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"Precision Analgesia: A Prospective Study on TAP Block in Laparoscopic Hysterectomy"

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Abstract

Background: Laparoscopic hysterectomy, though minimally invasive, often results in significant postoperative pain due to visceral and incisional components. The transversus abdominis plane (TAP) block has emerged as a promising regional anesthesia technique for improving perioperative analgesia and reducing opioid consumption. **Objective:** To evaluate the clinical efficacy of ultrasound-guided TAP block using 0.25% bupivacaine in patients undergoing laparoscopic hysterectomy in terms of perioperative fentanyl consumption, hemodynamic stability, pain scores, and side effects. **Methods:** This prospective, randomized, controlled trial enrolled 72 ASA I–II female patients (aged 18–65 years), scheduled for elective laparoscopic hysterectomy. They were allocated into two equal groups (n=36): Group 1 received standard general anesthesia, while Group 2 received bilateral TAP block (20 mL of 0.25% bupivacaine per side) post-induction. Intraoperative vitals, end-tidal CO_2, oxygen saturation, and total fentanyl requirements were monitored. Postoperative pain was assessed using the Visual Analogue Scale (VAS), and sedation was monitored for 24 hours. Rescue analgesia with fentanyl was administered when VAS ≥ 4. **Results:** Group 2 demonstrated significantly lower intraoperative and postoperative fentanyl requirements (median top-ups: intraop 0 vs 2, postop 1 vs 4; $p<0.001$). Intraoperative hemodynamics were more stable in Group 2, with significantly lower pulse rate and mean arterial pressure from 20 to 120 minutes post-induction ($p<0.001$). VAS scores were consistently lower in Group 2 throughout 24 hours ($p<0.05$), with higher patient comfort and reduced incidence of nausea and vomiting (13.9% vs 33.3%). No block-related complications were reported. **Conclusion:** Ultrasound-guided TAP block with bupivacaine is a safe and effective technique for perioperative analgesia in laparoscopic hysterectomy. It significantly reduces opioid consumption, improves intraoperative hemodynamic stability, and provides superior postoperative pain control without notable adverse effects.

Keywords: TAP block, laparoscopic hysterectomy, regional anesthesia, postoperative pain, fentanyl consumption, ultrasound-guided block, bupivacaine, hemodynamic stability.

Introduction: Laparoscopic surgery, when compared to open procedures, offers significant benefits such as better maintenance of physiological homeostasis, reduced postoperative morbidity, shorter hospital stays, faster recovery, and superior cosmetic outcomes due to smaller incisions and less tissue trauma [1,2]. Laparoscopic hysterectomy, a common gynecological surgery, is widely accepted as a minimally invasive alternative to traditional open hysterectomy, and is generally associated with lower postoperative pain scores [3]. However, contrary to this belief, patients may still experience considerable postoperative pain due to factors such as peritoneal stretching, trocar site trauma, and visceral irritation [4].

Effective postoperative pain management is crucial, as poorly controlled pain can lead to a cascade of complications including respiratory compromise, prolonged immobilization, delayed recovery, increased opioid use, and even chronic postoperative pain syndromes [5]. Traditionally, analgesia following laparoscopic abdominal surgery has relied on systemic agents including opioids, non-steroidal anti-inflammatory drugs (NSAIDs), paracetamol, alpha-2 agonists, and ketamine, as well as neuraxial techniques such as epidural analgesia [6]. While these modalities provide effective pain relief, they are not without risks and side effects.

Recent advances in regional anesthesia have introduced peripheral nerve blocks such as the transversus abdominis plane (TAP) block as attractive alternatives for postoperative analgesia. TAP block specifically targets the sensory innervation of the anterior abdominal wall, blocking the lower thoracic intercostal nerves (T7–T12), the iliohypogastric and ilioinguinal nerves, and branches of the lumbar plexus (L1–L3) by injecting local anesthetic between the internal oblique and transversus abdominis muscles within the neurofascial plane—most commonly accessed via the triangle of Petit [7].

