ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 8, Issue – 5, October - 2025, Page No.: 54 – 66

A Comparative Study Using Ultrasonography Guided Transverse Abdominis Plane Block between Levobupivacaine versus Levobupivacaine with Dexmeditomedine for Post Operative Pain Relief in Patients Undergoing Unilateral Inguinal Hernia Surgery

[1]Dr. Kishore Keerthy N, DNB, Associate Professor, Department of Anaesthesiology, Kempegowda Institute Of Medical Sciences, Bangalore

[2]Dr. H.S Suraj, MD, Professor, Department of Anaesthesiology, Kempegowda Institute of Medical Sciences, Bangalore

[3]Dr. Noel Jojy, MD, Senior Registrar, Hosmat Hospital's Kalyan Nagar, Karnataka, Bangalore

Corresponding Author: Dr. Kishore Keerthy N, DNB, Associate Professor, Department of Anaesthesiology, Kempegowda Institute Of Medical Sciences, Bangalore

How to citation this article: Dr. Kishore Keerthy N, Dr. H.S Suraj, Dr. Noel Jojy, "A Comparative Study Using Ultrasonography Guided Transverse Abdominis Plane Block between Levobupivacaine versus Levobupivacaine with Dexmeditomedine for Post Operative Pain Relief in Patients Undergoing Unilateral Inguinal Hernia Surgery", IJMACR- October - 2025, Volume – 8, Issue - 5, P. No. 54 – 66.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: The transversus abdominis plane block is a novel regional anaesthetic technique used to provide analgesia to the anterior and lateral abdominal wall. It is an effective and novel method to reduce postoperative pain and analgesic consumption for lower abdominal surgeries.[2]

Dexmeditomedine, is a selective α2 agonist having good analgesic and sedative properties with low cardiac and CNS toxicity. It prolongs the duration of action of local anaesthetics. It reduces the use of opioids for post-operativer analgesia[4] The use of Ultrasound helps in better delineation of the anatomical structures which makes the block safer and more reliable, hence avoids complications.[5]

Objectives of the study

To compare the effect of Levobupivacaine versus Levobupivacaine with Dexmeditomedine in ultrasound guided transversus abdominis plane block for unilateral hernioplasty under general anesthesia with respect to

A. Assess duration of postoperative analgesia.

B. Total analgesic requirement in first 24 hours

C. To assess any side effects if any

Material and Method

Study Design: Prospective Randomized Clinical Study.

Study Period: 18 months.

Place of Study: Kempegowda Institute of Medical Sciences and Research Centre.

Sample Size: Two groups of 35 each

Result: 70 patients aged 18-60 years belonging to ASA I and II undergoing elective unilateral inguinal hernia surgeries were randomised and allocated to study by computer generated numbers.

Discussion: In the study a total of 70 patients belonging to ASA grade I and II category posted for open unilateral inguinal hernia surgery.

Keywords: Abdominal Surgery, Analgesia, Dexmeditomedine, Levobupivacaine, Visceral Site, Vas Score

Introduction

Patient normally suffer from significant pain after abdominal surgery, with major source of pain being in the anterior abdominal wall and the abdominal viscera.[1]

Therefore a multimodal approach to postoperative analgesia after inguinal surgery is required, so as to block nociceptive transmission from the abdominal wall incision and visceral site.

Transverse abdominis plane (TAP) block is a pheripheral nerve block designed to anaesthetise the nerves supplying the anterior abdominal wall (ie. T6 to L1).[6]

Local anaesthetic is injected in between the internal oblique and transverse abdominis muscles just deep to the facial plane where the sensory nerves pass.

The TAP block is performed usually, within the ilio-lumbar triangle of Petit, bounded inferiorly by the iliac crest, posteriorly by the latissimus dorsi, and anteriorly by the external oblique (EO) muscles. The needle is advanced through the EO and IO fascia layers. The aim is to place the tip of the needle between the IO and the TA muscles. Studies in cadavers and healthy volunteers suggest that a 20 ml solution spreads from the iliac crest to the costal margin and ensures a complete sensory blockade of the abdominal wall.[9]

Ultrasound has allowed providers to identify and administer the block with greater accuracy under direct visualisation. Levobupivacaine was designed in the late 1970s.[12] It is a levorotatory pure s (-) enantiomer of racemic bupivacaine. It has a similar clinical profile and a lower toxicity in the cardiovascular and central nervous system than bupivacaine.[13]

The present study is aimed at comparing the efficacy of TAP block done under USG guidance with Levobupivacaine and Levobupivacaine with dexmedetomidine for post-operative pain relief in patients undergoing unilateral inguinal hernia surgery with reference to duration of post-operative analgesia, side effects and complications.

Objectives of the Study

To compare the effect of Levobupivacaine versus Levobupivacaine with Dexmeditomedine in ultrasound guided transversus abdominis plane block for unilateral hernioplasty under general anesthesia with respect to

A. Assess duration of postoperative analgesia.

B. Total analgesic requirement in first 24 hours

C. To assess any side effects if any

Material and Method

Source of Data

Present study entitled “A comparative study using ultrasound guided transverse abdominis plane block between Levobupivacaine versus Levobupivacaine with Dexmedetomidine for post-operative pain relief in patients undergoing unilateral inguinal hernia surgeries” at Kempegowda Institute of Medical Sciences and Research Centre, Bangalore.

