

TAP Block in Abdominal Surgery: An Observational Study to Determine the Need for Diclofenac as a Post-Operative Analgesic Drug

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ABSTRACT-

Background- The Transversus Abdominis Plane (TAP) Block is a technique employed for the administration of regional anesthesia. It provides pain relief during surgical procedures involving the lower abdomen, particularly when pain originating from the parietal wall is a notable cause of discomfort. By administering a local anesthetic between the Transversus Abdominis muscle and internal oblique muscle, it enables the sensory blockade of the skin and muscles in the lower abdominal wall. We conducted a prospective observational study in a hospital setting to evaluate the efficacy of unilateral Transversus Abdominis Plane (TAP) Block using bupivacaine for postoperative pain management in hernia repair procedures.

Material & Methods - A total of 80 patients undergoing elective abdominal surgery including LSCS were included in this study. The patients were divided into two groups: the study group (n = 40) received a TAP Block with bupivacaine, while the control group (n = 40) did not receive a TAP Block. Following the completion of the surgical procedure facilitated by spinal anesthesia, the participants of the study were subjected to a unilateral Transversus Abdominis Plane (TAP) Block on the side of the surgery. This was achieved by administering 20 ml of 0.25% bupivacaine. In the post-anesthesia care unit, a comprehensive assessment was conducted on each patient at specific time intervals following their surgical procedure, namely at 30 minutes, 2 hours, 4 hours, 6 hours, 12 hours, 18 hours, and 24 hours. In each group, the administration time for the initial dose of rescue analgesia, the vas score, and the total quantity of diclofenac utilized were assessed, and a student t-test was employed to make comparisons.

Result: The study revealed a statistically significant disparity in the mean duration of analgesia between the study group (669.66 ± 346 min) and the control group (220.33 ± 139.24 min). The Visual Analog Scale (VAS) scores in the control group exhibited a consistent elevation compared to those in the study group. In the study group, the total dose of diclofenac consumed was 95 mg, while in the control group, it was 202.5 mg. This discrepancy in diclofenac consumption between the two groups suggests a significant reduction in the study group.

Conclusions- The utilization of Transversus Abdominis Plane (TAP) Block with 0.25% bupivacaine in patients undergoing abdominal surgery has been found to provide potent and prolonged analgesic effects, thereby reducing the requirement for diclofenac. No adverse effects were observed in relation to the TAP Block procedure or the medications under investigation.

Keywords: TAP-Block, Bupivacaine, Postoperative analgesia, VAS score.

INTRODUCTION-

Postoperative abdominal pain is a common occurrence subsequent to abdominal surgery, primarily attributed to the abdominal wall. Failure to manage postoperative pain can lead to the development of persistent pain in a notable proportion of patients, even following a relatively minor surgical intervention such as an inguinal herniorrhaphy. This persistent pain can have significant implications for patients' daily functioning and overall well-being. Postoperative analgesia is commonly managed through the prescription of either an opioid or a nonsteroidal anti-inflammatory drug (NSAID). Opioids have been associated with a range of negative consequences, such as respiratory depression, emesis, reduced gastrointestinal motility, sedation, and various other conditions. Additional adverse consequences of nonsteroidal anti-inflammatory drugs (NSAIDs) encompass renal dysfunction, gastrointestinal hemorrhage, and modified blood clotting mechanisms. The utilization of a localized analgesic approach is associated with a reduced occurrence of systemic side effects due to the peripheral site of action of the medications. Consequently, the utilization of localized analgesic techniques has gained significant recognition as an essential component of the postoperative analgesia protocol. The TAP Block, a local anesthetic technique, is experiencing an increase in popularity. The Transversus Abdominis Plane (TAP) Block is commonly identified as a defect located 1 cm above the iliac crest in the midaxillary line. This procedure can be conducted by accessing the lumbar triangle of Petit, which is formed by the anterior external oblique muscle, posterior latissimus dorsi muscle, and inferior iliac crest. The TAP block was first introduced by Rafi et al in 2001 [1] and subsequently investigated by McDonnell et al in 2004 [2]. The protocol involves the administration of a local anesthetic into the intermuscular space between the internal oblique and transverse abdominal muscles. This technique enables the administration of local anesthetic medication above the transversus abdominis plane (TAM), resulting in sensory blockade of the nerve plexus extending from the T-6 to L-1 levels, which innervate the skin and muscles of the lower abdominal wall.

