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Comparing Transversus Abdominis Plane Block and Wound Infiltration without Liposome Anesthetics in Adult Patients: Systematic Review and Meta-Analysis

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Abstract

Backrub and aim: The aim of present systematic review and meta-analysis was comparing postoperative pain at rest within 24 h after surgery and postoperative pain during movement within 24 h after surgery of Transversus abdominis plane block and Wound infiltration without liposome anesthetics in adult patients.

Method: From the electronic databases, PubMed, Cochrane Library, Embase have been used to perform a systematic literature between 2011 and May 2021. For Data extraction, two reviewers blind and independently extracted data from abstract and full text of studies that included. Moreover mean difference with 95% confidence interval (CI), fixed effect model and Inverse-variance method were calculated. The Meta analysis have been evaluated with the statistical software Stata/MP v.16 (The fastest version of Stata).

Result:A total of 881 potentially relevant titles and abstracts were found during the electronic search. Finally, sixteen studies required for this systematic review. Meta-analysis showed lower postoperative pain scores at rest at 2,4,6,12 and 24 was h -0.66, -0.56 , -0.87 , -0.78 and -0.24, respectively ($p<0.05$) , except 1h was -0.30 ($p>0.05$). Also, postoperative pain scores during movement at 2, 4, 6 and 24 was -1.05, -0.65, -0.73 and -0.76, respectively ($p<0.05$), except 1h was -1.03 ($p>0.05$).

Conclusion: Transversus abdominis plane block could lead to more effective analgesia than wound infiltration without liposome anesthetics in adult patients in 2 to 24 hours after surgery.

Keywords: Transversus abdominis plane block, wound infiltration, anesthetics, and adult patients

Introduction

Visceral tissue damage is one of the most common postoperative problems, surgical incision can also cause postoperative pain(1). The transverse abdominis plane (TAP) block is a peripheral

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nerve block designed to anesthetize the nerves supplying the anterior abdominaland it can gradually become an alternative to analgesic technology (2). Currently, the use of traditional local anesthetic wound infiltration is a popular method used by many surgeons. Recent studies show that many physicians and surgeons have compared TAP block and wound infiltration, however, there is insufficient evidence and the results are unclear. Therefore the aim of present systematic review and meta-analysis was Comparing Transversus abdominis plane block and wound infiltration without liposome anesthetics in adult patients.

Methods

Search strategy

From the electronic databases, PubMed, Cochrane Library, Embase, ISI have been used to perform a systematic literature over the last ten years between February 2011 and May 2021. The reason for choosing studies in the last ten years is to be able to provide sufficient evidence in this area and use newer studies. Therefore, a software program (Endnote X8) has been utilized for managing the electronic titles. Searches were performed with mesh terms:

("Abdominal Muscles"[Mesh]) OR “Transversus abdominis plane block"[Mesh] AND "wound infiltration"[Mesh] AND (“Anesthesia"[Mesh] OR “Anesthesia, Local"[Mesh])) AND "Adult"[Mesh]) AND "Randomized Controlled Trials as Topic"[Mesh]. In other databases, the search was performed with the keyword Anesthesia, Transversus abdominis plane block, wound infiltration, local anesthetics, and adult patients.

This systematic review has been conducted on the basis of the key consideration of the PRISMA Statement–Preferred Reporting Items for the Systematic Review and Meta-analysis(3), and PICO strategy (Table1).

Selection criteria

Inclusion criteria

1. Randomized controlled trials studies
2. Transversus abdominis plane block vs wound infiltration
3. Age >16 years of age.
4. Patients undergoing abdominal surgeries
5. English language

Exclusion criteria

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 2875 - 2887
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1. Prospective and retrospective cohort studies. In vitro studies, reviews, case-Control Studies, case report and animal studies

2. Liposomal local anesthetics

3 Incomplete or inconsistent data for the purpose of the present study.

Table1. PICO strategy

PECO strategy	**Description**
P	Population: adult patients undergoing abdominal surgeries
I	Intervention: Transversus abdominis plane block
C	Comparison: wound infiltration
O	Outcome: pain and postoperative complications

Data Extraction and method of analysis

The data have been extracted from the research included with regard to the study, years, study design, sample size,surgery, age,anesthesia, technology, drug, and operative site.

Cochrane Collaboration's tool (4) used to assessed quality of the RCT studies that included in present meta-analysis. The scale scores for low risk was 1 and for High and unclear risk was 0, Scale scores range from 0 to 6 and higher score means higher quality.