Study Design: Prospective Randomized Clinical Study.

Study Period: 18 months.

Place of Study: Kempegowda Institute of Medical Sciences and Research Centre.

Sample Size: Two groups of 35 each

Formula: $n = 2S^2 \frac{(Z_1 + Z1)^2}{(M1 - M2)^2}$

Where

N = Required sample size.

Z1 = Z value associated with alpha

Z2 = Z value associated with Beta

M1 = Mean of outcome (Pain score at 24 hours) group 1

M2 = Mean of the outcome (pain score at 24 hours) group 2

Dropout rate: 20-30 subjects

Total sample size: Two groups of 35 subjects each.

Confidence interval (2 sided) – 95% (Alpha error 5%)

Power 90% (Beta error 10%)

Statistical Analysis

- Descriptive statistics of VAS score and analgesic requirements for unilateral inguinal hernia surgeries will be analyzed in both the groups and expressed in terms of mean and standard deviation.
- Unpaired t- test would be used to compare VAS and analgesic requirement between the two groups.

Inclusion Criteria

1. Patients aged between 18-60 years.
2. Patient willing to give informed consent.
3. American Society of Anaesthesiologist (ASA) physical status 1 and 2.
4. Elective unilateral inguinal hernia mesh repair.
5. Patients without coagulation disorders

Exclusion Criteria

1. Patients not giving informed consent
2. Infection at the site of block.
3. Patients on chronic opioid use.
4. Coagulopathy and patients on anticoagulants.
5. Known allergy to local anesthetic agents.

Observations and Results

Study design

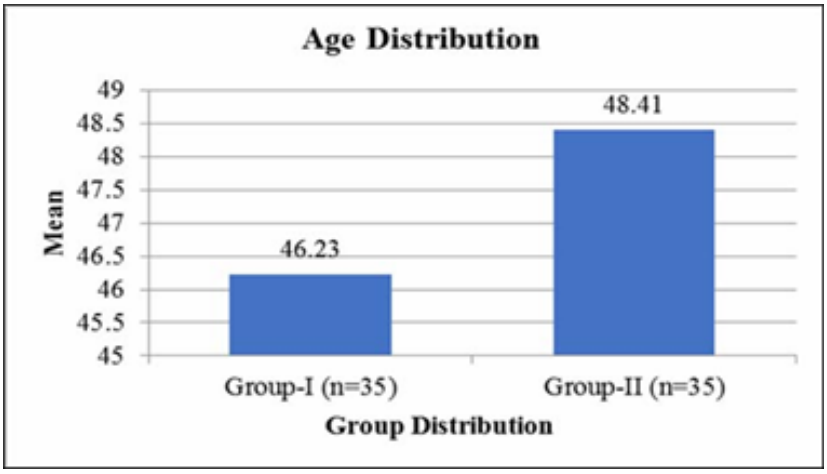
A total of 70 patients belonging to ASA grade I and II posted for open unilateral inguinal hernia surgery

- Group I (n=35) = Ultrasound guided Unilateral transversus abdominis plane block with 19 ml of 0.5% Levobupivacaine and 1ml of normal saline on side of surgery.
- Group II (n=35) = Ultrasound guided Unilateral transversus abdominis plane block with 19 ml of 0.5% Levobupivacaine and 1 ml (1mcg/kg) Dexmeditomedine on side of surgery.

Table 1: Distribution according to age in Group-I and Group-II

Age	Group-I (n=35)	Group-II (n=35)	t-test	P-value
Mean ± SD	46.23 ± 7.56	48.41± 8.35	1.15	0.26

Graph 1: Distribution according to age in Group-I and Group-II

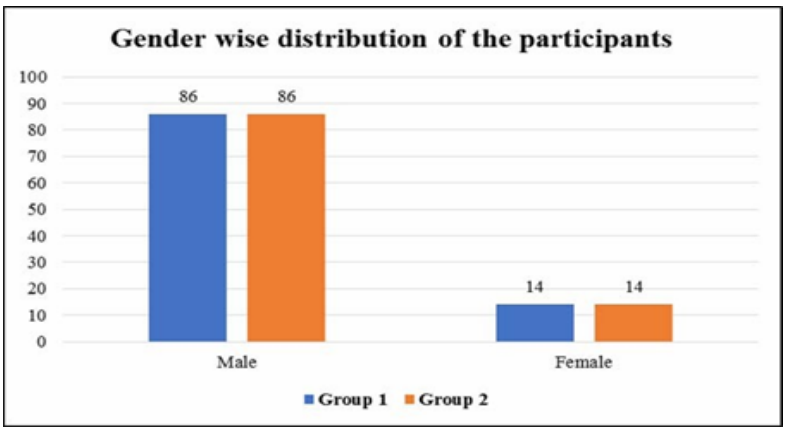


Study showed that the mean age in Group-I was 46.23 years with a standard deviation of 7.56, while in Group-II; it was 48.41 years with a standard deviation of 8.35. P value of 0.26 indicated no significant age difference between the groups.

