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RESEARCH ARTICLE

EARLY RECOVERY FOLLOWING ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK (TAP) IN ABDOMINAL CONTOURING SURGERIES

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Abstract

Background: The transversus abdominis plane (TAP) block is a well-known regional nerve block that is used for the pain control after various inguinal and abdominal surgeries. The most effective and well known method of administering the TAP block is under ultrasound guidance. Till now only few studies have evaluated analgesic efficacy of TAP block in Abdominoplasty surgical procedure, in which post-operative pain is a major concern for both surgeon as well for the patient.

Objectives: We conducted retrospective cohort study to assess efficacy of ultrasound-guided bilateral TAP block, in controlling post-operative pain in abdominoplasty patients.

Methods: Sixty Patients who had undergone Lipoabdominoplasty procedure were studied retrospectively. The patients who had received TAP block were assigned as group A and those patients who had not received any TAP block were assigned as group B, with thirty Patients in each group. The patients in two groups were compared for their demographic characteristics, pain intensity on mobilization, time to first rescue analgesic dose (visual analog scale (VAS) score ≥ 5 or on demand), opioid consumption and incidence of nausea-vomiting episodes during first post-operative 24 hours.

Results: The patients in two groups were similar in demographic characteristics. Patients in group A (TAP block group) had required significantly smaller mean dose of postoperative opioids (Group A: 5mg; Group B: 75 mg; $P = <0.000$) and had significantly longer mean time of first request for analgesic medication (Group A: 8 hours 11 minutes; Group B: 1 hours 20 minutes; $P = <0.000$). Median VAS score on mobilization was significantly lower in Group A (group A: 1; Group B: 5). Only Three patients in group A as compared to 18 patients in group B had experienced nausea and vomiting in post-operative period.

Conclusions: The ultrasound guided TAP block provide more effective analgesia after Lipoabdominoplasty, which allows more comfortable early post-operative mobilization, decreases opioid requirement as well as opioid related side-effects, Therefore ultrasound guided TAP block should be considered in most of lipoabdominoplasty patients for better patient experience and outcome.

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Introduction:-

Lipoabdominoplasty is one of the common aesthetic procedures performed by plastic surgeons [1]. Due to significant length of incision and soft-tissue undermining involved in this procedure, the postoperative pain is a major concern for both surgeons as well as for the patients. Previously various studies have been conducted related to various nerve blocks in order to improve analgesia after Lipoabdominoplasty procedure [2,3]. The transversus abdominis plane (TAP) block was first introduced by Rafi in 2001 [4], and has been successfully utilised in various surgical procedures like herniorrhaphy, appendectomy, colorectal surgeries and post many gynecological procedures [5-10], but its use in plastic surgery is still not widely applied.

In this study we evaluated efficacy of TAP block in patients who had undergone lipoabdominoplasty and compared them with those patients who had underwent lipoabdominoplasty without any regional block.

Methods:-

Transverse Abdominis Plane (TAP) Block:

The concept behind the TAP block is to place local anaesthetic medication into the anatomical plane that lies between internal oblique and transverse abdominis muscles, in order to block the anterior rami of nerves T7 to L1 that run through this plane. The TAP block technically involves bilateral injection to block nerves from each side of anterior abdominal wall.

TAP block was classically administered blindly through the lumbar triangle of Petit [4]. Since then various modifications have been introduced including subcostal approach as defined by Hebbard [10] and ultrasound guided administration of TAP block.

TAP block if administered by the lumbar triangle of Petit approach, the nerve block reliably extends only up to the T10 dermatome hence providing nerve block only in lower quadrant of the abdomen, in addition this approach is difficult in obese patients [7,8], on the other hand the subcostal approach blocks mainly the upper quadrant dermatomes of abdomen and may escape lower abdominal dermatomes including L1 dermatome [8,9,11,12].

The mid-abdominal approach was introduced in 2012, which administers TAP block under ultrasound guidance [13]. This technique involves injection of local anaesthetic medication 5 to 8 cm lateral to the umbilicus and reliably blocks the T9 through L1 dermatomes; in addition ultrasound guided TAP block technique is easily reproducible and effective as well. Ultrasound guided TAP block is administered at our center as it best combines the blockade effect of both Petit lumbar triangle approach as well as of subcostal approach.