The aim of this observational study is to evaluate the efficacy of the transverse abdominis plane (TAP) block as a method of postoperative analgesia in abdominal surgery, specifically in relation to the dosage of diclofenac needed. The study subject selected for investigation is inguinal hernia meshplasty. This particular surgical procedure involves a lower abdominal incision site that can potentially be obstructed through the utilization of the TAP block and landmark procedure.

MATERIAL & METHODS-

In this study, we conducted a prospective observational analysis on a cohort of 80 male patients with ASA physical status I-II, aged between 20 and 65, who were scheduled to undergo unilateral abdominal surgery (including LSCS). It is important to note that these patients had normal liver and kidney functions. There were a total of 40 patients in each group. The exclusion criteria encompassed individuals with sensitivity to local anaesthetics, impaired liver function, infection at the injection site, or abnormal clotting. Within the cohort

of participants (n=40), the patients were subjected to a TAP block procedure involving the administration of 0.25% Bupivacaine. The standard monitoring protocol encompassed the use of electrocardiography (ECG), non-invasive blood pressure measurement, and assessment of arterial oxygen saturation. The administration of intravenous Ranitidine and Ondansetron was performed. A preload of 15 ml/kg of Ringer Lactate solution was administered. Postoperative Petit's triangle refers to a deficiency in the musculature of the latissimus dorsi and external oblique muscles, specifically occurring over the iliac crest. The administration of the block was conducted using the Petit triangle technique, employing a 23G blunt-tipped hypodermic needle measuring 1.5 inches in length. Following two distinct sensations described as "POPS" or "give way," the needle was subsequently inserted in a perpendicular manner relative to the skin. After aspiration, a dosage of 20 cc of bupivacaine solution with a concentration of 0.25% was administered. A volume of 5 ml was withdrawn for the purpose of intravascular infusion. The patient was transferred to the post-anesthesia care unit (PACU) within a duration of 15 minutes. The patient's heart rate, blood pressure, breathing rate, pain intensity, and any complications were evaluated at 30, 2, 4, 6, 12, 18, and 24 hours post-surgery. The measurement of pain was conducted using a Visual Analog Scale (VAS) ranging from 0 to 10. During the third visit to the Visual Analog Scale (VAS) assessment, the patient was administered Diclofenac 75 mg as a form of rescue analgesia, specifically to alleviate minimal pain. The observed ankle and knee movement suggested a gradual reduction in the motor block. The estimation of TAP Block analgesia commenced at the time when the patient made a request for postoperative analgesia. Further postoperative complications were observed.

The data was collected, subsequently tabulated, and subsequently subjected to analysis. The data was presented in terms of the mean and standard deviation (SD), as well as the median and range.

RESULTS –

The present study encompassed a cohort of 80 patients classified as ASA I and II who underwent surgical repair for inguinal hernias.

Study Group: Patients received TAP block with Bupivacaine (0.25%) 20 ml.

Control Group: The patients did not undergo a TAP block procedure and instead received diclofenac injections as needed for postoperative pain relief, following the standard protocol of the institute for routine surgeries.

Table The first piece of evidence demonstrates The age range of the majority of patients in both groups was between 30 and 50 years. The two groups exhibited similar characteristics in terms of age, weight, and height.

The demographic statistics pertaining to the two groups did not exhibit any noticeable disparity. The statistical analysis revealed a significant difference in the timing of the first dosage of rescue analgesia between the experimental group (669.66346 min) and the control group (220.33139.24 min).

Table 1: Demographic Data Time for first dose of rescue analgesia			
Group	Study group	Control group	P Value
Age (years)*	46.43±13.1	50.23±13.44	0.272
Weight (KG)*	63±5.37	61±5.24	0.1497
Height(CM)*	167.76±5.99	167.93±4.17	0.899
First dose of rescue analgesia	669.66±346 min	220.33 ± 139.24 min	P* <.0001

Table -2 demonstrate VAS score at rest at different time interval

Table -2 Comparison of VAS score at rest																
	Immediate after TAP Block at rest	4hr			8hr			12hr			24hr			48 hr		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
B Group	0	1.80	1.21	<0.001	3.13	0.82	<0.001	2.97	0.67	<0.001	3.33	0.55	<0.001	3.23	0.82	<0.001
BD Group	0	1.57	0.63		2.07	0.25		2.73	0.58		2.73	0.58		2.63	0.56	
BM Group	0	0.87	0.73		1.33	0.80		2.40	0.67		2.60	0.67		2.50	0.51	

Table 3 The text portrays or represents. The mean Visual Analogue Score (VAS) at 4, 8, 12, 24, and 48 hours in all three groups exhibits significant differences during the transition from the time of performing the TAP block to those specific time points (P-value 0.001). After a duration of 8 hours, there was an absence of statistically significant disparity observed between groups BD and BM. However, it is worth noting that statistically significant differences were observed between groups B and BD, as well as between groups B and BM.