Table 2: Gender wise distribution of the participants

	Group 1		Group 2	
	Frequency	Percentage	Frequency	Percentage
Male	30	83	30	83
Female	5	17	5	17
Total	35	100	35	100

Graph 2: Distribution according to gender in Group I and Group II

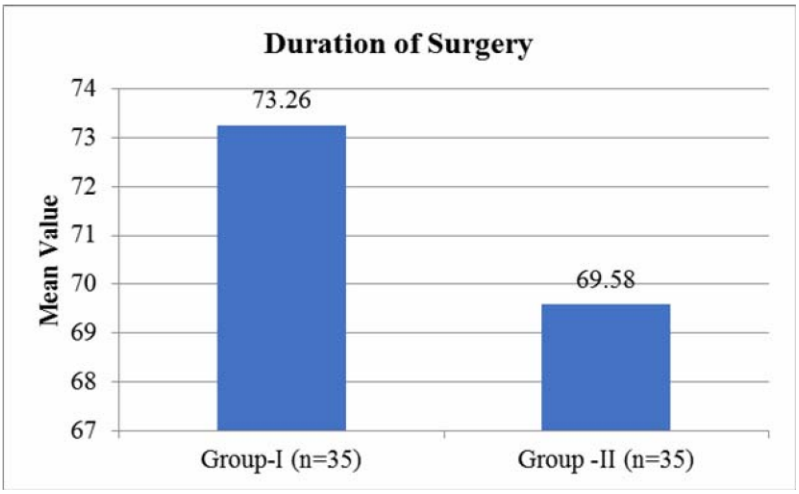


The table presents the gender distribution of participants in two groups. In both Group 1 and Group 2, the male participants consistently account for 86% of the total, while female participants represent 14%. Each group includes 35 participants, with 30 males and 5 females in each, resulting in uniform gender representation across the groups. The total number of participants in each group is 35, maintaining a 100% distribution overall. This equal distribution in gender proportions suggests that both groups have identical demographic compositions in terms of gender. The results indicate a balanced representation within the groups, with no variation in the gender ratio between Group 1 and Group 2.

Table 3: Distribution according to duration of surgery in min in Group-I and Group-II

Duration of surgery in min	Group-I (n=35)	Group -II (n=35)	t-test	P-value
Mean ± SD	73.26 ± 7.47	69.58 ± 6.24	-2.24	0.03

Graph 3: Distribution according to duration of surgery in min in Group-I and Group-II

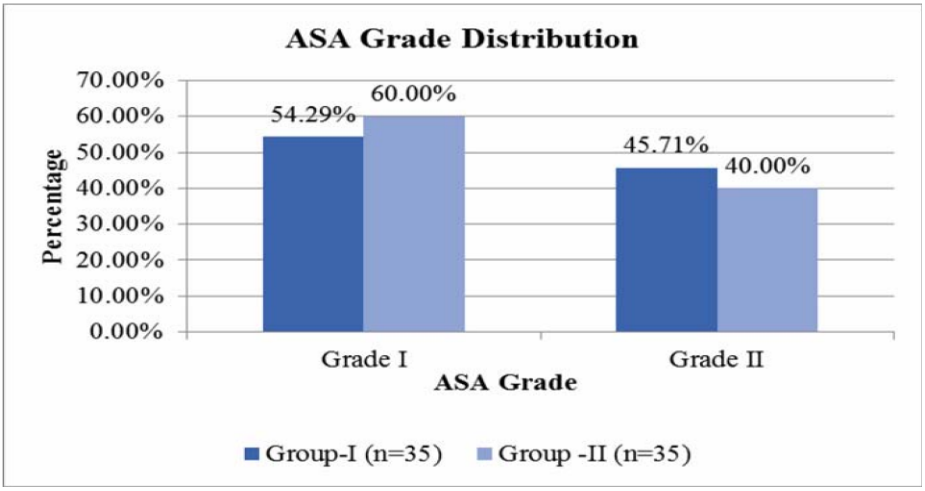


Group-I had an average surgery duration of 73.26 minutes, with a standard deviation of 7.47, while Group-II had an average surgery duration of 69.58 minutes, with a standard deviation of 6.24. The t-test and a p-value of 0.03 showed no significant difference in surgery duration between the two groups.