Ultrasound-guided TAP block offers a distinct advantage over traditional landmark-based techniques by allowing real-time visualization of needle placement, thereby enhancing the precision, efficacy, and safety of the block [8]. This method has been shown to improve perioperative analgesia and reduce opioid consumption in various laparoscopic surgeries including hysterectomy [9].

Nevertheless, concerns remain regarding complications such as inadvertent injury to abdominal viscera (e.g., liver, colon), transient femoral nerve palsy, local anesthetic systemic toxicity (LAST), and block failure due to technical inaccuracies [10-13]. Despite these concerns, studies have demonstrated that when performed correctly under ultrasound guidance, the TAP block is safe and effective.

El-Dawlatly et al. reported that TAP block, when added to general anesthesia for laparoscopic surgery, significantly reduced perioperative opioid requirements [8]. Similarly, Baaj et al. demonstrated improved postoperative analgesia and patient satisfaction in obstetric surgery with ultrasound-guided TAP block, confirming its role in multimodal pain management [14].

Considering these findings, the present study was designed to evaluate the clinical efficacy of ultrasound-guided TAP block in patients undergoing laparoscopic hysterectomy. The study aims to assess perioperative opioid consumption, intraoperative hemodynamic stability, incidence of block-related complications, and adverse drug effects, thereby exploring the potential of TAP block as a component of precision analgesia in gynecological laparoscopy.

Objectives: To compare perioperative opioid consumption, assess intraoperative hemodynamic stability, evaluate the efficacy and safety of TAP block, and identify any drug-related side effects in patients undergoing laparoscopic hysterectomy.

Material and methods:

This prospective, randomized, controlled study was conducted at the Department of Anesthesiology, Yashwant Rao Chavan Memorial Hospital, Pune, Maharashtra between January 2022 and December 2024. The study received approval from the Institutional Ethics Committeeand informed written consent was obtained from all participants prior to enrollment.

Sample Size Calculation

The sample size was calculated based on a previous study that demonstrated a 70% reduction in postoperative opioid consumption with the use of ultrasound-guided TAP block [McDonnell JG et al.] [15]. Considering a 70% expected effect size (P = 0.70), 95% confidence interval, and a relative precision (E) of 15%, the minimum required sample size per group was calculated using the formula:

$$n = \frac{Z^2 \cdot P \cdot (1 - P)}{E^2}$$

$$n = \frac{(1.96)^2 \cdot 0.7 \cdot 0.3}{(0.15)^2} \approx 36$$

Thus, 72 patients were enrolled, with 36 patients each randomized into two groups.

Inclusion Criteria

- Female patients aged 18–65 years
- ASA physical status I or II
- Scheduled for elective laparoscopic hysterectomy
- Mallampati class I or II

- No known airway anomalies

Exclusion Criteria

- Patient refusal to participate
- ASA grade III or IV
- Mallampati class III or IV
- History of allergy to bupivacaine
- BMI > 40 kg/m²
- Recent (within 24 hours) use of analgesics
- Psychiatric disorders or history of substance abuse
- Uncontrolled hypertension, diabetes, asthma, or other systemic illness

Study Design and Group Allocation

Seventy-two eligible patients were randomly assigned to one of two groups using computer-generated random numbers:

- **Group 1 (Control group):** Received standard general anesthesia with systemic analgesia
- **Group 2 (TAP group):** Received bilateral ultrasound-guided TAP block with 20 mL of 0.25% bupivacaine on each side after induction

Anesthetic Technique

All patients were premedicated with IV fentanyl 2 μg/kg on the operating table. General anesthesia was induced with propofol 2 mg/kg and vecuronium 0.1 mg/kg to facilitate endotracheal intubation. Anesthesia was maintained with sevoflurane (MAC 1.0) in 60% nitrous oxide and oxygen. Neuromuscular blockade was maintained with intermittent doses of vecuronium, and ventilation was adjusted to maintain normocapnia ($EtCO_2$ 35–40 mmHg).