Ultrasound guided TAP Block Technique at our Centre:

An ultrasound transducer (linear 6–13 MHz; SonoSite M-Turbo®, Bothell, WA) is placed transversely in the flank between the anterior superior iliac spine and the costal margin. Using real-time ultrasound imaging the muscles of anterior abdominal wall (the external oblique, internal oblique and transverse abdominis) are identified. After aseptic preparation of the injection site, a 22-gauge 100-mm insulated needle (Stimuplex® A, B-Braun Medical, Melsungen, Germany) is introduced medially and in the plane of the ultrasound beam until its tip reaches between the internal oblique and transverse abdominal muscle layers. After negative aspiration, 20-mL bupivacaine 0.25% is injected in 5-mL increments. Distribution of the injection between the internal oblique and the transverse abdominal muscles is observed under real-time imaging. As the blocks are performed bilaterally, a total of 40-mL bupivacaine 0.25% is administered.

Study Design:

Data of the Patients that had undergone lipoabdominoplasty with or without flank liposuction at King Abdullah bin Abdul Aziz University Hospital, Princess Nourah bint Abdulrahman University (KAAUH, PNU) was analyzed and sixty patients were found to fulfill eligibility criteria for inclusion in our this retrospective cohort study. The patients who had received ultrasound guided TAP block at the end of surgery were assigned to group A, while as patients who had not received any regional block were assigned to group B. The patients in the two groups were compared for their demographic characteristics (i.e., age, gender, BMI, weight and height), pain intensity on mobilization using a visual analogue scale (VAS) score (0 = no pain to 10 = worst pain), time to first rescue analgesic dose (VAS score

≥ 5 or on demand), opioid consumption and incidence of nausea- vomiting episodes during first post-operative 24 hours. The Patient's records were also studied for any adverse effects related to TAP block technique like hematomas, lightheadedness, seizures, arrhythmia, lower limb weakness, peritonitis or any other form of intra-abdominal injury.

The Patients excluded from this study were those with history of allergy to local anesthetics, patients below 18 or above 60 years of age, combined surgical procedure in addition to lipoabdominoplasty, coagulopathy, morbid obesity, opioid tolerance or drug addiction, known psychiatric illness, any known liver, renal or cardiac disease, any history of prior upper abdominal wall surgery.

Normally distributed numerical data was analyzed using the Student's t-test and Skewed data using the Mann-Whitney U-test. Categorical variables in both groups were analyzed using the Fisher's exact test or the Pearson's Chi-square test as applicable. $P < 0.05$ was considered statistically significant.

This study was approved from the institutional Review Board (IRB) of our university hospital (KAAUH, PNU).

Results:-

The demographic parameters (Age, Body weight, BMI and Gender ratio) as well as preoperative hemodynamic parameters (pulse rate, systolic and diastolic blood pressure) were found comparable between the two groups without any statistically significant differences [Table 1].

Postoperative opioid consumption data by the two groups are given in Table 2. The mean Tramadol dose received by the patients in TAP block group during first 24 hours after surgery was 5 milligrams, whereas the mean dose received by the patients in group B during this time period was 75 milligrams, that makes reduction of 93% ($P = < 0.0001$) in opioid consumption in the TAP block group. The mean opioid dose per kilogram (kg) of patient weight was also smaller in the TAP block group (Group A: 0.068 mg/kg; Group B: 1.036 mg/kg; $P = < 0.0001$). This gives 93% reduction in opioid dose per kg body weight in the TAP block group. In addition, the time interval of first request for as-needed analgesic was longer in the TAP block group (Group A: 8 hours 11 minutes; Group B: 1 hour 20 minutes; $P = < 0.0001$). Mean VAS score on mobilization in postoperative period was lesser in TAP block group as compared to group B patients (mean VAS 1 vs. 5). These differences between the two groups were found to be statistically significant, which validates the ultrasound guided TAP block use in lipoabdominoplasty patients [Table 2].

Three patients in group A and 18 patients from group B had experienced nausea- vomiting episodes during first 24 hours of surgery and the difference was found to be statistically significant [Table 2].

No complications related to TAP block like hematoma formation, local site infection, local anesthetic toxicity signs and symptoms due to any accidental intravascular injection of anesthetic (like dizziness, tinnitus, perioral numbness and tingling, seizures, lethargy, signs of cardiac toxicity like arrhythmias, atrio-ventricular conduction block, myocardial depression and cardiac arrest), peritoneal perforation, intestinal perforation, difficulty in ambulation or fall secondary to spread of local anesthetic to nerves of the buttock, lateral thigh or to femoral nerve were found in ultrasound guided TAP block group.