Table 4: Distribution according to ASA Grade in min in Group-I and Group-II

ASA Grade	Group-I (n=35)	Group -II (n=35)	χ^2 -test	P-value
	No of cases (%)	No of cases (%)		
I	19(54.29%)	21 (60.00%)	0.23	0.63
II	16 (45.71%)	14 (40.00%)		

Graph 4: Distribution according to ASA Grade in min in Group-I and Group-II



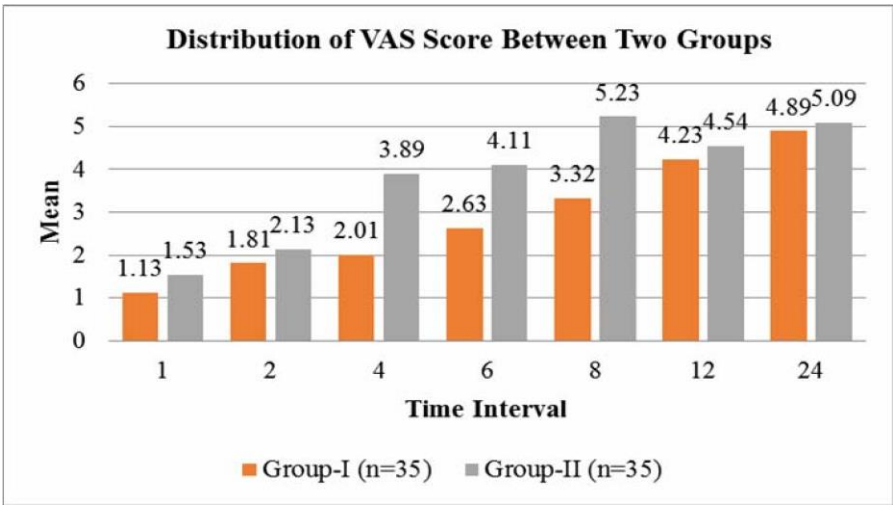
In this comparison of ASA Grade distribution between Group-I and Group-II, ASA

Grade I was observed in 54.29% of Group-I and 60.00% of Group-II, while ASA Grade II was present in 45.71% of Group-I and 40.00% of Group-II. The $\chi 2$-test resulted in a non-significant p-value of 0.63 indicating no significant difference in ASA Grade distribution between the two groups.

Table 5: Comparison of visual analog scale (VAS) score between the two groups at different time intervals interchange groups

Time interval	Group-II (n=35)	Group-I (n=35)	t-test	P-value
1	1.13 ± 0.41	1.53 ± 0.88	2.43	0.018
2	1.81 ± 0.20	2.13 ± 0.76	2.40	0.019
4	2.01 ± 2.11	3.89 ± 1.83	3.98	0.002
6	2.63 ± 0.18	4.11±1.65	5.28	<0.0001
8	3.32 ± 1.21	5.23±2.69	-0.13	0.90
12	4.23 ± 0.35	4.54 ± 2.12	4.96	<0.000
24	4.89 ± 1.42	5.09 ± 2.66	2.26	0.002

Graph 5: Comparison of visual analog scale (VAS) score between the two groups at different time intervals interchange groups



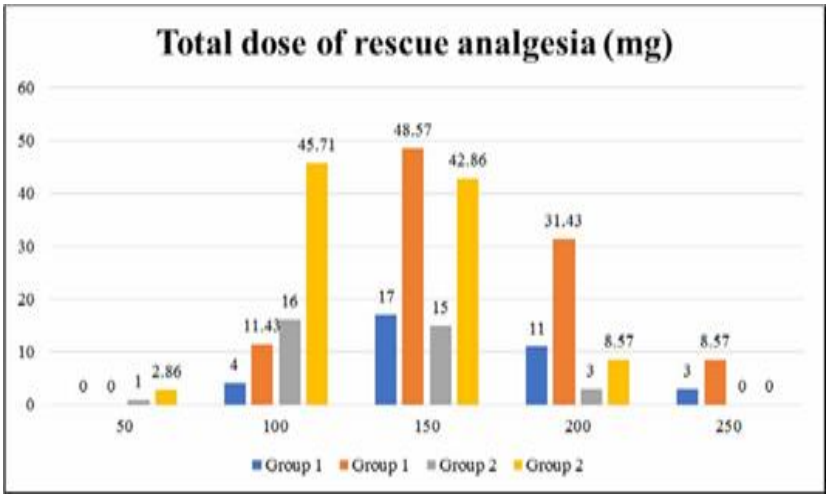
The comparison of Visual Analog Scale (VAS) scores between Group-I and Group-II revealed significant differences at most time intervals. Group-II consistently had lower scores than Group-I at 1, 2, 4, 6, 12, and 24 hours, with p-values indicating statistical significance (all $p < 0.05$). However, at the 8-hour mark, the difference was not significant ($p = 0.90$).

Table 6: Total dose of rescue analgesia

Total dose of rescue analgesia (mg)	Group 1		Group 2	
	Frequency	Percentage	Frequency	Percentage
50	0	0	1	2.86

100	4	11.43	16	45.71
150	17	48.57	15	42.86
200	11	31.43	3	8.57
250	3	8.57	0	0
Total	35	100	35	100
Mean ± Std Deviation	168.57 ± 40.37		128.57 ± 34.90	
P value	<0.001			