Ultrasound-Guided TAP Block

In Group 2, the TAP block was performed after induction using a high-frequency (6–13 MHz) linear ultrasound probe. The probe was positioned transversely at the midaxillary line between the iliac crest and the subcostal margin. A 22G, 50 mm short-bevel needle was inserted in-plane to deposit the anesthetic between the internal oblique and transversus abdominis muscles. Hydrodissection with saline was used to confirm correct needle placement. A total of 20 mL of 0.25% bupivacaine was injected on each side after negative aspiration.

Intraoperative Monitoring

Standard ASA monitoring was used, including:

- ECG with ST-segment analysis
- Non-invasive blood pressure

- Heart rate
- SpO_2
- $EtCO_2$
- MAC of sevoflurane
- Temperature monitoring

Vital parameters were recorded at baseline (5 min post-intubation), then at 10, 20, 30, 40, 50, 60, 70, 80, 90, 120, and 150 minutes. Inadequate analgesia, defined as heart rate or MAP >20% above baseline, was managed with rescue IV fentanyl (0.5 μg/kg). The total intraoperative fentanyl requirement was recorded.

Postoperative Monitoring

Patients were monitored in the Post-Anesthesia Care Unit (PACU) and in the ward for 24 hours. Parameters included:

- Heart rate, MAP, SpO_2 (hourly for first 4 hours, then every 4 hours)
- Pain scores using the 10-cm Visual Analogue Scale (VAS) at rest and movement
- Sedation levels using Ramsay Sedation Scale (1–6)
- Adverse effects such as nausea, vomiting, and block-related complications

Rescue analgesia with IV fentanyl (0.5 μg/kg) was given if VAS ≥ 4. Total postoperative opioid consumption and the number of rescue doses were documented.

Statistical Analysis

Data were analyzed using SPSS version 20. Continuous variables (e.g., age, pain scores, opioid consumption) were expressed as mean ± standard deviation and compared using the independent t-test. Categorical variables (e.g., adverse effects, ASA grade) were analyzed using the Chi-square or Fisher's exact test. A p-value < 0.05 was considered statistically significant.

Results and observations: This prospective, randomized, controlled study was conducted at the Department of Anesthesiology, Yashwant Rao Chavan Memorial Hospital, Pune, Maharashtra between January 2022 and December 2024after obtaining Institutional Ethics Committee approval and informed consent. A total of 72 female patients (aged 18–65 years, ASA I–II) scheduled for elective laparoscopic hysterectomy were randomly allocated into two groups (n=36 each): Group 1 received standard general anesthesia, while Group 2 received bilateral ultrasound-guided TAP block with 20 mL of 0.25% bupivacaine on each side after induction. The sample size was calculated based on a previous study by McDonnell et al. showing a 70% reduction in opioid consumption with TAP block. Standard anesthesia induction and maintenance were followed, and

intraoperative parameters including heart rate, MAP, SpO_2, and $EtCO_2$ were monitored at regular intervals. Postoperatively, patients were observed for 24 hours for pain scores (VAS), sedation (Ramsay Sedation Scale), and side effects, with rescue fentanyl (0.5 μg/kg) administered for VAS ≥ 4. Data were analyzed using SPSS v20, with continuous variables compared using the independent t-test and categorical data using Chi-square or Fisher's exact test; a p-value < 0.05 was considered statistically significant.

Table 1: Comparison of age (years) in group 1 and group 2.

Group	Number of patients	Gender		Age (years)		P-value
		Male	Female	Mean	SD	
Group 1	36	18	18	41.39	12.438	0.886
Group 2	36	16	20	41.86	14.074	

In this study, each group consisted of 36 patients. In Group 1, there were 18 male and 18 female participants, with a mean age of 41.39 ± 12.44 years. Group 2 included 16 male and 20 female patients, with a mean age of 41.86 ± 14.07 years. The comparison of age between the groups using the independent t-test yielded a p-value of 0.886, indicating no statistically significant difference. Thus, both groups were comparable in terms of gender distribution and age, ensuring baseline demographic similarity.

Table 2: Distribution of ASA grade in group 1 and group 2.