For Data extraction, two reviewers blind and independently extracted data from abstract and full text of studies that included. Prior to the screening, kappa statistics was carried out in order to verify the agreement level between the reviewers. The kappa values were higher than 0.80.

Moreover mean difference with 95% confidence interval (CI), fixed effect model and Inverse-variance method were calculated. Random effects were used to deal with potential heterogeneity and I^2 showed heterogeneity. I^2 values above 50% signified moderate-to-high heterogeneity. The Meta analysis have been evaluated with the statistical software Stata/MP v.16 (The fastest version of Stata).

Results

According to the purpose of the study, in the initial search with keywords, 881 articles were found. In the first step of selecting studies, 854 studies were selected to review the abstracts. Then, studies that did not meet the inclusion criteria were excluded from the study. In the second step, the full text of 59 studies was reviewed. Finally, sixteen studies were selected (Figure1).

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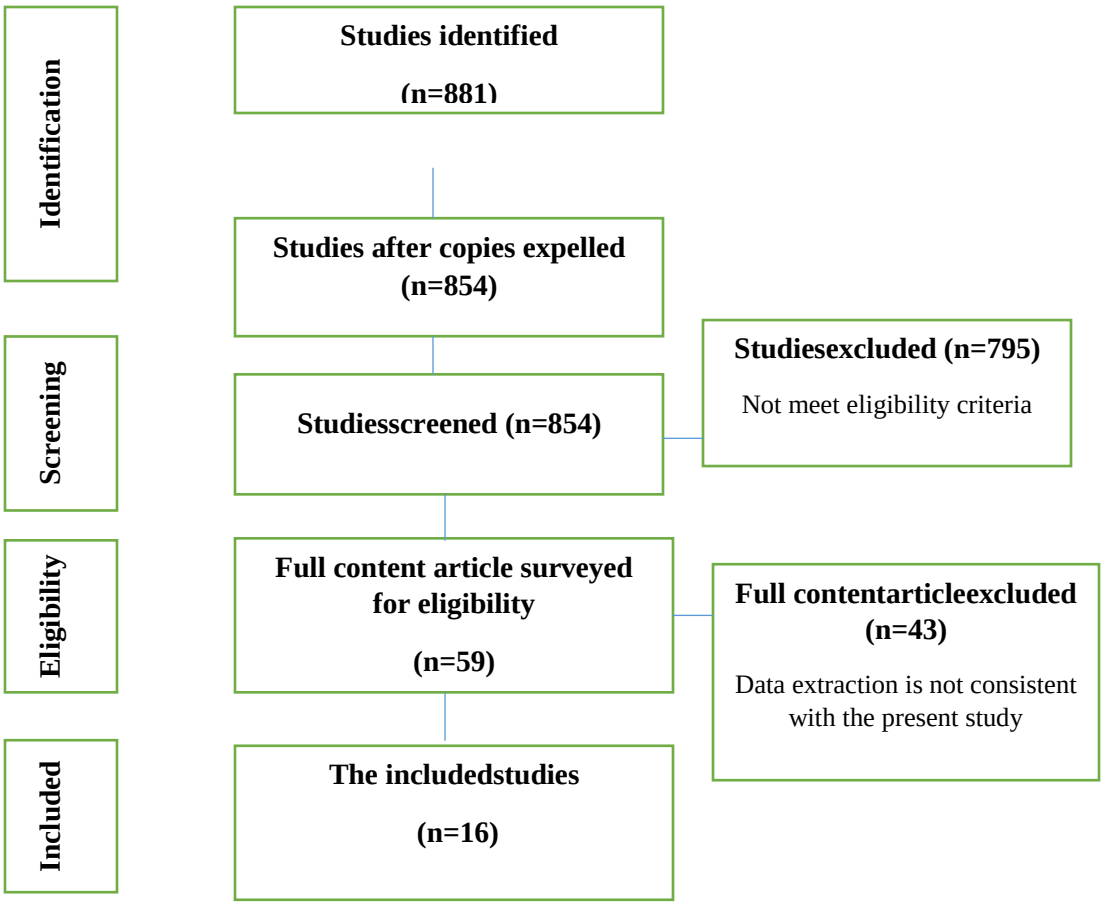

Figure 1. Study Attrition

Characteristics

Sixteen studies (Randomized controlled trial) have been included in present article. The Number of patients in Transversus Abdominis Plane Block group was 523 and in Wound Infiltration group was 521, a total was 1044 with rang of age 16-85 years. In all studies used Bupivacaine except two studies that used Ropivacaine and one study used Levobupivacaine(Table2).