Graph 6: Total dose of rescue analgesia



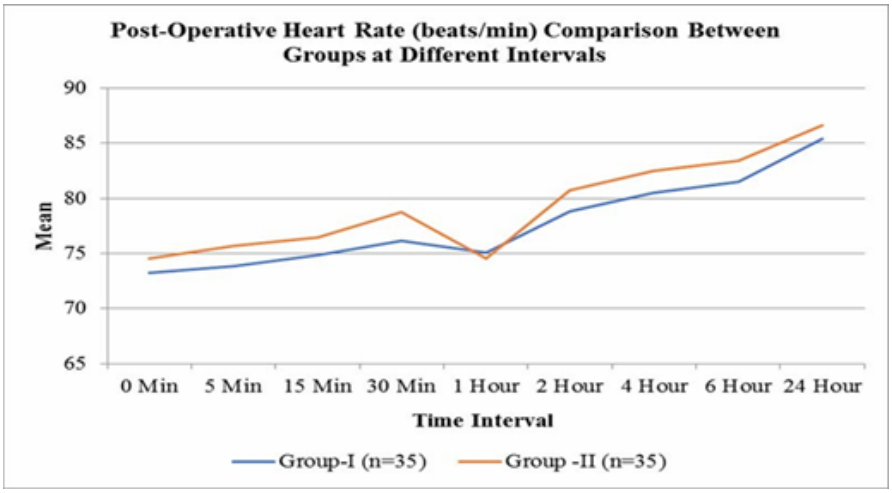
The table compares the total dose of rescue analgesia required by two groups. Group 1 shows a higher mean dose of 168.57 ± 40.37 mg, with nearly half the participants (48.57%) receiving 150 mg. In contrast, Group 2 has a lower mean dose of 128.57 ± 34.90 mg, with 45.71% receiving 100 mg. Notably, no one in Group 2 required the highest doses of 200 mg or 250 mg, while Group 1 had 31.43% and 8.57% in these categories, respectively. The significant P value of <0.001 indicates a statistically significant difference between the groups, suggesting that Group 1 required more analgesia overall compared to Group 2.

Table 7: Comparison of Post-operative heart rate (beats/min) at different time interval in between both groups

Post-operative HR	Group-I (n=35)	Group -II (n=35)	p-value
0 Min	73.26 ± 5.9	74.50 ± 5.11	0.35
5 Min	73.86 ± 4.71	75.66 ± 5.72	0.16
15 Min	74.83 ± 5.7	76.43 ± 4.19	0.31
30 Min	76.12 ± 7.84	78.76 ± 6.77	0.14
1 Hour	75.10 ± 7.97	74.56 ± 3.03	0.71
2 Hour	78.83 ± 7.77	80.73 ± 5.46	0.24

4 Hour	80.52 ± 6.19	82.47 ± 7.15	0.22
6 Hour	81.46 ± 5.14	83.39 ± 6.22	0.16
24 Hour	85.38 ± 6.14	86.62 ± 5.22	0.37

Graph 7: Comparison of Post-operative heart rate (beats/min) at different time interval in between both groups

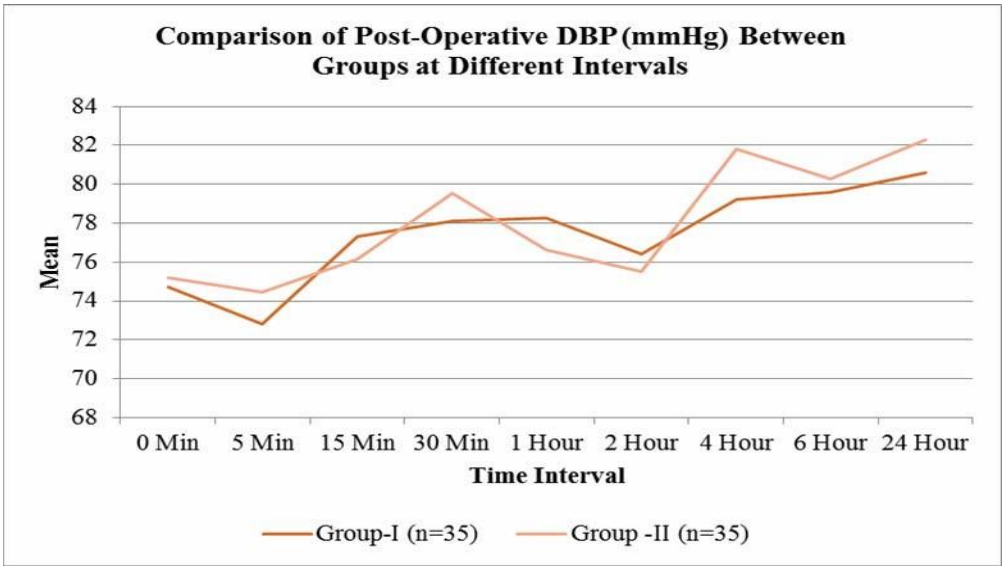


The post-operative heart rates between Group-I and Group-II showed no significant differences at any time interval, with all p-values above 0.14.

