Original Research Article

The Analgesic Efficacy of Ultrasound-Guided Fascia Iliaca Plane block after Hip Arthroplasty

Abstract:

Hip fractures are a persistent health problem especially post-operative with morbidity disability and mortality. The fascia iliaca nerve block (also called the fascia iliaca compartment nerve block) is considered an alternative to a femoral nerve or a lumbar plexus nerve block

Objective: This study aims to evaluate the analgesic efficacy of ultrasound-guided fascia iliaca plane block after hip arthroplasty. **The primary outcome**: average postoperative VAS pain scores. **Secondary outcome:** Time to first analgesic request; Postoperative analgesic consumption; Overall patient satisfaction with analgesia; Any adverse effects e.g., nausea, vomiting, pruritus or urinary retention.

Patients and Methods:

This Prospective randomized double blinded clinical trial will be carried out in Tanta University Hospital in orthopedic Surgery Department. The study included 60 adult patients aged > 25 years; ASA class I&II scheduled for total hip arthroplasty surgery.

Results

As regard, first analgesic requirement of analgesic there were significant statistical increases in group I compared to group II. also, there were statistically significant decreases in total consumption of both paracetamol and pethidine in group, however There were significant statistical decreases in total pethidine consumption (mg) in group I compared to group II

Conclusion:

FICB is safe and effective in improving post-operative pain after hip arthroplasty. It provides lower NRS, more hemodynamics stability, longer time for 1st time of analgesics requirement ad lower amount of total analgesic consumptions within 1st 24 hours.

Key word: Analgesic, Ultrasound-Guided, Fascia Iliaca block, Hip Arthroplasty

Introduction:

Hip fractures are a persistent health problem especially post-operative with morbidity disability and mortality that may threat patient recovery[(1)] .It is important that side effects of anesthesia to be decreased to optimize patient safety and comfort and to facilitate rehabilitation[(2)]. The main anesthetic options are general anesthesia (GA) and regional anesthesia (RA) or a combination of the two. In a recent systematic review, regional anesthesia (RA) was demonstrated to reduce post-operative pain compared to systemic analgesia[(3)] .

Spinal anesthesia is a RA technique commonly used in many patients undergoing hip arthroplasty[(4)] .Opioids added to the spinal anesthetic to prolong and improve post-operative pain relief and are associated with reduced post-operative analgesic requirements in patients undergoing hip arthroplasty[(5)]. However, intrathecal opioids are associated with side effects including urinary retention, nausea and vomiting, pruritus and rarely, but most seriously, respiratory depression. Such adverse effects can be uncomfortable for the patient, delay mobilization, recovery and eventual discharge and occasionally be dangerous[(6)].

In patients undergoing hip arthroplasty; peripheral nerve blockade has been shown to improve pain scores and reduce analgesic consumption[(7)] .The fascia iliaca block can provide sensory blockade of the main nerves which supply pain to the hip. However, clinical success rates of this block when performed 'blindly' using traditional landmark techniques are variable[(8),(9)]. Using ultrasound to locate nerves during peripheral nerve blockade has repeatedly been shown to increase success rates, reduce block onset time, increase block duration, reduce volumes of local anesthetic required and increase patient satisfaction compared to traditional techniques[(10),(11)].

This study aims to evaluate the analgesic efficacy of ultrasound-guided fascia iliaca plane block after hip arthroplasty. **The primary outcome**: average postoperative VAS pain scores. **Secondary outcome:** Time to first analgesic request; Postoperative analgesic consumption; Overall patient satisfaction with analgesia; Any adverse effects e.g. nausea, vomiting, pruritus or urinary retention.

Patients and Methods

This Prospective randomized double blinded clinical trial was carried out in Tanta University Hospital in orthopedic Surgery Department from… to …….

Ethical committee: After approval from institutional ethical committee, an informed written consent was taken from each patient. All data of patients were confidential with secret codes

and private file for each patient, all given data were used for the current medical research only. Any unexpected risks encountered during the course of the research were cleared to the participants as well as to the Ethical Committee on time. Every patient received an explanation to the purpose of the study and have secret code number to ensure privacy to participants and confidentiality of data.

