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## Evaluation of transversus abdominis plane (TAP) block in lipoabdominoplasty surgical procedure: a comparative study

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### ABSTRACT

**Background:** The transversus abdominis plane (TAP) block is a well-known regional nerve block, used for the pain control in various surgeries. There are only few studies in the literature, which have evaluated analgesic efficacy of TAP block in Abdominoplasty; A surgery in which post-operative pain is of major concern for both patient and operating surgeon.

**Objectives:** We conducted randomized control trial, to assess the efficacy of ultrasound-guided bilateral TAP block in Abdominoplasty patients for controlling post-operative pain.

**Methods:** Sixty patients planned for lipoabdominoplasty were randomly assigned to two groups A and B, with thirty Patients in each group. The ultrasound guided TAP block was administered in group A patients whereas no block was administered to group B. The patients in two groups were compared for demographic characteristics, pain intensity on mobilization, opioid consumption, time to first rescue analgesic dosage and nausea- vomiting incidences.

**Results:** The demographic characteristics were similar in both groups. The Group A Patients required significantly smaller mean dose of opioids and had significantly longer mean time of first request for analgesic medication. The Median VAS score on mobilization in Group A was significantly lower than Group B. Only few patients in group A experienced nausea-vomiting compared to group B.

**Conclusions:** The ultrasound guided TAP block provides effective analgesia after Lipoabdominoplasty, which allows more convenient early post-operative mobilization and decreases opioid requirement as well as its related side-effects. Hence we suggest that ultrasound guided TAP block should be considered in most lipoabdominoplasty cases for better patient experience.

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Lipoabdominoplasty; post-operative analgesia; ultrasound guided transversus abdominis plane (TAP) block; Abdominoplasty

### Introduction

Abdominoplasty is one of the most common aesthetic procedures performed by plastic surgeons throughout the world [1]. Due to significant soft-tissue undermining and incision length involved in this procedure, the postoperative pain is a major concern both for the patient as well as for the surgeon. Previously various studies have been conducted to improve analgesia after Lipoabdominoplasty procedure using different nerve blocks [2,3]. The transversus abdominis plane (TAP) block was first introduced in 2001 by Rafi [4], and since then it has been successfully utilised in various surgical procedures like appendectomy, herniorrhaphy, colorectal surgeries and in many gynecologic procedures [5–10], but in plastic surgery it is yet to be applied widely.

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

### Methods

#### Transverse abdominis plane (TAP) block

The concept behind the TAP block is to place local anaesthetic medication in anatomical plane that lies between the transverse

abdominis and internal oblique muscles, thereby blocking the anterior rami of nerves T7 to L1 that run in this plane. The TAP block technically requires bilateral infiltration of local anesthetic, for blocking nerves from either side of the anterior abdominal wall.

Previously the TAP block was administered blindly through the lumbar triangle of Petit [4] and with time various modifications have been introduced that include ultrasound guided administration of TAP block and subcostal approach as defined by Hebbard [10].

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

The mid-abdominal approach for TAP block was introduced in 2012, in which TAP block is administered under the ultrasound guidance [13]. This technique involves administration of local anaesthetic medication 5 to 8cm lateral to the umbilicus and hence reliably blocks the T9 through L1 dermatomes; in addition this technique is easily reproducible and more effective as well.

We adopted ultrasound guided TAP block in our study as it best combines the blockade effect of both subcostal approach as well as of the petit lumbar triangle approach.

### Ultrasound guided TAP block technique

An ultrasound transducer was placed transversely in the flank between the costal margin and the anterior superior iliac spine. Using the real-time ultrasound imaging the muscles of anterior abdominal wall (the external oblique, internal oblique and the transverse abdominis) were identified. After aseptic preparation of the injection site, a 22-gauge 100-mm insulated needle was introduced medially and in the plane of the ultrasound beam until its tip reaches between the internal oblique and the transverse abdominis muscle layers. After negative aspiration, 20-ml of bupivacaine 0.25% was injected in the increments of 5 ml. Distribution of the medication between the internal oblique and the transversus abdominis muscles was observed under real-time imaging. As the blocks were performed bilaterally, a total dose of 40-ml bupivacaine 0.25% was administered.

### Study design

Sixty Patients were included in this randomized control trial that underwent lipoabdominoplasty with or without flank liposuction from January 2017 till December 2019. The patients were randomly assigned to two groups A and B, using computer generated randomized chart with thirty Patients in each group. The patients in Group A received ultrasound guided TAP block at the end of surgery as defined above, while as patients in group B did not received any regional block. The patients in the two groups were compared for their demographic characteristics (i.e. age, gender, weight, height and BMI), time to first rescue analgesic dose (VAS score  $\geq 5$  or on demand), pain intensity on mobilization using a visual analogue scale (VAS) score (0=no pain to 10=worst pain), total opioid consumption and incidence of nausea-vomiting episodes during first 24h after completion of surgery.