Table 8: Comparison of Post-operative DBP (mmhg) at different time interval in between both groups

Post-operative DBP	Group-I (n=35)	Group -II (n=35)	p-value
0 Min	74.73 ± 4.72	75.2 ± 5.04	0.69
5 Min	72.80 ± 5.82	74.43 ± 5.76	0.24
15 Min	77.33 ± 6.82	76.13 ± 6.98	0.52
30 Min	78.10 ± 6.97	79.56 ± 7.03	0.38
1 Hour	78.26 ± 5.80	76.60 ± 5.00	0.20
2 Hour	76.43 ± 7.29	75.5 ± 6.34	0.70
4 Hour	79.23 ± 6.35	81.8 ± 7.55	0.13
6 Hour	79.58 ± 5.17	80.29 ± 5.41	0.55
24 Hour	80.58 ± 6.31	82.30 ± 7.26	0.29

Graph 8: Comparison of Post-operative DBP (mmhg) at different time interval in between both groups

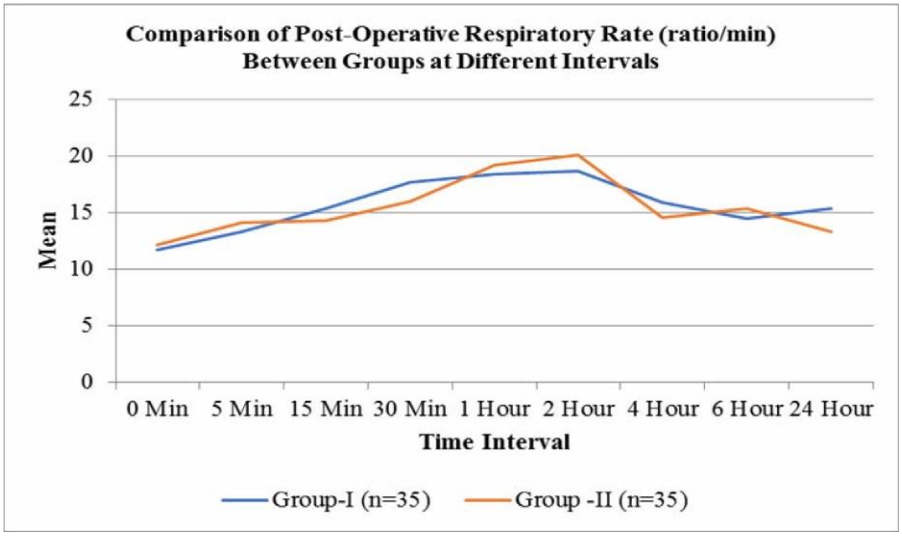


At 0 minutes, the DBP was 74.73 ± 4.72 mmHg in Group-I and 75.20 ± 5.04 mmHg in Group-II (p = 0.69). Similarly, at 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, and 24 hours, there were no statistically significant differences between the two groups (all p-values > 0.13).

Table 9: Comparison of Post-operative respiratory rate/min at different time interval in between both groups

Post-operative RR	Group-I (n=35)	Group -II (n=35)	p-value
0 Min	11.74 ± 2.50	12.13 ± 2.80	0.53
5 Min	13.36 ± 3.21	14.14 ± 3.47	0.33
15 Min	15.39 ± 3.78	14.28 ± 2.40	0.15
30 Min	17.67 ± 4.06	15.97 ± 4.11	0.08
1 Hour	18.37 ± 4.27	19.20 ± 4.66	0.44
2 Hour	18.65 ± 3.78	20.13 ± 4.23	0.13
4 Hour	15.92 ± 3.48	14.55 ± 3.09	0.09
6 Hour	14.47 ± 4.52	15.36 ± 3.71	0.37
24 Hour	15.34 ± 3.39	13.33 ± 5.63	0.07

Graph 9: Comparison of Post-operative respiratory rate/min at different time interval in between both groups



At 0 minutes, the RR was 11.74 ± 2.50/min in Group-I and 12.13 ± 2.80/min in Group-II (p = 0.53). Similarly, at 5 minutes, 15 minutes, 30 minutes, 1 hour, 2 hours, 4 hours, 6 hours, and 24 hours, there were no statistically significant differences between the two groups (all p-values > 0.07).

Discussion

In our study a total of 70 patients belonging to ASA grade I and II category posted for open unilateral inguinal hernia surgery.

Demographic Profile across the Groups: In our study, the majority of patients were of the age group of 40-60 years in the two groups. There was no statistically significant difference between the two groups in regard to gender, duration of surgery, height, weight, BMI and most of the patients belonged to ASA I category.

Time For Rescue Analgesia: In our study, the patients who received TAP block with dexmeditomedine had prolonged analgesia in the postoperative period and their first request for analgesia came much later compared to patients who received TAP block with only Levobupivacaine.

This finding is similar to studies done by Abdelaal et al where addition of dexmeditomedine to levobupivacaine in TAP block prolonged the duration of post operative analgesia and time for request of rescue analgesia was 205±10.2 mins.[90]

Total Post-Operative Analgesic Requirement: In our study, the patients who received TAP block with dexmeditomedine had prolonged analgesia in the postoperative period and their consumption of IV analgesics was less compared to patients who received TAP block with only Levobupivacaine.

Conclusion

In our study we have found that addition of dexmedetomidine to Levobupivacaine significantly prolong duration of analgesia. It also decreases the need for post – operative analgesics. There were no significant haemodynamic changes due to addition of dexmedetomidine. We found that dexmeditomedine can safely be used as an adjuvant for Levobupivacaine in TAP block.