Table2. Studies selected for systematic review and meta-analysis.

Study. Years	Study design	Number of patients		Mean/rang of age (years)	Technology		medication
		examination Group	Control group		examination Group	Control group	
Jiang et al.,2021 (5)	RCT	30	30	18–75	Ultrasound-guidedbilateral injection	Surgical site infiltration	R

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Kargar et al.,2019 (6)	RCT	24	21	18-50	Ultrasound-guided bilateral injection	infiltration in the trocar insertion sites	B
Noureldin et al.,2018 (7)	RCT	42	40	>18	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Li et al.,2018 (8)	RCT	20	20	18-75	Ultrasound-guided bilateral injection	infiltration in the trocar insertion sites	R
Mughal et al.,2018 (9)	RCT	30	30	18-80	Laparoscope-guided unilateral injection	Surgical site infiltration	B
Garcia et al.,2018 (10)	RCT	70	70	41-48	Laparoscope-guided unilateral injection	Surgical site infiltration	B
Görkem et al.,2017 (11)	RCT	42	46	18-45	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Rashid et al.,2017 (12)	RCT	28	28	>18	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Tawfik et al.,2017 (13)	RCT	39	39	22-31	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Elamin et al., 2015 (14)	RCT	40	40	18-85	Laparoscope-guided unilateral injection	Surgical site infiltration	B
Aydogmus et al.,2014 (15)	RCT	35	35	23-35	Ultrasound-guidedbilateral injection	Surgical site infiltration	L
Ibrahim et al.,2014 (16)	RCT	21	21	>18	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Skjelsager et al.,2013 (17)	RCT	23	25	18-80	Ultrasound-guidedbilateral injection	Surgical site infiltration	B
Ortiz et al.,2012 (18)	RCT	39	35	18-64	Ultrasound-guidedbilateral injection	infiltration in the trocar insertion sites	B
Tolchard et al.,2012 (19)	RCT	21	22	>16	Ultrasound-guidedbilateral injection	infiltration in the trocar insertion sites	B
Atim etal.,2011 (20)	RCT	19	19	30-63	Ultrasound-guidedbilateral injection	Surgical site infiltration	B

RCT:randomized controlled trial; B: Bupivacaine; R: Ropivacaine; L: Levobupivacaine

Bias assessment

According to Cochrane Collaboration's tool, seven studies had a total score of 6/6, six studies had a total score of 5/6, and three studies had a total score of 4/6. This result showed low risk of bias in all studies or High quality for all studies that included (Table3).

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Table3. Risk of bias assessment (Low (+), unclear (?), high (-))

study	Random sequence generation	allocation concealment	blinding of participants and personnel	blinding of outcome assessment	incomplete outcome data	selective reporting	Total score
Jiang et al.,2021(5)	+	-	+	+	+	+	5
Kargar et al.,2019 (6)	+	+	+	+	+	+	6
Noureldin et al.,2018 (7)	+	+	+	?	+	+	5
Li et al.,2018 (8)	+	+	+	+	+	+	6
Mughal et al.,2018 (9)	+	+	+	+	+	+	6
Garcia et al.,2018 (10)	+	?	?	+	+	+	4
Görkem et al.,2017 (11)	+	+	?	+	+	+	5
Rashid et al.,2017 (12)	?	+	+	-	+	+	4
Tawfik et al.,2017 (13)	+	+	+	+	+	+	6
Elamin et al., 2015 (14)	+	+	+	?	+	+	5
Aydogmus et al.,2014 (15)	+	+	?	-	+	+	4
Ibrahim et al.,2014 (16)	?	+	+	+	+	+	5
Skjelsager et al.,2013 (17)	+	+	+	+	+	+	6
Ortiz et al.,2012 (18)	+	+	+	+	+	+	6
Tolchard et al.,2012 (19)	?	+	+	+	+	+	5
Atim etal.,2011 (20)	+	+	+	+	+	+	6

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Postoperative pain score (VAS) at rest within 24 h after surgery

Subgroup meta-analysis:

