8% patients in Ilioinguinal - Iliohypogastric nerve block IL/IH group. In another study done by **Belavy et al.**<sup>[9]</sup>, the 24 hours median morphine consumption following ultrasound-guided TAP block with 0.5% ropivacaine after cesarean delivery was found to be 18 mg, which was significantly reduced when compared to patients who received saline for TAP block, which was 31.5 mg. **Bessmertnyj et al.**<sup>[10]</sup> from Russia, in their prospective randomized study, concluded that both TAP & IL/IH were comparable in terms of postoperative opioid consumption post-cesarean for the first 24 hours. These results are different than the current work, which could be attributed to different inclusion criteria and sample size.

In contrast to our finding, a retrospective analysis of TAP Vs. IL/IH block for post-cesarean pain after spinal-epidural by **Jin et al.**<sup>[11]</sup> found that cumulative morphine consumption was comparable between groups until 12 hours. Yet, at 24 & 48 hour IL/IH group consumed less morphine than their counterparts. The study design [non-randomized and retrospective], the use of intrathecal morphine & blocks done with the ultrasound-guided technique could contributed to the controversy seen in our results. Similarly, a cohort by **Ahemed et al.**<sup>[12]</sup> in a study done in Ethiopia found that 24-hour total tramadol consumption was lower in IL/IH group compared to the TAP group. These results are also different than the current work.

Also, **Mohamed et al.**<sup>[13]</sup> compared ultrasound-guided Ilioinguinal/Iliohypogastric [IL/IH] nerve block versus ultrasound-guided TAP block for pediatric inguinal hernia repair on 50 pediatric patients and reported that pain score in IL/IH group was lower than pain score in TAP group. The discrepancy between their study and our findings may be because pediatric herniotomy procedures are done with minimal incision without placing a mesh. In contrast, adult patients require extensive dissection and tissue trauma along with mesh placement.

**Sujatha et al.**<sup>[14]</sup> found that there was no difference between the TAP group and IL/IH group; this can be explained by the addition of local wound infiltration with IL/IH block.

In line with the results of the current study, **Hosalli et al.**<sup>[15]</sup> concluded that pain scores at rest were significantly reduced at 12 and 24 hours in the TAP block group, and pain scores at movement were significantly reduced in the TAP group at 24 and 48 hours when compared to IL/IH group.

In conclusion, ultrasound-guided TAP block reduces the postoperative pain and subsequently analgesics consumption compared to ultrasound-guided Ilioinguinal and Iliohypogastric nerve [IL/IH] block in patients undergoing lower abdominal surgeries.

#### Financial and Non-Financial Relationships and Activities of Interest

None

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