References

1. Jakobsson J, Wickerts L, Forsberg S, Ledin G. Transversus abdominal plane (TAP) block for

postoperative pain management: a review. F1000Research. 2015;4.

2. Rebecca L. Johnson, Sandra L. Kopp, Jens Kessler and Andrew T. Gray, Millers textbook of Anesthesia 9th edition. Ultrasound guided Transverse abdominis plane block (1465-1466)
3. Jaap Vuyk, Elske Sitsen and Marije Reekers, Millers textbook of Anesthesia 9th edition. Intravenous Anesthetics – Dexmeditomedine (670-675)
4. Bajwa SJ, Kaur J. Clinical profile of levobupivacaine in regional anesthesia: A systematic review. Journal of Anaesthesiology Clinical Pharmacology. 2013 Oct 1;29(4):530-9.
5. Hesham Elsharkawy and Thomas F. Bendtsen, Ultrasound guided Transversus Abdominis Plane Blocks, Hadzic's textbook of Regional Anaesthesia and Acute Pain Management, second edition (Page 642-649).
6. Rozen WM, Tran TMN, Ashton MW, Barrington MJ, Ivanusic JJ, Taylor GI. Refining the course of the thoracolumbar nerves. A new understanding of the innervations of the anterior abdominal wall. Clin Anat 2008; 21: 325–33
7. Rafi AN. Abdominal field block: a new approach via the lumbar triangle. Anaesthesia 2001; 56: 1024–6.
8. Peterson PL, Mathiesen O, Torup H, Dahl JB. The transversus abdominis plane block a valuable option for post-operative analgesia. A topical review Acta Anaesthesiol Scand 2010 May 54(5) 529-35
9. McDonnell JG, O'Donnell BD, Farrell T, et al. Transversus abdominis plane block: a cadaveric and radiological evaluation. Reg Anesth Pain Med 2007; 32: 399–404
10. Karim Mukhtar, MB BCh, MSc, FRCA Royal Liverpool and Broadgreen University Hospitals, Liverpool U.K. Transversus abdominis plane block. The Journal of NYSORA 2009; 12: 28-33
11. Xiao F, Liu L, Xu W, Zhang Y, Wang L. Dexmedetomidine can extend the duration of analgesia of levobupivacaine in transversus abdominis plane block: a prospective randomized controlled trial. Int J Clin Exp Med. 2017 Jan 1;10(10):14954-60.
12. Heppolette CA, Brunnen D, Bampoe S, Odor PM (June 2020). "Clinical Pharmacokinetics and Pharmacodynamics of Levobupivacaine". Clinical Pharmacokinetics. 59 (6): 715–745.
13. McLeod GA, Burke D. Levobupivacaine. Anaesthesia. 2001; 56:331–41.
14. Karim Mukhta, Royal Liverpool and Broadgreen University Hospitals, Liverpool U. K., THE JOURNAL OF THE NEW YORK SCHOOL OF REGIONAL ANESTHESIA ,2009 May Volume 12 (28-30). (WWW.NYSORA.COM)
15. Carney J, McDonnell JG, Ochana A, et al. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. Anesth Analg 2008; 107:2056-60.
16. O'Donnell BD, McDonnell JG, McShane AJ. The transversus abdominis plane (TAP) block in open retropubic prostatectomy. Reg Anesth Pain Med 2006 ; 31:91
17. Mukhtar K, Singh S. Transversus abdominis plane block for laparoscopic surgery. Br J Anaesth 2009; 102(1):143-4