ASA grade	Group		P-value
	Group 1	Group 2	
I	27	26	0.999
II	9	10	
Total	36	36	

In Group 1, 27 out of 36 patients were classified as ASA Grade I and the remaining 9 as ASA Grade II. Similarly, in Group 2, 26 patients were ASA Grade I and 10 were ASA Grade II. The distribution of ASA physical status between the two groups was analyzed using the Chi-square test, which revealed no statistically significant difference (p > 0.05), indicating that both groups were comparable in terms of preoperative physical status.

Comparison of Vital Parameters:

Table 3: Comparison of pulse rate between the groups

Time Point	**Group 1 (Mean ± SD)**	**Group 2 (Mean ± SD)**	**P-value**
Intraoperative			
5th min	78.17 ± 10.40	76.11 ± 10.58	0.409

10th min	80.08 ± 9.83	78.92 ± 10.66	0.683
20th min	108.31 ± 14.88	78.11 ± 15.49	< 0.001
30th min	96.03 ± 11.13	79.61 ± 15.43	< 0.001
40th min	95.50 ± 12.68	76.47 ± 11.35	< 0.001
50th min	97.58 ± 16.79	77.58 ± 12.25	< 0.001
60th min	99.94 ± 13.33	76.67 ± 11.34	< 0.001
70th min	93.28 ± 11.40	78.97 ± 12.74	< 0.001
80th min	97.14 ± 17.36	78.08 ± 10.60	< 0.001
90th min	92.86 ± 12.58	76.86 ± 10.45	< 0.001
120th min	87.58 ± 11.36	76.94 ± 8.59	< 0.001
Postoperative			
1st hour	80.97 ± 7.58	77.89 ± 10.26	0.152
2nd hour	81.03 ± 9.08	79.14 ± 10.78	0.424
3rd hour	83.11 ± 9.86	79.42 ± 9.22	0.105
4th hour	81.22 ± 10.86	80.61 ± 10.13	0.806
8th hour	80.44 ± 9.48	79.75 ± 8.88	0.749
12th hour	81.08 ± 9.33	79.17 ± 9.61	0.394
16th hour	81.14 ± 9.07	79.67 ± 8.25	0.474
20th hour	80.61 ± 9.31	80.19 ± 9.21	0.849
24th hour	80.50 ± 9.41	79.44 ± 7.84	0.607

The comparison of pulse rate between the two groups showed no significant difference at 5 and 10 minutes intraoperatively ($p > 0.05$). However, from the 20th minute to the 120th minute intraoperatively, Group 1 consistently had significantly higher pulse rates compared to Group 2 ($p < 0.001$), indicating better hemodynamic stability in the TAP block group. Postoperatively, pulse rates remained comparable between the groups at all time points ($p > 0.05$), suggesting that the TAP block did not significantly affect postoperative heart rate.

Table 4: **Comparison of Mean Arterial Blood Pressure**

Time Point	**Group 1 (Mean ± SD)**	**Group 2 (Mean ± SD)**	**P-value**
Intraoperative			
5th min	76.86 ± 9.13	76.11 ± 10.58	0.680
10th min	78.06 ± 8.73	73.92 ± 10.66	0.325
20th min	103.53 ± 10.07	78.11 ± 15.49	< 0.001
30th min	93.89 ± 9.87	79.61 ± 15.43	< 0.001
40th min	95.03 ± 10.48	76.47 ± 11.35	< 0.001
50th min	99.31 ± 12.22	77.58 ± 12.25	< 0.001
60th min	103.58 ± 13.82	76.67 ± 11.34	< 0.001
70th min	93.11 ± 11.66	78.97 ± 12.74	< 0.001
80th min	97.86 ± 12.47	78.08 ± 10.60	< 0.001
90th min	92.92 ± 11.41	76.86 ± 10.45	< 0.001