**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 ( $\pm 7$ )	42.6 ( $\pm 8$ )	0.538
Mean body weight, kg (S.D)	73.2 ( $\pm 13$ )	72.4 ( $\pm 15$ )	0.826
Female to male ratio	30:0	30:0	1
BMI mean (S.D)	29.3 ( $\pm 2$ )	29.1 ( $\pm 1$ )	0.626
ASA PS (I/II)	22/8	24/6	0.5429
Mean Pulse rate /minute (S.D)	80 ( $\pm 12$ )	78 ( $\pm 14$ )	0.554
Mean systolic BP (S.D)	122 ( $\pm 25$ )	124 ( $\pm 30$ )	0.780
Mean Diastolic BP (S.D)	76 ( $\pm 12$ )	78 ( $\pm 14$ )	0.554

ASAPS: American society of anesthesiologists physical status; SD: 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 ( $\pm 5$ )	75 ( $\pm 25$ )	<0.0001
Mean Tramadol dose/body weight, mg/kg (S.D)	0.068 ( $\pm 0.06$ )	1.036 ( $\pm 0.25$ )	<0.0001
Mean Time to first request for as-needed opioid medication, (Hour : minute) (S.D)	8:11 ( $\pm 0:45$ )	1:20 ( $\pm 0:25$ )	<0.0001
Mean VAS on mobilization (S.D)	1 ( $\pm 1$ )	5 ( $\pm 2$ )	<0.0001
PONV (Yes/No)	3/27	18/12	0.0003

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

The patients were also observed for any adverse effects related to TAP block technique like hematomas, lightheadedness, arrhythmias, seizures, lower limb weakness, peritonitis and for any other form of intra-abdominal injury.

The exclusion criteria for participation in this study included allergy to local anesthetics, patients below 18 or above 60 years of age, refusal to give consent, coagulopathy, morbid obesity, combined surgical procedure in addition to lipoabdominoplasty, opioid tolerance or drug addiction, known psychiatric illness, any known liver, renal or cardiac disease, any prior upper abdominal wall surgeries.

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

An informed consent was taken from all the patients that participated in this study.

### Results

The demographic parameters (Age, Weight, BMI and Gender ratio) as well as preoperative hemodynamic parameters (like pulse rate, systolic and diastolic blood pressures) were comparable between the two groups without any statistically significant differences (Table 1).

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

Three patients in group A while as 18 patients from group B experienced nausea-vomiting episodes during the first 24 h of surgery and the difference was statistically significant (Table 2).

No complications related to TAP block like hematoma formation, local site infection, intestinal perforation, peritoneal perforation, difficulty in ambulation or fall secondary to spread of local anesthetic medication to nerves of the buttock, lateral thigh or to femoral nerve were found in any patient from Group A and neither any local anesthetic toxicity signs and symptoms due to accidental intravascular injection of anesthetic (like dizziness, tinnitus,

seizures, perioral numbness and tingling, lethargy, signs of cardiac toxicity like arrhythmias, atrio-ventricular conduction block, myocardial depression and cardiac arrest) was found in any of the patients from ultrasound guided TAP block group (Group A).

No infections; flap necrosis, wound dehiscence, deep vein thrombosis or pulmonary embolism was observed in any of the patient from either group.

## Discussion

Various studies in the literature have documented advantage of using different nerve blocks in controlling pain and in addition leading to the decrease in opioid consumption post Abdominoplasty surgery. Feng [2] described a combination of intercostal, pararectus, ilioinguinal and iliohypogastric nerve blocks for Lipoabdominoplasty. Her study reported significant improvement in pain scores and reduction in opioid usage.

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

Araco et al. [15,16] described in 2010, an open TAP block technique administered by the surgeon himself during abdominoplasty. West and Milner [17] also reported in a letter to an editor that a surgeon-performed TAP block was beneficial after Transversus rectus abdominis myocutaneous (TRAM) flap and deep inferior epigastric artery perforator flap (DIEP) procedures.

In this study we administered the ultrasound guided TAP block in patients who underwent lipoabdominoplasty and compared them with those patients who underwent same procedure without receiving any regional block. Results from this randomized control study indicate the benefits of ultrasound guided TAP block and substantial reductions in the amount of postoperative opioid consumption in lipoabdominoplasty patients, in addition the time interval for requirement of the first as-needed opioid analgesic was significantly longer in the group A (the ultrasound guided TAP block group) as compared to the group B. These findings are consistent with the results described in number of other studies on TAP blocks administered for various other different surgical procedures [4–12]. Sufficient analgesic effect from the ultrasound guided TAP block was seen up to first 24 h after surgery, many other studies have reported effectiveness of TAP block for the period of 24 to 48 h after surgery [6–9]. The patients in the TAP block group were found to ambulate early and more conveniently than the patients in group B. In addition the patients in group A (TAP block group) had fewer episodes of opioid induced nausea and vomiting as compared to the patients in group B, which is consistent with the findings in some of the other studies done previously on TAP block [7,18].

The limitation of our study is the small sample size. We suggest a large scale double blind, randomized study for the improved level of evidence.

## Conclusion

The ultrasound guided TAP block decrease the overall opioid consumption by providing excellent postoperative analgesia and in addition facilitates the early post-operative mobilization of

lipoabdominoplasty patients with more ease and comfort. Hence we suggest that the ultrasound guided TAP block should be considered in lipoabdominoplasty patients for better patient experience, satisfaction and outcome.

## Disclosures statement

No potential conflict of interest was reported by the author(s).

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