18. Tran TMN, Ivanusic JJ, Hebbard P, et al. Determination of spread of injectate after ultrasound-guided transversus abdominis plane block: a cadaveric study. Br J Anaesth 2009; 102(1): 123-7
19. Hebbard P. Transversus abdominis plane (TAP) block. 2007; Website: www. heartweb.com.au /downloads TAPblock.pdf
20. Margaret W. Local anesthetic agents. In: Wood M and Wood JJA Edt. Drugs and anesthesia. Pharmacology for Anaesthesiologist. 2nd ed, London: WILLIAMS AND WILKINS. 319-345.
21. Senard M, Kaba A, Jacquemin MJ, Maquoi LM, Geortay MP, Honoré PD, et al. Epidural levobupivacaine 0.1% or ropivacaine 0.1% combined with morphine provides comparable analgesia after abdominal surgery. Anesth Analg. 2004;98:389–94.
22. Cacciapuoti A, Castello G, Francesco A. Levobupivacaina, bupivacaina racemica e ropivacaina nel blocco del plesso brachiale. Minerva Anestesiol. 2002;68:599–605.
23. Piangatelli C, De Angelis C, Pecora L, Recanatini F, Cerchiara P, Testasecca D. Levobupivacaine and ropivacaine in the infraclavicular brachial plexus block. Minerva Anestesiol. 2006;72:217–21.
24. Pujol E, Faulí A, Anglada MT, López A, Pons M, Fàbregas N. Ultrasound-guided single dose injection of 0.5% levobupivacaine or 0.5% ropivacaine for a popliteal fossa nerve block in unilateral hallux valgus surgery Rev Esp Anestesiol Reanim. 2010;57:288–92
25. Ishida T, Sakamoto A, Tanaka H, Ide S, Ishida K, Tanaka S, Mori T, Kawamata M. Transversus abdominis plane block with 0.25 % levobupivacaine: a prospective, randomized, double-blinded clinical study. J Anesth. 2015 Aug;29(4):557-61. doi: 10.1007/s00540-015-1993-0. Epub 2015 Mar 1. PMID: 25725780.
26. PubChem [Internet]. Bethesda (MD): National Library of Medicine (US), National Center for Biotechnology Information; 2004-. PubChem Compound Summary for CID 92253, Levobupivacaine; [cited 2024 Aug. 23].
27. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long acting local anesthetics, ropivacaine and levobupivacaine. Acta Biomed. 2008;79:92–105.
28. Burlacu CL, Buggy DJ. Update on local anesthetics: Focus on levobupivacaine. Ther Clin Risk Manag. 2008;4:381–92.
29. Santos AC, Karpel B, Noble G. The placental transfer and fetal effects of levobupivacaine, racemic bupivacaine, and ropivacaine. Anesthesiology. 1999 Jun;90(6):1698-703.
30. Camorcia M, Capogna G, Berritta C, Columb MO. The relative potencies for motor block after intrathecal ropivacaine, levobupivacaine, and bupivacaine. Anesth Analg. 2007 Apr;104(4):904-7.
31. Leone S, Di Cianni S, Casati A, Fanelli G. Pharmacology, toxicology, and clinical use of new long acting local anesthetics, ropivacaine and levobupivacaine. Acta Biomed. 2008 Aug 1;79(2):92-105.
32. Purdue Pharma L.P. Chirocaine (levobupivacaine injection) prescribing information. Norwalk (CT), USA: 1999.
33. Bajwa SJ, Kaur J. Clinical profile of levobupivacaine in regional anesthesia: A

systematic review. J Anaesthesiol Clin Pharmacol. 2013 Oct;29(4):530-9.

34. Welch DR. Biologic considerations for drug targeting in cancer patients. Cancer Treat Rev. 1987 Dec;14(3–4):351–8.
35. Jalonen J, Hynynen M, Kuitunen A, Heikkilä H, Perttilä J, Salmenperä M, et al. Dexmedetomidine as an anesthetic adjunct in coronary artery bypass grafting. Anesthesiology. 1997 Feb;86(2):331–45.
36. Memiş D, Turan A, Karamanlioğlu B, Pamukçu Z, Kurt I. Adding dexmedetomidine to lidocaine for intravenous regional anesthesia. AnesthAnalg. 2004 Mar;98(3):835– 40, table of contents.
37. Haselman MA. Dexmedetomidine: a useful agent to consider in some high risk situation. AANA J.2008;76(5):335-9
38. Panzer O, Moitra V, Robert N Sladen. Pharmacology of sedative-analgesic agents – Dexmedetomidine, remifentanil, ketamine, volatile anaesthetics and the role of Mu antagonists. Critical Clin2009; 25:451-69.
39. Arian SR, Ruchlow RM, Uhrich TD, Ebert TJ. Efficacy of Dexmedetomidine versus morphine for post-operative analgesia after major in-patient surgery. AnaesthAnalg2004; 98:153-8.
40. Ebert TJ, Hall JE, Barney JA, Uhrich TD, Colinco MD. The effects of increasing plasma concentration dexmedetomidine in humans. Anaesthesiology 2009; 93:382-94.
41. Venn RM, Karol MD, Grounds RM, Pharmacokinetics of dexmedetomidine infusions for sedation of post-operative requiring intensive care. Br. J Anaesth 2002; 88:669-75.
42. Precede (Dexmedetomidine) Package Insert. Abort Park II; Abott Laboratories;2004.
43. Abdelaal W, Metry AA, Refaat M, Ragaei M, Nakhla G. Comparative study between levobupivacine versus levobupivacaine plus dexmedetomidine for transversus abdominis plane block “tap” in post-operative pain management after abdominoplasty. Enliven: J Anesthesiol Crit Care Med. 2015;2(2):004.
44. Varshney A, Prabhu M, Periyadka B, Nanjundegowda DC, Rao A. Transversus abdominis plane (TAP) block with levobupivacaine versus levobupivacaine with dexmedetomidine for postoperative analgesia following cesarean delivery. J Anaesthesiol Clin Pharmacol. 2019 Apr-Jun;35(2):161-164.
45. Romi R, Hoda W, Kumar S, Bharati B, Toppo S, Singh D, Oraon P, Kumari R, Lakra A, Priye S. Comparative Study of Levobupivacaine Versus Levobupivacaine with Dexmedetomidine as an Adjuvant in Transversus Abdominis Block for Postoperative Pain Relief in Abdominal Hysterectomy Patients: A Randomized, Double-Blind Study. Cureus. 2024 May 2;16(5): e59523.