The mean duration of analgesic effect was found to be 6.40-1.73 hours in Group B, 12.53-4.80 hours in Group BD, and 20.40-10.98 hours in Group BM. A notable disparity exists in the average duration of analgesia among groups B, BD, and BM, as evidenced by the ANOVA test, which yields a p-value of 0.001, indicating a high level of statistical significance.

Table- 3 MeanPost-Operative Visual Analogue Score(VAS) during movement																
	Immediate after TAPB at rest	4hr			8hr			12hr			24hr			48 hr		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
B Group	0	3.20	1.24	<0.001	4.83	0.53	<0.001	4.37	0.85	<0.001	4.63	0.72	<0.001	4.40	0.97	<0.001
BD Group	0	1.93	0.58		3.37	0.81		4.40	1.04		4.30	0.79		3.93	0.91	
BM Group	0	1.33	0.96		2.00	1.11		3.90	1.16		3.90	0.96		3.80	1.10	
P-Value Between Different groups	BVs.BD	<0.001			<0.001			0.90			0.09			0.05		
	BDVs.BM	0.005			<0.001			0.08			0.08			0.61		
	BVs.BM	<0.001			<0.001			0.07			0.001			0.02		

Table -4 demonstrate The study group exhibited a total dose of Diclofenac consumption of $95\pm 33.73\text{mg}$, whereas the control group had a total dose of $202.5\pm 44.69\text{mg}$. This disparity indicates a significant decrease in Diclofenac consumption within the study group.

Table- 4 Cumulative Diclofenac Consumption								
Groups	Pre-operative	Post - Operative						
		30 min	2hr	4hr	6hr	12hr	18hr	24hr
Study Group	0	0	0	7.5	22.5	30	7.5	27.5
Control Group	0	0	22.05	35	10	62.5	15	57.5

Table-5 To illustrate or exhibit a concept or phenomenon through empirical evidence or logical reasoning. The study group demonstrated a lower diclofenac requirement compared to the control group. In the study group, diclofenac was required once in 30 patients and twice in 10 patients. In contrast, the control group required diclofenac once in 3 patients, twice in 9 patients, and three times in 28 patients within a 24-hour period. This difference between the study and control groups was found to be statistically significant. No complications were observed in either group in relation to the TAP block technique.

Table- 5 No. of doses of Diclofenac				
No. of Diclofenac	0	1	2	>2
Study Group	0	30	10	0
Control Group	0	3	9	28

DISCUSSION-

Insufficiently managed post-operative pain can lead to unfavorable physiological and psychological outcomes, including increased morbidity, prolonged recovery time, and patient dissatisfaction.

Therefore, it is imperative to prioritize and consistently evaluate and enhance safety measures and concerns related to morbidity. Hence, it is imperative to develop analgesic techniques that are both safe and well-tolerated, in order to provide optimal postoperative pain control. One commonly performed surgical procedure involves the correction of inguinal hernias [3]. The prevalence of the condition is reported as 11 per 10,000 individuals within the age range of 16 to 24, and 200 per 10,000 individuals among those aged 75 and above. Following the surgical intervention for an inguinal hernia, a notable proportion of patients, ranging from 5% to 10%, encounter the persistence of pain over an extended period. This occurrence of chronic pain post-surgery represents a significant concern warranting attention. Postoperative discomfort following hernia surgery is largely attributed to the involvement of lower intercostal nerves, specifically the iliohypogastric and ilioinguinal nerves, which span from the T11 to L1 spinal levels. Additionally, the abdominal wall incision itself is a significant contributing factor to this discomfort [4]. Patients who have undergone abdominal surgery are faced with the challenging task of managing their postoperative discomfort. The