Patient grouping: Sixty patients were randomly classified to two equal groups (30 patients each) with ASA physical status I, II, III; Age > 25 years of age of both sexes scheduled for hip arthroplasty; Competence to consent.

Group I: (Fascia iliaca group): Spinal anesthesia with hyperbaric bupivacaine at a dose 10-15 mg, adjusted at the level of L2-L3 with addition of intrathecal fentanyl 25 micrograms (0.5 ml). Ultrasound guided fascia iliaca block using 2 mg/kg bupivacaine diluted to a total of 30 ml with sterile saline.

Group II: Control group: Spinal anesthesia with hyperbaric bupivacaine at a dose 10-15 mg with addition of intrathecal fentanyl 25 micrograms (0.5 ml). Ultrasound guided fascia iliaca injection with 30 ml of sterile saline was done.

Patient refusal; Coagulopathy or infection at the site of block**;** Allergy to local anesthesia or opioid; Significant peripheral neuropathy or neurological disorder affecting the lower extremity, Pregnancy; History of drug dependency; Patient that cannot express his pain were excluded from our study

Preoperative assessment was done by: History taking; Clinical examination; Routine laboratory investigations including: CBC, bleeding time, clotting time, liver function tests, kidney function tests; Make patient familiar with VAS (0: no pai to 10: intensive pain).

The following data were recorded: Demographic data: age, sex, body mass index, ASA, duration of surgery; Vital signs: Mean arterial blood pressure (mmHg), heart rate (beats/minute) were monitored postoperatively at PACU, 6, 12, and 24 hr; Duration of sensory and motor block.

Postoperative pain was assessed by visual analog scale

Postoperative pain was assessed using 10 cm marked visual analog scale (VAS) where zero means no pain and ten means severe pain. Pain was assessed at PACU, 2, 6, 12, 24 after operation. Patients with a >7 VAS score ≥ 4 during the stay in hospital were given I.V. paracetamol (with a maximum dose of 1 g every 6 h), starting in the postoperative ward and for 24 h postoperatively, if VAS > 7 pethidine at dose of 30 mg as rescue analgesia.

Time of first rescue analgesia; Postoperative analgesic consumption.

Overall patient satisfaction with analgesia with analgesia was assessed by a second anesthesiologist on postoperative day 1using a 5-point verbal scale ranging from very satisfied to very dissatisfied (1 for (very satisfied); 2 for (some-what satisfied); 3, for (neither satisfied nor dissatisfied); 4 for (some-what dissatisfied); 5 for (very dissatisfied) [(12)].

Any undesirable side effects during the time of the study were recorded (Manifestations of local Anesthetic toxicity, intravascular injection, and hematoma, hypersensitivity to local anesthesia or opioids).

Statistical analysis

Epi-Info software statistical package created by World Health Organization (WHO) and by Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA version 2002 were used to calculate the sample size at (N=45), 95% confidence limit and 80% power of the study, then the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) was used to analyze the gathered data. Quantitative variables were presented as mean ± standard deviation, while qualitative data were expressed as frequency and percentage. $P \leq 0.05$ was considered statistically significant.

Results

Regarding HR comparison in both groups, at 6hrs. there were decreased HR in group I when compared to group II but this difference was statically in-significant at PACU, at 2h, at 6h. While from12 to 24h, HR showed significant statistical decrease in group I compared to group II. Regarding mean arterial blood pressure comparison in both groups, at PACU and at 2h, there were no statistically significant difference. while from 6h to 24h, arterial blood pressure showed significant statistical decrease in group I compared to group II

Regarding duration of sensory block, there was significant statistical increase in group I compared to group II. While there was no significant statistical difference between both groups in duration of motor block

Regarding VAS comparison in both groups, there was decrease in group I compared to group II, but the difference was not significant at PACU and at 2h, but from 6h to 24h, VAS showed statistically significant decrease in group I compared to group II **(Table 1)**

As regard, first analgesic requirement of analgesic there were significant statistical increases in group I compared to group II. also, there were statistically significant decreases in total consumption of both paracetamol and pethidine in group, however There were significant statistical decreases in total pethidine consumption (mg) in group I compared to group II **(Table 2).**

As regard Patient satisfaction our study reported that, there were significant statistical increase in patient satisfaction score in group I compared to group II **(Table 3)**

Discussion

Regarding VAS comparison in both groups, there was decrease in group I compared to group II, but the difference was not significant at PACU and at 2h, but from 6h to 24h, VAS showed statistically significant decrease in group I compared to group II.

