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RESEARCH ARTICLE
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ANALGESIC EFFICACY OF POST-OPERATIVE TRANSVERSE ABDOMINAL PLANE BLOCK IN INFRAUMBILICAL OBSTETRIC AND GYNAECOLOGICAL SURGERIES USING 0.5%LEVOBUPIVACAINE WITH FENTANYL VERSUS 0.5%ROPIVACAINE WITH FENTANYL, BILATERALLY, POSTOPERATIVELY-ANOBSERVATIONAL, INTERVENTIONAL AND COMPARATIVE STUDY.

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ABSTRACT

AIMS: to study and compare analgesic efficacy of 0.5% levobupivacaine with fentanyl versus 0.5% ropivacaine with fentanyl in trans abdominal plane block in obstetrics & gynecological surgeries.

OBJECTIVES: to evaluate and compare duration of block, analgesia postoperatively and rescue doses of intravenous diclofenac given within first 24hrs [numbers.]

INTRODUCTION: The transverse abdominis plane block has shown promising results in reducing the usage of opioids and providing effective postoperative pain relief by introducing local anesthetics into the transversus abdominis plane via the triangle of Petit and block the sensory nerves of the anterior abdominal wall.

MATERIALS AND METHODS: This prospective, randomized, comparative study comprised female patients(ASA grade 1/2), ages 18 to 65, undergoing elective infraumbilical obstetrics and gynecological surgeries. PNS directed TAP block was given bilaterally, postoperatively, to two groups of 35 patients each: group-R-0.5% ropivacaine[18ml]+fentanyl [2ml=100 mcg], while group-L received 0.5% levobupivacaine[18ml]+fentanyl [2ml=100 mcg].

END RESULT: Group-R showed delayed request of first rescue analgesia (intravenous diclofenac), lesser analgesia(171.08±18.21 mg of total intravenous diclofenac in 24 hours) versus in Group-L(291.20±21.4 mg),$p<0.0001$ and had lower VAS scores at 0,4,8,12,16,20,24 hours postoperatively($p< 0.05$).

CONCLUSION- postoperative pain management with TAP block for lower abdominal surgeries using 0.5% ropivacaine was associated with greater duration of analgesia, delayed first demand for rescue analgesia and decreased necessity for total number of rescue analgesics. These findings support the use of ropivacaine in TAP blocks to improve pain management and patient outcomes

during gynecological and obstetric procedures.

Keywords: levobupivacaine, postoperative pain, ropivacaine, transversus abdominis planeblock

INTRODUCTION

In many medical professions, pain management is a crucial component of patient treatment, from surgery to chronic illnesses. Over the years, medical professionals have looked into a number of methods for effectively reducing pain while limiting the risks associated with traditional analgesic treatments. Recently, there has been an increase in popularity of the Transversus Abdominis Plane (TAP) block technique. The nerves supplying the anterolateral abdominal wall (T6 to L1) can be made numb by peripheral nerve blocks, also known as TAPblocks. [1] It has also been demonstrated to decrease the requirement for postoperative opioids, lengthen the time until patients ask for more painkillers, and improve pain management by lowering the frequency of opioid-related side effects such nausea, vomiting, and drowsiness.

It is usually necessary to administer 0.5% levobupivacaine or 0.5% ropivacaine during infraumbilical surgeries. Clinical studies have shown that 0.5% levobupivacaine in TAP blocks has a long half-life and significantly lowers postoperative pain. [2] It is well known for having a favorable safety profile and less cardiotoxicity. On the other hand, ropivacaine, amore contemporary local anesthetic, has been demonstrated to be equally successful in TAP blocks as levobupivacaine. Given its decreased risk of cardiac and central nervous system injury, it is often chosen in TAP blocks. [3]

Even with our growing knowledge of the physiology of acute pain, the development of newopioid and nonopioid painkillers, the use of multiple drug delivery routes and methods, andthe growing popularity of minimally invasive surgical procedures, the management of pain following surgery is still a major area of focus. [4]

We wanted to know how effective both 0.5% levobupivacaine[18ml] + fentanyl[2ml=100mcg] (group-L) and 0.5% ropivacaine[18ml] + fentanyl[2ml=100mcg] (group-R) were as analgesics in PNS guided TAP block, bilaterally, postoperatively, as wellas how many rescue analgesics were needed overall by both groups during the postoperative24-hour period. The VAS scores of the aforementioned study groups were compared.