No infections, flap necrosis, deep vein thrombosis, pulmonary embolism or wound breakdown were found in either of the groups.

Discussion:-

Various studies have documented usefulness of different nerve blocks in controlling pain as well as decrease in consumption of opioids after Abdominoplasty surgery. Feng [2] described a combination of pararectus, intercostal, ilioinguinal and iliohypogastric nerve blocks for abdominoplasty. Her study showed significant improvement in pain scores and reduced opioid use.

Various techniques have been defined in literature for administration of the TAP block. Sforza et al [14] had described a blind injection technique during abdominoplasty in which the TAP space was approached laterally through the lumbar triangle of Petit, but this approach often fails to block upper abdominal dermatomes. Young et al [7] reported two cases of liver injury in hepatomegaly patients after lateral approach of TAP block. Araco et al [15],

16]in 2010 described an open TAP block technique administered by the surgeon himself during abdominoplasty. West and Milner [17] also reported in a letter to the editor that a surgeon-performed TAP block was beneficial after deep inferior epigastric artery perforator flap and transverse rectus abdominis myocutaneous flap procedures.

In this study we compared those lipoabdominoplasty patients who had received TAP block to those patients who had undergone same procedure without receiving any regional block. Results from this retrospective cohort study infer the advantages of ultrasound guided TAP block and substantial reduction in the amount of postoperative opioid consumption in lipoabdominoplasty patients, in addition the time interval for requirement of first as-needed opioid analgesic was significantly longer in group A (the ultrasound guided TAP block group) as compared to group B. These findings are consistent with the results described in number of other studies on TAP blocks administered for various different surgical procedures [4-12]. Sufficient analgesic effect from ultrasound guided TAP block was seen up to first 24 hours of postoperative period, many other studies have reported effectiveness of TAP block for 24 to 48 hours post operatively [6-9]. Patients in the TAP block group were also found to ambulate earlier and more comfortably than those patients who did not receive any regional block. In addition the patients in group A (TAP block group) had lesser episodes of opioid induced nausea and vomiting as compared to group B, which is consistent with the findings in some other studies done previously on TAP block [7,18].

Limitation of our study is small sample size. We suggest a larger scale double blind, randomized study for improved level of evidence.

Table 1:- Baseline Patient Characteristics in Group A (TAP block group) and Group B.

Characteristic	Group A (n = 30)	Group B (n = 30)	P-value
Mean age, y (S.D)	41.4 (+/- 7)	42.6 (+/-8)	0.538
Mean body weight, kg (S.D)	73.2 (+/-13)	72.4 (+/-15)	0.826
Female to male ratio	30:0	30:0	1
BMI mean (S.D)	29.3 (+/-2)	29.1 (+/-1)	0.626
ASA PS (I/II)	22/8	24/6	0.5429
Mean Pulse rate /minute (S.D)	80 (+/- 12)	78 (+/-14)	0.554
Mean systolic BP (S.D)	122 (+/-25)	124 (+/-30)	0.780
Mean Diastolic BP (S.D)	76 (+/-12)	78 (+/-14)	0.554

ASA PS = American society of anesthesiologists physical status, S.D=Standard deviation

There were no statistically significant differences between the two groups.

Table 2:- Comparison of various parameters between the Two Groups.

Outcome	Group A (n = 30)	Group B (n = 30)	P Value
Mean total Tramadol dose, mg (S.D)	5 (+/-5)	75 (+/-25)	<0.0001
Mean Tramadol dose/body weight, mg/kg (S.D)	0.068(+/-0.06)	1.036(+/-0.25)	<0.0001
Mean Time to first request for as-needed opioid medication, (Hour :minute)(S.D)	8:11 (+/-0:45)	1:20 (+/-0:25)	<0.0001
Mean VAS on mobilization (S.D)	1 (+/-1)	5 (+/-2)	<0.0001
PONV (Yes/No)	3/27	18/12	0.0003

VAS: Visual analogue Scale PONV: post-operative nausea vomiting

The opioid consumption was much less in Ultrasound guided TAP block group and Time interval for requesting first analgesic dose was longer in this group and post-operative nausea vomiting episodes were more in group B; All these factors were statistically significant.

Conclusion:-

The ultrasound guided TAP block provide excellent postoperative analgesia, decrease opioid consumption and facilitates early post-operative mobilization with more comfort in lipoabdominoplasty patients, hence ultrasound guided TAP block should be considered in lipoabdominoplasty patients for better patient experience and outcome.

Disclosures:

The authors declare no conflicts of interest in this research.

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