In agreement with our study, **Madabushi et al.**[13] who compared analgesic efficacy of fascia iliaca block vs intravenous fentanyl and found that the drop in VAS scores was significantly more in the FICB group. They concluded that, fascia iliaca block offers superior analgesia compared to IVF in patients with femur fracture

In addition, **Ghimire et al.**[7] evaluated the feasibility and effectiveness of fascia iliaca compartment block (FICB) and femoral nerve block (FNB) in reducing pain in patients undergoing proximal femoral fracture fixation procedures and reported that, FICB was more effective in reducing pain than femoral nerve block (FNB).

In **accordance to our results, Krych et al.,**[14] evaluated the utility of multimodal analgesia with fascia iliaca blockade for acute pain control in patients undergoing hip arthroscopy, they reported that multimodal analgesia with fascia iliaca blockade following hip arthroscopy was safe and effective. The quality of early post-operative analgesia provided by the fascia iliaca blockade was excellent and high quality of pain relief.

Other study supports our results, by **Wongswadiwat et al.** [15] **,** investigated the effectiveness of using fascia iliaca block for post-operative pain relief. They found that there was statistically significant decrease in pain score between the two groups. They concluded that the fascia iliaca block is effective for providing pain control for at least 24 hours.

Also, Deniz et al. [16], compared the postoperative analgesic efficiency of an ultrasound-guided fascia iliaca compartment block and a 3 in 1 block in patients who underwent hip prosthesis surgery as a result of hip fracture and They observed decrease in VAS values in both block groups. They believed that the ultrasound guided 3 in 1 block and FICB are parts of multimodal analgesic treatment in order to enable postoperative analgesia in hip prosthesis surgery.

Also in agreement to the present study, **Desmet et al.**[17], assessed patients scheduled for THA (longitudinal supra-inguinal FICB) compared to group C (control, no block) and found that there was a statistically significant reduction in pain scores postoperatively.

In **addition, Kumie et al.**[8] assessed the efficacy of fascia iliaca compartment nerve block when it is used as part of multimodal analgesia after surgery for femoral bone fracture and

found found that VAS pain scores were reduced within the first 24 hours after operation in the FICNB group compared with the control group (Non- FICNB). They recommended FICNB for analgesia after surgery for femoral bone fracture patients at the emergency department.

In agreement to this study, **Gola et al. [18]** assessed the feasibility of fascia iliaca compartment block (FICB) combined with nonopioid analgesics and patient controlled analgesia (PCA), in the perioperative anaesthetic management for elective total hip replacement, they found that the pain score in FICB group was statistically significantly lower than the control group. They concluded that, FICB in elective THR treatments is an effective form of analgesia.

Also, Telletxea, [19] evaluated the effectiveness of the fascia iliaca compartment block to control pain following total hip replacement by assessing pain intensity for 24 hours after surgery and they reported that, the VAS scores recorded in the postanaesthetic recovery unit were significantly different in the 2 groups (FICB group and control, no block) with lower scores in the group receiving the fascia iliaca compartment block.

In addition, **Diakomi et al.[20]** compared the efficacy of fascia iliaca compartment block (FICB) to intravenous (IV) fentanyl for positioning hip fracture patients for SA; they reported that compared with the IVFE group, the FICB group showed significantly lower numeric rating pain scale scores in all instances following the analgesic intervention, they concluded that, performing an FICB before positioning for SA provides superior pain management compared with IVFE administration, facilitates spinal performance, and yields satisfactory postoperative analgesia and wide patient acceptance, hence improving overall quality and efficiency of care.