MATERIAL & METHODS

A prospective randomized experiment was conducted with consent from the Institutional Ethics Committee. Prospectively, the study included patients of female sex between the ages of 18 and 65 who were scheduled for elective infraumbilical obstetrics and gynecological procedures under SAB and who were in ASA grades 1 or 2. The patients provided signed, informed consent to participate in the study. The patients were divided into two groups, each consisting of 35 patients. Group R had a postoperative bilateral administration of 0.5% ropivacaine (18 ml) + fentanyl (2 ml = 100 mcg), while Group L underwent a PNS-guided TAP block using 0.5% levobupivacaine (18 ml) + fentanyl (2 ml = 100 mcg). A six-month prospective, randomized, comparative, interventional, and observational study was conductedat the anesthesiology department of the Index Medical College Hospital and Research Centrein Indore.

INCLUSION CRITERIA

1) The first requirement for inclusion is ASA physical status I or II.
2) Been alive for 18 to 65 years.
3) Individuals having abdominal hysterectomy and elective C-sections.
4) Patient for whom spinal anesthesia is not contraindicated.

EXCLUSION CRITERIA

1. Patient refusal.
2. ASA class III and higher.

3. Individuals with diabetes and asthma who have ASA grade 2 comorbidities.
4. Individuals suffering from hypotension, CAD, genetic enzyme problems (G6PD), heart blockages, hepatic illnesses, or renal ailments.
5. Patients who are older than 65 and younger than 18 years old.
6. A history of drug sensitivity under examination.
7. A patient having a history of drug addiction and an underlying psychological condition.
8. The surgery took longer than three hours.
9. When spinal anesthesia is not appropriate.
10. Being obese (BMI > 30 kg/m2)

PROCEDURE

A comprehensive pre-anaesthetic evaluation was performed before obtaining the patient'sinformed written consent.

1. As soon as the patient entered the operating room, standard monitoring equipment including electrocardiography (ECG), non-invasive blood pressure (NIBP), and peripheral oxygen saturation (SpO2) was attached. A 20 G intravenous line that was secured was filledwith fluid.
2. Following aseptic procedures, a subarachnoid block at the L3-L2 level was performed using a 25G Quincke's spinal needle. After a clear, unobstructed flow of CSF fluid and a small amount of aspiration, intrathecal bupivacaine heavy 0.5%, volume as directed by protocol, without adjuvant, was administered. The patient was then observed to determinewhether the medication was having the desired effect, and after the required degree of blockage had been reached, the patient was turned over to the surgeon.
3. Following surgery, Group L [n=35] patients had a transabdominal plane block under aseptic precautions (0.5%) of levobupivacaine(18 ml) + fentanyl(2 ml=100 mcg) and GroupR [n=35] patients received a transabdominal plane block (0.5%) of ropivacaine(18 ml) + fentanyl(2 ml= 100 mcg). With the PNS in the supine position, bilateral TAP block was carried out utilizing the Landmark-guided TAP Block approach.

PROCEDURE OF BLOCK:

The iliac crest, the posterior border of the external oblique, and the anterior border of the latissimus dorsi were palpated to form the Petit triangle. Following aseptic measures and skinpreparation, the external and internal obliques (double loss of resistance technique) were punctured. A 5 cm, 20 G, insulated needle was used to pierce the skin perpendicularly, delivering 1.5–2.5 mA of current at a frequency of 1 Hz and a pulse duration of 0.1 ms via PNS. The needle was moved forward gradually. After determining which abdominal muscleswere twitching, the current was progressively decreased to 0.5–0.3 mA. A test dosage of 1 mL was injected to assess flow resistance and confirm needle tip placement inside the fascialplane with cautious aspiration (to rule out vascular puncture) if the abdominal muscle twitch remained at this current. Following this, a local anesthetic solution containing 0.5% levobupivacaine 18 ml + 2 ml fentanyl (100 mcg) was administered in groups L and R, with increments of 0.5% levobupivacaine 18 ml + 2 ml fentanyl (100 mcg) and aspiration every 2 ml, under close observation for toxicity signs. The TAP block was then executed using the same method on the other side.