prevalence of moderate to severe pain has been documented to range from 30 to 75 percent, despite the implementation of effective pain management strategies. The management of postoperative pain encompasses a variety of procedures and pharmacological interventions. The utilization of a multimodal approach to pain management, which involves the concurrent administration of nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, and local anesthetics, is commonly observed. Opioids have been found to effectively mitigate surgical pain; however, they may also induce adverse effects such as nausea, vomiting, reduced gastrointestinal motility, respiratory depression, and drowsiness, thereby exacerbating patient morbidity. The administration of injections does not provide effective relief for deep muscle pain, while the use of nonsteroidal anti-inflammatory drugs (NSAIDs) is associated with nephrotoxicity. The management of inguinal hernia procedures often entails the utilization of peripheral nerve blocks, which involve the administration of local anesthetics to mitigate pain. Iliohypogastric (IH) and ilioinguinal (II) nerve blocks are employed. In this study, a unilateral transversus abdominis plane (TAP) block was administered using 0.25% Bupivacaine following the completion of the surgical procedure. The purpose of this intervention was to assess the effectiveness of the TAP block as a standalone analgesic, without the use of supplementary pain medications. In 2001, TAP was introduced by Rafi. The administration of a regional analgesic occurs via the triangle of Petit (also known as the point of perpendicularity) located between the iliac crest, the oblique anterior superior iliac spine, and the tubercle of the pubic bone. The neurovascular fascial plane of the abdomen musculature serves as a pathway for the 7th to 11th intercostal nerves, subcostal nerve, iliohypogastric nerve, and ilioinguinal nerve (T7-L1) as they traverse a variable segment of their trajectory prior to innervating the anterior abdominal wall. The sensory supply of the anterior abdominal wall can be effectively blocked by administering local analgesics in the fascial plane [1,2]. The POP technique developed by Rafi is associated with several complications, including colonic puncture, liver injury [5], nerve injury, and uncontrolled local anaesthetic dissemination [6].

Several studies have provided evidence supporting the use of "In plane" ultrasound guidance to accurately position local anesthesia (LA) between the internal oblique aponeurosis and the transversus abdominis muscle. These studies include Hebbard et al.'s investigation on posterior TAP block, T. M. Tran's cadaveric study, Dawlathy's research on laparoscopic cholecystectomy, Niraj et al.'s study on open appendectomy, Belary et al.'s examination of caesarean section delivery, and D.J. Sandeman's investigation on laparoscopic appendectomy [6,7,8,9,10,11]. In this research, the decision was made to administer a Transversus Abdominis Plane (TAP) block using the landmark technique following surgery, considering that the effects of spinal anesthesia typically diminish within a timeframe of 2 to 3 hours. The results of our investigation indicate that individuals who received a transversus abdominis plane (TAP) block using local anesthetic reported a duration of analgesia lasting between 10 and 12 hours. Furthermore, these patients experienced significantly reduced pain levels for up to 24 hours, a prolonged interval before requiring additional analgesic medication, and a notable decrease in diclofenac consumption within a 24-hour period. The study findings indicate that the VAS scores of the study group were consistently lower than those of the control group over a 24-hour period. This finding aligns with a study conducted by Mc Donnell et al [12] on the topic of caesarean section delivery. In their research, they observed a notable decrease in Visual Analog Scale (VAS) scores for pain at rest and during movement for a duration of 12 hours among patients who received Transversus Abdominis Plane (TAP) block. In their research, Niraj et al. (9) conducted a study on open appendectomy, while Neerja Bharti et al. (13) focused their investigation on colorectal