Huang et al.,[21] evaluate the analgesic effect of preoperative fascia iliaca block (FIB) on postoperative morphine equivalent dose (MED), pain level, and patient satisfaction for patients electing to undergo primary hip arthroscopic labral repair with osteochondroblastic. They support our result that there was no significant difference in PACU, however in disagreement to our results that there was no significant difference in pain scores (VAS) between patients receiving the FIB and a no-block control group at 1 day after surgery. This contrast can be explained by different time of measuring the VAS score (1st measurement was at 1 day)

Also in disagreement to our results, **Glomset et al.,[22]** compared the efficacy of ultrasound-guided fascia iliac block with intra-articular ropivacaine in controlling pain after hip arthroscopy and reported that, there was no significant difference in pain scores in the PACU between the FIB and IAR groups which can be explained by they compared 2 blocks and at different time of measurement (2 weeks, 6 weeks, and 3 months)

Also in contrast to this study **Bang et al.** [23] compared the opioid consumption between patients who received intravenous patient-controlled analgesia (PCA) with and without FICB, they found that there was no difference in pain scores between the 2 groups (FICB and non-FICB) this can be explained by small sample size (Twenty-two patients) and all patients received PCA either with block or not so the pain score was less but without significant difference.

As regard, Time to first analgesic requirement there were significant statistical increases in group I compared to group II. As regard, total consumption of both paracetamol and pethidine, there were statistically significant decreases in group I compared to group II.

In accordance to our results, Stevens et al. [24] who assessed whether a modified fascia iliaca compartment block in unilateral total hip arthroplasty provides a morphine-sparing effect and found that less opioid consumption in the first 24 hours. They concluded that a modified fascia iliaca compartment block has a significant morphine-sparing effect in unilateral total hip arthroplasty.

Also, Gola et al.[18] found that the total consumed dose of opioids, in FICB group was statistically significantly lower than the PCA control group.

Also, Kumie et al.[8]**,** support our study that, the total analgesic consumption of diclofenac was reduced in the FICNB group than control group, and the time for the first analgesic request was significantly prolonged.

In addition, **Diakomi et al.**[20] compared the efficacy of fascia iliaca compartment block (FICB) to intravenous (IV) fentanyl for positioning hip fracture patients for SA; they reported that compared with the IVFE group, the FICB group showed that, postoperative morphine consumption was lower, the time to first dose demand was longer.

In agreement to our study, **Desmet et al.**[17], showed that opioids consumption at 24 hours postoperatively was significantly reduced in group FICB compared to non-FICB group.

In agreement, **Madabushi et al.**[13] reported that postoperative analgesic requirement was lesser in group FICB than IVF group. They concluded that, fascia iliaca block offers less analgesia consumption compared to IVF in patients with femur fracture.

Also, Deniz et al.[16], support our results that, opioids consumption was found decreased in block groups.

In accordance to our results, Krych et al.,[14] , reported that the fascia iliaca blockade had low opioid consumption, high quality of pain relief. No complications were identified in patients who received the fascia iliaca blockade.

In agreement to our study, Bang et al. [23] found that amount of fentanyl required was low in the FICB group and the FICB has a significant opioid-sparing effect in first 24hours after hemiarthroplasty and concluded that FICB is an effective way for multimodal analgesia in hip surgery.

In contrast to our study, **Huang et al.,** [21] reported that no significant difference in analgesic consumption within the first 24 hours between the FIB and no-block control groups which can be explained by different measurement times (days not hours)

Also, **Glomset et al.,** [22] reported no significant differences in total analgesic consumption over 3 months after surgery, this explained by at different time of measurement (2 weeks, 6 weeks, and 3 months) and the lock not give this control

In addition, **Behrends et al.,**[25] investigated whether a preoperative fascia iliaca block. They reported that, there was no significant difference in analgesic consumption within the first 24 hours between the FIB and saline placebo groups.this explained y all groups received intraarticular local anesthetic injection either with FICB or not. They used ultrasound guided as us

Regarding HR comparison in both groups, at 6hrs. there were decreased HR in group I when compared to group II but this difference was statically in-significant at PACU, at 2h, at 6h. While from12 to 24h, HR showed significant statistical increase in group II compared to group I. Regarding mean arterial blood pressure comparison in both groups, at PACU and at 2h, there were no statistically significant difference. while from 6h to 24h, HR showed significant statistical increase in group II compared to group I.

In agree with us, **Sana et al.,** [26] determined that efficacy of FICB for positioning during spinal anaesthesia and to determine its efficacy for post-operative analgesia. They found that, there was statistically significant difference between control and intervention groups in mean arterial pressure and heart rate during positioning at 30 minutes. The difference in Baseline Mean arterial pressure, Heart rate (Baseline as well as during positioning at 30 minutes) was not found to be statistically significant.