After block at regular intervals (2, 5, 10, 15, 20, and 30 minutes), sensory dermatomal coverage was measured in a supine position using a blunt needle tip for touch feeling from T5to L1 dermatomes. It was confirmed that the block effect existed. The pain score at 0 minutes, 4 hours, 8 hours, 12 hours, 16 hours, 20 hours, and 24 hours was assessed using the VAS (VAS: 0 = no pain; 10 = worst agony possible). Intravenous boluses of diclofenac at a rate of 0.3 mg/kg were administered on demand or anytime the VAS pain score in both groups reached ≥4. The entire amount of intravenous injections of diclofenac (rescue analgesia) was recorded. If any adverse effects were noted, they included hypotension, nausea, vomiting, and dizziness. Intravenous ondansetron 8 mg was given for severe nausea, vomiting, or gastritis.

RESULTS:

A total of 100 patients had their eligibility evaluated; 30 of them were subsequently ruled outbased on predetermined criteria. After enrollment, 70 patients were split into two groups of 35 each at random.

A comparison of Group R and Group L's demographic information is presented in Table 1. The table gives some preliminary information about the differences between each group's mean values and standard deviations for age, weight, height, BMI, and ASA status in additionto the computed P values.

Table 1: Comparison of demographic data

Demographic profile	Group R(n=35)	Group L(n=35)	P value
Age(yrs.)	43.23±8.91	40.97±9.98	0.3
Weight(kgs)	60.7±8.0	67.2±10.6	0.06
Height(m)	1.66±0.07	1.67±0.07	0.08
BMI(kg/m^2)	22.1±4.1	21.3±4.4	0.65
ASA status(1/2)	22/13	23/12	0.03

Table 2 compares Group R and Group L's Visual Analog Scale (VAS) ratings at various points in time. At 0, 4, 8, 12, 16, 20, and 24 hours after the block, there were significant variations in the VAS scores; Group R consistently reported lower scores than Group L ($p < 0.0001$, 0.015, <0.0001, 0.0006, respectively). These results imply that, in comparison to Group L, treatment in Group R resulted in noticeably reduced pain levels and the need for rescue analgesia at different points after treatment.

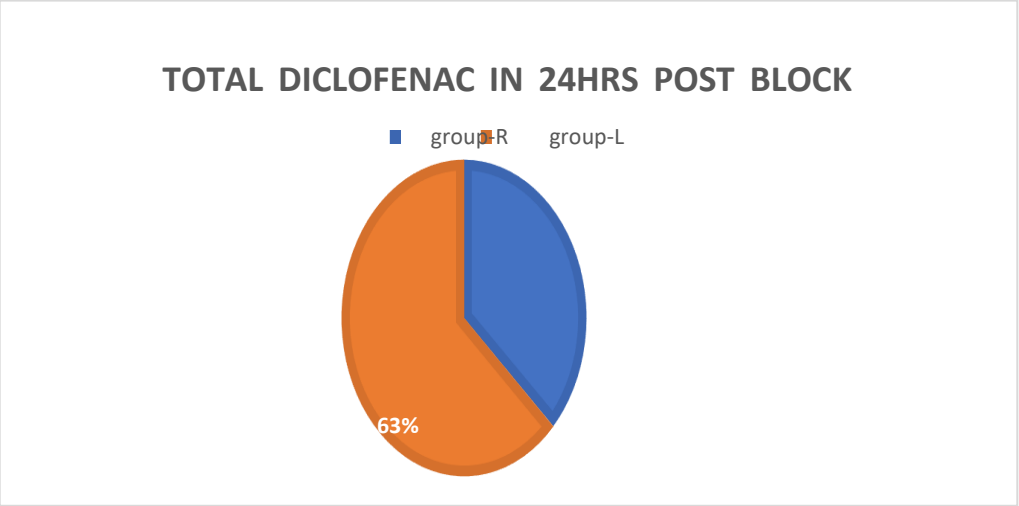
Table 2: The VAS scores at different time intervals