120th min	92.08 ± 10.43	76.94 ± 8.59	< 0.001
Postoperative			
1st hour	77.89 ± 6.87	77.89 ± 10.26	0.812
2nd hour	80.25 ± 6.71	79.14 ± 10.78	0.573
3rd hour	81.61 ± 7.78	79.42 ± 9.22	0.309
4th hour	81.17 ± 8.54	80.61 ± 10.13	0.474
8th hour	81.03 ± 8.68	79.75 ± 8.88	0.586
12th hour	81.61 ± 8.18	79.17 ± 9.61	0.555
16th hour	79.97 ± 8.54	79.67 ± 8.25	0.611
20th hour	80.86 ± 6.84	80.19 ± 9.21	0.830
24th hour	80.69 ± 6.00	79.44 ± 7.84	0.660

The table compares Mean Arterial Pressure (MAP) between Group 1 and Group 2 at various intraoperative and postoperative time points. During the intraoperative period, MAP was significantly higher in Group 1 than in Group 2 from the 20th minute to the 120th minute ($p < 0.001$), indicating better hemodynamic stability in the TAP block group (Group 2). However, during the postoperative period, MAP values were comparable between both groups across all time points ($p > 0.05$), showing no significant difference. This suggests that TAP block provided better intraoperative blood pressure control without causing hypotension postoperatively.

Table 5: Comparison of mean ETCO2 in group 1 and group 2.

Time Point	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	P-value
5th min	33.42 ± 1.30	33.42 ± 1.32	0.999
10th min	33.36 ± 1.31	33.36 ± 1.33	0.999
20th min	33.44 ± 1.32	33.56 ± 1.21	0.710
30th min	35.89 ± 1.43	35.58 ± 1.59	0.395
40th min	36.36 ± 1.38	36.19 ± 1.65	0.643
50th min	36.28 ± 1.09	36.17 ± 1.42	0.711
60th min	35.83 ± 1.00	35.72 ± 1.26	0.679
70th min	35.75 ± 1.02	35.67 ± 1.22	0.754
80th min	35.44 ± 1.03	35.36 ± 1.20	0.752
90th min	34.69 ± 1.04	34.67 ± 1.07	0.911
120th min	34.25 ± 1.00	34.17 ± 1.11	0.738

There was **no statistically significant difference** in end-tidal CO_2 ($EtCO_2$) levels between Group 1 and Group 2 at any intraoperative time point ($p > 0.05$). This indicates that both groups maintained **adequate ventilation and normocapnia** throughout the surgery, suggesting that the type of analgesia (systemic vs TAP block) did not impact intraoperative respiratory parameters.

Table 6: Comparison of mean SPO2 in group 1 and group 2.

Time Point	Group 1 (Mean ± SD)	Group 2 (Mean ± SD)	P-value
Intraoperative			
5th min	99.83 ± 0.51	99.56 ± 0.69	0.057
10th min	99.72 ± 0.70	99.53 ± 0.70	0.242
20th min	99.72 ± 0.70	99.17 ± 0.94	0.006
30th min	99.69 ± 0.75	99.22 ± 0.87	0.016
40th min	99.69 ± 0.75	99.22 ± 0.87	0.016
50th min	99.72 ± 0.66	99.17 ± 0.91	0.004
60th min	99.72 ± 0.70	99.19 ± 0.89	0.007
70th min	99.69 ± 0.75	99.31 ± 0.86	0.044
80th min	99.78 ± 0.54	99.31 ± 0.86	0.007
90th min	99.72 ± 0.66	99.31 ± 0.86	0.024
120th min	99.75 ± 0.60	99.31 ± 0.86	0.013
Postoperative			
1st hour	98.17 ± 0.70	98.08 ± 0.73	0.622
2nd hour	98.14 ± 0.72	98.03 ± 0.77	0.531
3rd hour	98.17 ± 0.70	98.08 ± 0.73	0.622
4th hour	98.31 ± 0.58	98.28 ± 0.61	0.844
8th hour	98.58 ± 0.65	98.47 ± 0.74	0.111
12th hour	98.28 ± 0.61	98.22 ± 0.68	0.717
16th hour	98.28 ± 0.57	98.17 ± 0.61	0.426
20th hour	98.25 ± 0.60	98.14 ± 0.64	0.451
24th hour	98.28 ± 0.57	98.19 ± 0.58	0.538

During the intraoperative period, SpO_2 was significantly higher in Group 1 at multiple time points (20 to 120 minutes), although both groups-maintained values well within the normal oxygenation range (>99%), indicating clinical stability. Postoperatively, SpO_2 values remained statistically comparable ($p > 0.05$) between groups at all time points, reflecting effective oxygenation in both groups without any clinically relevant desaturation.