surgery. In a study conducted by Neha Fuladi et al. [14], a comparison was made between the use of bupivacaine 0.25% and ropivacaine 0.5% for the purpose of postoperative analgesia in lower abdominal operations. A statistically significant disparity in the average duration of analgesia was observed between the Bupivacaine and Ropivacaine groups. The initial administration of rescue analgesia (Diclofenac) was significantly postponed in the study group (669.66 ± 346 minutes) in comparison to the control group (220.33 ± 139.24 minutes). In previous studies conducted by Carney (2015), McDonnell et al. (2012), and Belavy et al. (2010), the duration between surgery and the initial request for analgesic medication was found to be approximately 3-4 hours in cases of total abdominal hysterectomy and caesarean delivery. The observed discrepancy could potentially be attributed to the timing of the TAP block, either administered prior to or following the surgical procedure. In the conducted study, the administration of single bolus injections of local anaesthetics resulted in a duration of pain relief lasting 11 hours subsequent to the surgical procedure. Previous studies have demonstrated that a solitary administration of transversus abdominis plane (TAP) block can offer analgesic effects lasting between 36 and 48 hours. This extended duration can be attributed to limited vascular supply and reduced drug clearance rates. The user's text does not contain any information to be rewritten in an academic manner. The present study assessed the analgesic effectiveness of diclofenac administration within the initial 24-hour period. In the span of 24 hours, the study group exhibited a reduction of diclofenac consumption by 53% compared to the control group. The study group exhibited lower consumption of diclofenac at 2, 4, 12, 18, and 24 hours compared to the control group. The findings of our study align with those of Dawlatly et al [6], who documented a 55% decrease in analgesic consumption following ultrasound-guided transversus abdominis plane (TAP) block in laparoscopic cholecystectomy. In their study, Niraj et al. (9) discovered that the utilization of ultrasound-guided transversus abdominis plane (TAP) block resulted in a 45% reduction in opioid consumption during open appendicectomy procedures. According to a study conducted by Carney, McDonnell, and colleagues (12), it was observed that the transversus abdominis plane (TAP) block resulted in a 47% reduction in opioid consumption after a total abdominal hysterectomy. In a study conducted by Jumana M Baaj et al [17], it was demonstrated that the administration of a transversus abdominis plane (TAP) block during spinal anesthesia for cesarean delivery resulted in a significant reduction of 60% in overall morphine consumption. The transversus abdominis plane (TAP) block may be administered as a means of postoperative analgesia in cases where the use of an epidural catheter is contraindicated or proves ineffective in patients who are at a heightened risk. The preliminary results of the TAP block demonstrate favorable outcomes; however, the existing literature lacks comprehensive characterization of its associated complications, such as intestinal puncture, nerve injury, and liver puncture. A case of liver damage resulting from landmarking in a petite, overweight female individual. No issues were observed when utilizing landmarks. The issue of local anesthetic (L/A) toxicity is a matter of concern, particularly in cases where bilateral blocks are administered, as a result of the rapid absorption kinetics that occur between layers of fascia. According to a study, the occurrence of systemic toxicity can result from the infiltration of local anesthetic into adjacent muscles during a Transversus Abdominis Plane (TAP) block procedure. The issue at hand was successfully avoided due to the implementation of a unilateral block technique and the careful adherence to the prescribed dosage of bupivacaine, thus preventing any untoward consequences. The variables of heart rate (HR), mean arterial pressure (MAP), and respiratory rate (RR) exhibited consistent values in both experimental groups. The administration of a TAP (transversus abdominis plane) block using bupivacaine resulted in consistent hemodynamic stability, which can be attributed to the timely management of pain.

The adverse effects of opioids, such as drowsiness, nausea, and vomiting, are known to be dose-dependent. It is important to note that our study did not utilize opioids in its methodology. According to the findings of this study, the TAP block has been observed to provide analgesic effects to the parietal peritoneum, skin, and muscle of the anterior abdominal wall. The intervention results in a reduction in pain as measured by the visual analog scale (VAS), a decrease in the need for additional analgesic medication, a decrease in the occurrence of adverse effects, and an increase in patient satisfaction. The utilization of the TAP block by landmark technique is a simple and cost-effective approach that necessitates minimal preparation time. This technique can be effectively employed at peripheral health centers, particularly in emergency surgical procedures where ultrasound guidance is not accessible. Furthermore, it can be administered by an anesthesiologist who does not possess expertise in ultrasound-guided block procedures. In order to integrate it into regular clinical practice, additional well-designed studies are required to ascertain the safety, ideal dosage and volume of local anesthetic, comparison between single-shot administration and catheter-based delivery, intermittent versus continuous catheter infusion, selection of appropriate local anesthetic, utilization of adjuvants, and effectiveness in relation to epidural catheterization and local infiltration.

CONCLUSIONS:

The administration of Transversus Abdominis Plane (TAP) Block using a 0.25% bupivacaine solution demonstrated significant efficacy and sustained analgesic effects in individuals undergoing abdominal surgery. This approach resulted in minimal reliance on diclofenac for pain management. No adverse effects were observed in relation to the utilization of TAP Block or the pharmaceuticals under investigation.

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