Parameter	Group	No.	Mean±SD	P value
VAS 0 hr	R	35	1.63 ±2.01	0.061
	L	35	2.25 ± 1.78	
VAS 4 hr	R	35	2.72 ± 1.47	0.246
	L	35	3.60 ±1.30	
VAS 8 hr	R	35	3.50 ±1.62	0.098
	L	35	3.87 ±1.5	
VAS 12 hr	R	35	4.85 ±1.21	0.003
	L	35	6.67 ± 1.52	
VAS 16 hr	R	35	1.55 ± 1.21	0.123
	L	35	2.58 ± 1.42	
VAS 20 hr	R	35	3.60 ± 1.21	0.004
	L	35	5.95 ± 1.25	
VAS 24 hr	RL	35	1.87 ± 0.56	0.750
		35	2.90 ± 0.66	

Significant differences were found when comparing the analgesic efficacy of Group R and Group L, as shown in Table 3. With a p-value of less than 0.0001, Group R showed a lower total diclofenac requirement (171.08±18.21 mg total in the first 24 hours) than Group L (291.20±21.4 mg total in the first 24 hours). These results imply that Group R may have hadsuperior pain management because they needed considerably fewer rescue analgesics than Group L.

Table 3: Requirement of analgesics (rescue analgesia)

Parameter	Group R (n=35)	Group L (n=35)	P Value
Total diclofenac requirement (mg)	171.08±18.21	291.20±21.4	<0.0001



DISCUSSION:

There is no doubt that receiving proper postoperative analgesics reduces postoperative stress response, postoperative morbidity, and, in some cases, improves surgical result. Numerous techniques have been attempted to alleviate postoperative pain in individuals having minimally invasive gynecological and obstetric procedures. IV NSAIDs and intermittent opioids as needed is the most widely utilized regimen. There have been attempts at epidural analgesia, intraperitoneal, subfascial, and subcutaneous local anesthetic infiltration, as well asintravenous patient control anesthesia with opioids.

Numerous benefits, including improved surgical results in particular surgical procedures, lower postoperative discomfort, and decreased postoperative morbidity, are associated with effective postoperative analgesia. Effective pain management speeds up the healing and recuperation period following surgery and promotes regeneration.

Prior research has demonstrated that TAPB is effective in managing postoperative pain inindividuals undergoing minimally invasive gynecological and obstetric procedures.

Levobupivacaine and ropivacaine, two intermediate-acting local anesthetics, were employedin two different groups in this investigation. Our research indicates that 0.5% Ropivacaine issuperior than 0.5% Levobupivacaine in terms of delivering postoperative pain relief throughTAP block for patients having gynecological and obstetric procedures. A lower VAS score suggested that Group R, using 0.5% ropivacaine, was better in providing postoperative analgesia.

1) Our study's results were consistent with those of the following studies:

1. For elective lower segment cesarean sections, Oraon et al. 2022 compared intrathecal0.5% isobaric levobupivacaine, 0.5% isobaric ropivacaine, and 0.5% hyperbaric bupivacaine. In contrast to 12 mg of hyperbaric bupivacaine (2.2 mL of 0.5% each), they found that intrathecal administration of 12 mg isobaric levobupivacaine and 12 mg isobaric ropivacaine produced appropriate anesthetic for cesarean deliveries. Theshorter duration of motor block caused by ropivacaine compared to the other two drugs may be beneficial for early ambulation.
2. A comparison of the analgesic effectiveness of ropivacaine and bupivacaine in rectus sheath block for midline abdominal surgeries was carried out in 2019 by Arti Kuldeepet al. They discovered that providing postoperative analgesia to patients having midline abdominal procedures can be done safely and effectively with bilateral singleshot rectus sheath block (RSB) utilizing isobaric ropivacaine (0.25%) or bupivacaine (0.25%). But because of its better delayed postoperative analgesia and reducedcardiac toxicity profile, ropivacaine is a better choice for the RSB.
3. In 2018, patients undergoing percutaneous nephrolithotomy had their postoperative analgesia after ultrasound-guided paravertebral block compared to ropivacaine, according to a study conducted by Richa Saroa, Sanjeev Palta, et al. They discoveredthat the time to first analgesic necessity was

greater in the Levobupivacaine group (1.60 ± 3.64 h) than in the Ropivacaine group (0.33 ± 1.04 h), despite the fact that thedifference was statistically not significant.

4. Neha Sharma and colleagues (2016) compared the use of ultrasonography-guided transversus abdominis plane block for postoperative analgesia following abdominal procedures between 0.25 percent Bupivacaine and 0.50 percent Ropivacaine. They discovered that the duration of analgesia was longer with 0.5% Ropivacaine than with0.25% Bupivacaine in patients undergoing abdominal operations during Ultrasound guided TAP Block. TAP Block by lumbar route using ultrasonography provides betterpain control than upper abdominal operations, especially for lower abdominal surgery.
5. In 2014, Neha Fuladi et al. tested bupivacaine 0.25% against ropivacaine 0.5% in thetransversus abdominis plane block for pain relief following surgery in surgery of the lower abdomen. They found analgesia could be achieved more quickly with 0.5% ropivacaine in comparison to 0.25 % bupivacaine.

2) The findings of our investigation disagreed with the results of the subsequent studies:

i. A PRISMA-compliant meta-analysis on the success rate of levobupivacaine against ropivacaine for peripheral nerve block was carried out in 2017 by Ang Li, Zhijian Wei, et al.They reported that levobupivacaine induced anesthesia that lasted longer than ropivacaine, and that there was a substantial difference in the occurrence of postoperative emergency pain relief between the ropivacaine and levobupivacaine groups.
ii. Dr. V. Sai Dilip et al. compared 0.5% ropivacaine and 0.5% levobupivacaine in supraclavicular block in 2015. Based on the findings, levobupivacaine generated an enduringsensory and motor blockage than ropivacaine.

Our study's primary strength was its prospective randomized trial design, which included a two-arm parallel intervention, dermatomal mapping, and a full 24-hour follow-up. The absence of vascularization in the TAP, which is in charge of the slower pace at which medications are eliminated from the body, may be the reason for the extended analgesic effect that follows a single-shot TAP block. The study did, however, have certain shortcomings. First, if TAP block is performed after surgery, the residual effects of the subarachnoid block may conceal the untreated TAP block's beginning. Second, TAP block was performed using a blind landmark technique with PNS, which might result in iatrogenic damage to the intra-abdominal contents, causing bowel perforation and other serious problems that were not addressed. Third, because postoperative pain is a subjective feeling, itis challenging to measure objectively and may have an impact on the study's findings. A technological constraint or the existence of visceral discomfort that the TAP block does not treat could be the cause of insufficient pain alleviation following a TAP block. Fourth, depending on the operator's skill level, the success rate of local anesthetic treatments ranges from 5 to 20 percent. Residents in their second and third year, with limited experience, conducted our study.
Ropivacaine produces less motor obstruction than bupivacaine because it is less lipophilic and has a lower affinity for large myelinated motor fibers. The improved motor-sensory independence of ropivacaine may be beneficial since motor blockage is undesirable. Reduced lipophilicity is also associated with a reduced chance of cardiovascular damage and inflammation of the central nervous system.

CONCLUSION

With regard to post-operative pain management, 0.5% ropivacaine is preferred to 0.5% levobupivacaine since it produces a stronger sensory blockage via the transverse abdominal plane (TAP) block.

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