Table 7: Comparison of Intraoperative and Postoperative Fentanyl Top-Ups

No. of Fentanyl Top-Ups	Intraop – Group 1	Intraop – Group 2	Postop – Group 1	Postop – Group 2
0	0	26	0	14
1	3	5	0	10
2	16	3	0	6
3	14	1	8	2
4	3	1	13	2

5	–	–	10	1
6	–	–	5	1
Total Patients	36	36	36	36
Median Top-Ups	2	0	4	1
P-value	< 0.001		< 0.001	

This composite table presents a clear side-by-side comparison of intraoperative and postoperative fentanyl top-up requirements in both study groups. Group 1 consistently required more top-ups during both phases, with median values of 2 (intraop) and 4 (postop), compared to Group 2 (0 and 1 respectively). The differences were statistically significant ($p < 0.001$), supporting the superior opioid-sparing effect of the TAP block in laparoscopic hysterectomy.

Table 8: Composite post-operative VAS and Sedation Scores for both groups

Postoperative Hour	Median VAS Group 1	Median VAS Group 2	VAS P-value	Median Sedation Group 1	Median Sedation Group 2	Sedation P-value
1st hr	3.5	3	0.024	1.5	2	0.393
2nd hr	3	2	0.045	2	2	0.476
3rd hr	3	2	0.001	2	2	0.106
4th hr	3	2	< 0.001	2	2	0.006
8th hr	4	2	< 0.001	1	2	< 0.001
12th hr	4	2	< 0.001	1	2	0.003
16th hr	4	2	< 0.001	1.5	2	< 0.001
20th hr	3	2	< 0.001	2	2	0.059
24th hr	3	2	0.001	2	2	0.013

The composite analysis of postoperative Visual Analogue Scale (VAS) and sedation scores over 24 hours revealed that Group 2 consistently experienced lower pain scores compared to Group 1 at all-time intervals, with statistically significant differences observed throughout the postoperative period ($p < 0.05$), indicating more effective analgesia in the TAP block group. Similarly, sedation scores were generally higher in Group 2, particularly between the 4th and 24th postoperative hours, where significant differences were noted ($p < 0.05$), suggesting prolonged comfort and minimal arousal without over-sedation. These findings highlight the superior efficacy of TAP block in providing sustained analgesia and optimal sedation postoperatively.

Table 9: Distribution of patients with respect to postoperative side effect

Side Effects	Group 1	Group 2	Total
Nil	24	31	55

Nausea	6	2	8
Vomiting	6	3	9
Total	36	36	72

In this study, the majority of patients in both groups experienced no side effects, with 24 patients in Group 1 and 31 in Group 2 reporting none. Minor side effects such as nausea and vomiting were slightly more common in Group 1 (6 each) compared to Group 2 (2 and 3, respectively), indicating that the TAP block group had a lower incidence of postoperative gastrointestinal discomfort.

Discussion: For the present study and reference studies here, we have provided more extensive comparison table.