In contrast to our results, **Ebshena and Wei,** [27] compared short axis in plane vs. long- axis in plane techniques of ultrasound guided continuous fascia iliac compartment block. They reported that, there was no significant difference observed in hemodynamic changes between the two groups, which can be explained that both groups received the block by different technique

Regarding duration of sensory block, there was significant statistical increase in group I compared to group II. While there was no significant statistical difference between both groups in duration of motor block.

In agree with us, **Sana et al.** [26] found that, the difference was found to be statistically significant in duration of sensory block.

In contrast to our study, **Ebshena and Wei,**[27] found that, **t**he sensory and motor blocks were similar in the two groups

As regard Patient satisfaction our study reported that, there were significant statistical increase in patient satisfaction score in group I compared to group II.

In accordance to our results, **Krych et al.,**[14] reported that multimodal analgesia with fascia iliaca blockade following hip arthroscopy associated with high overall patient satisfaction.

In addition, **Diakomi et al.**[20] compared the efficacy of fascia iliaca compartment block (FICB) to intravenous (IV) fentanyl for positioning hip fracture patients for SA; they reported that compared with the IVFE group, the FICB group showed that, patient satisfaction rates were higher ($P < 0.001$) in the FICB group.

In addition, **Gola et al.** [18], they found a high level of patient satisfaction with the analgesic treatment use

As regard complication, there was hypotension, bradycardia, nausea & vomiting post dual puncture headache. There were statically insignificant differences

In agreement with our study, **Behrends et al.,** [25] showed no statically difference between groups as regard side effects such as nausea, vomiting, or constipation when compared to the placebo group

Also, **Ebshena and Wei,** [27], reported there were statically insignificant differences between groups. There has been only one patient reporting the complication after the block.

In accordance to our results, Krych et al.,[14] , they reported that no complications were identified in patients who received the fascia iliaca blockade **.**

Also, Deniz et al.[16], support our results that, no adverse effect as nausea.

In addition, **Gola et al.** [18], they found that insignificant differences in complication.

Conclusion

FICB is safe and effective in improving post-operative pain after hip arthroplasty. It provides lower NRS, more hemodynamics stability, longer time for 1st time of analgesics requirement ad lower amount of total analgesic consumptions within 1st 24 hours.

Recommendation

1- The concurrent study recommends using FICB as adjuvant to spinal block in hip arthroplasty.
2- Additional studies including a large number of patients are required for generalization of these results.
3- Also, further studies assessment of different volumes and amount of L.A.

COMPETING INTERESTS DISCLAIMER: - 2 - 3

4- Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors

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Tables

Table)1(: VAS in both group

***denote significant. SD; standard deviation.**

		PACU	2h	6h	12h	24h
Group I	Mean	1.57	2.57	3.53	4.57	5.57
	SD	0.68	0.68	0.63	0.68	0.68
	Median	1.0	2.0	3.0	4.0	5.0
	Range	1.0-3.0	2.0-4.0	3.0-5.0	4.0-6.0	5.0-7.0
Group II	Mean	1.90	2.90	5.50	6.53	7.53
	SD	0.84	0.84	0.57	0.51	0.51
	Median	2.0	3.0	5.0	7.0	8.0
	Range	1.0-3.0	2.0-4.0	5.0-7.0	6.0-7.0	7.0-8.0
P value (t-test)		0.097	0.098	0.000*	0.000*	0.000*
P value (MW test)		0.124#	0.124#	0.000*#	0.000*#	0.000*#

Table 2: Time of first analgesic requirement in both groups (in minutes):

	Group I	Group II
	Time of first analgesic	
Mean	9.0	4.80
SD	3.67	1.86
P value	**0.000***	
	The total consumption of paracetamol	
Mean	2.57	3.20
SD	0.68	0.66
P value	**0.001***	
	The total consumption of pethidine	
Mean	3.0	47.0
SD	9.15	17.05
P value	0.000*	

***denote significant. SD; standard deviation.**

Table 3: Patient satisfaction:

	I Group I (n = 3)	Group II (n = 30)
Mean	4.3	3.53
SD	0.651	0.507
P value	**0.000***	