Study Author (Year)	Study Population/Procedure	Primary Outcome Measured	Findings	Similarity with Present Study
Present Study	Laparoscopic hysterectomy	Fentanyl consumption, VAS score, hemodynamic stability	Significant reduction in fentanyl, lower VAS, better hemodynamic stability	Baseline
O'Donnell BD et al (2006) [16]	TAP block analgesia	Efficacy of TAP block for analgesia	Effective postoperative analgesia	Yes
McDonnell JG et al (2007) [15]	TAP block analgesia	Analgesic effectiveness of TAP block	Reduced opioid requirement and better analgesia	Yes
Carney J et al (2008) [17]	TAP block in laparoscopic procedures	VAS scores and opioid requirement	Effective in lowering VAS scores	Yes
Niraj G et al (2009) [18]	TAP block in abdominal surgeries	Reduction in postoperative pain	Reduced need for opioids	Yes
Ra YS et al (2010) [19]	TAP block in laparoscopic surgeries	Pain control and opioid use	Lower pain scores and analgesic requirement	Yes
Parikh BK et al (2013) [20]	TAP block in laparoscopic hysterectomy	Pain scores and fentanyl consumption	Significant pain relief and reduced	Yes

			fentanyl use	
Sharma P et al (2013) [21]	TAP block in general surgeries	Pain relief effectiveness	Effective TAP block analgesia	Yes
Sinha A et al (2013) [22]	TAP block in abdominal surgeries	VAS score reduction	Reduced VAS and analgesic requirement	Yes
Tsuchiya M et al (2012) [23]	TAP block with general anesthesia	Hemodynamic stability, reduced anesthetic requirement	Improved hemodynamics and reduced anesthetic usage	Yes
Petersen PL et al (2012) [24]	TAP block in day-care laparoscopic hysterectomy	Pain scores and opioid use	Mild benefit in pain reduction, modest opioid reduction	Partially
Hosgood SA et al (2012) [25]	TAP block in abdominal surgeries	Postoperative morphine consumption	Lower morphine needs first 6 hrs, less pain Days 1-2	Partially
Belavy D et al (2009) [26]	TAP block efficacy in surgery	Postoperative analgesia comparison	Improved analgesia in study group	Yes
A.A. El-Dawlatly et al (2009) [8]	TAP block using US guidance	Accuracy and effect of TAP block	Safe and effective TAP block	Yes
Conaghan P et al (2010) [27]	Pain relief in abdominal surgery	VAS score and opioid requirement	Better pain relief with TAP block	Yes
Jumana M Baaj et al (2010) [28]	Ultrasound TAP block for analgesia	Post-op pain scores	Effective ultrasound-guided TAP	Yes
De Oliveira Jr G.S. et al (2011) [29]	Multimodal analgesia with TAP block	Effectiveness in pain and opioid use	Lower pain and less opioid need	Yes
Abdallah FW et al (2012) [30]	Opioid-sparing TAP block effect	Pain score and fentanyl reduction	Reduced opioid requirement	Yes
Keir A et al (2013) [31]	TAP block in laparoscopic surgery	Comparison with trocar infiltration	Similar benefit to trocar infiltration	Partially

Salman AE et al (2013) [32]	TAP block analgesic outcome	Pain score and need for analgesia	Reduced pain scores postoperatively	Yes
Sivapurapu V et al (2013) [33]	Postoperative pain after TAP block	VAS score and complications	Effective postoperative analgesia	Yes
Walter CJ et al (2013) [34]	TAP block effect on morphine usage	Morphine usage post-op	Lower morphine use, less pain days 1–2	Yes
Gasanova I et al (2013) [35]	TAP block vs multimodal regimen	Analgesic variability	Reduced pain variation with combo	Yes
Cánovas L et al (2013) [36]	Analgesia in abdominal surgeries	VAS and opioid consumption	Good postoperative pain control	Yes
Elkassabany N et al (2013) [37]	TAP block for postoperative pain	Pain score and morphine use	Effective for pain and morphine use	Yes
Onishi Y et al (2013) [39]	Analgesic outcomes after TAP block	Pain scores and opioid demand	Significant pain relief benefit	Yes

Conclusion: Tap block administered for laparoscopic hysterectomy holds great promise as an adjunct to general anaesthesia. It provides excellent intra and postoperative pain control, as exhibited by the overall reduction in the requirement of opioids. It is thus concluded that USG guided TAP block administered along with general anaesthesia can be used with advantage in laparoscopic hysterectomy for better hemodynamic stability andgood intraoperative and postoperative analgesia.There was no TAP block related complication nor any side effects related to bupivacaine use.

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