Mean difference of postoperative pain score (VAS) at rest at 1 hour was -0.30 (MD, -0.30 95% CI -0.60, 0.01; p>0.05) among five studies and heterogeneity found (I^2=37.44%; P =0.17). Mean difference of postoperative pain score (VAS) at rest at 2 h was -0.66 (MD,-0.66 95% CI -1.08, -0.23; p<0.05) among six studies and heterogeneity found (I^2=26.41%; P =0.24). Mean difference of postoperative pain score (VAS) at rest at 4 h was -0.56 (MD,-0.56 95% CI -1.11, -0.02; p<0.05) among three studies and heterogeneity found (I^2<0%; P =0.78). Mean difference of postoperative pain score (VAS) at rest at 6 h was -0.87 (MD,-0.87 95% CI -1.08, -0.66; p<0.05) among six studies and heterogeneity found (I^2<0%; P =0.89). Mean difference of postoperative pain score (VAS) at rest at 12 h was -0.78 (MD,-0.78 95% CI -0.91, -0.65; p<0.05) among four studies and heterogeneity found (I^2=18.13%; P =0.30). Mean difference of postoperative pain score (VAS) at rest at 24 h was -0.24 (MD,-0.24 95% CI -0.35, -0.12; p<0.05) among nine studies and heterogeneity found (I^2=62.84%; P =0.01). Overall mean difference of postoperative pain score (VAS) at rest within 24 after surgery was -0.53 (MD,-0.53 95% CI -0.60, -0.45; p<0.05). The test of group difference was statistically significant (p=0.00). This result showed lower pain scores at rest at 2-24 h, except 1h (Figure2).

Postoperative pain scores during movement within 24 h after surgery

Subgroup meta-analysis:

Mean difference of Postoperative pain scores during movement at 1 hour was -1.03 (MD, -1.03 95% CI -2.07, 0.00; p>0.05) among two studies and heterogeneity found (I^2=3.37%; P =0.31). Mean difference of Postoperative pain scores during movement at rest at 2 h was -1.05 (MD,-1.05 95% CI -1.57, -0.53; p<0.05) among four studies and heterogeneity found (I^2=0%; P =1.00). Mean difference of Postoperative pain scores during movement at rest at 4 h was -0.65 (MD,-0.65 95% CI -1.23, -0.06; p<0.05) among three studies and heterogeneity found (I^2<0%; P =0.66). Mean difference of Postoperative pain scores during movement at rest at 6 h was -0.73 (MD,-0.73 95% CI -1.22, -0.24; p<0.05) among three studies and heterogeneity found (I^2<0%; P =0.62). Mean difference of Postoperative pain scores during movement at rest at 24 h was -0.76 (MD,-0.76 95% CI -1.06, -0.46; p<0.05) among six studies and heterogeneity found (I^2=0%; P =0.52). Overall mean difference of Postoperative pain scores during movement at rest within 24

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 2875 - 2887
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after surgery was -0.80 (MD,-0.80 95% CI -1.01, -0.59). The test of group difference was no statistically significant (p=0.83). This result showed lower pain scores at rest at 2-24 h, except 1h (Figure2). This result showed lower pain scores at rest at 2-24 h, except 1h (Figure2).

Discussion

The aim of present systematic review and meta-analysis was comparing postoperative pain at rest within 24 h after surgery and postoperative pain during movement within 24 h after surgery of Transversus abdominis plane block and Wound infiltration without liposome anesthetics in adult patients. Present Meta-analysis showed lower oostoperative pain scores at rest at 2,4,6,12 and 24 was h -0.66, -0.56 , -0.87 , -0.78 and -0.24, respectively ($p<0.05$) , except 1h was -0.30 ($p>0.05$). also, postoperative pain scores during movement at 2,4,6 and 24 was -1.05, -0.65, -0.73 and -0.76, respectively ($p<0.05$) , except 1h was -1.03 ($p>0.05$). Heterogeneity was considered low to moderate in almost all studies, all studirs had a low risk of bias and high quality. The present study shows that TAP block has more analgesic action than WI, Albi-Feldzer et al. Also reported that the WI group scored lower than the TAP block group at the end of surgery(21). Another study showed that there was no significant difference between the WI and saline groups in pain scores 4 hours after surgery(22). Perhaps the reason for the short duration of action of WI is that WI leads to rapid drug absorption. A study showed that local anesthetics are not injected into the space between muscles, which contains many nerve branches, but are injected into muscle tissue, which causes accelerate drug absorption (2). Other studies have shown that TAP block, local anesthetics are injected into the space between the transverse abdominis and internal oblique muscles (23). Studies show that the use of continuous catheter technology can increase the duration of WI analgesia(24-26). A meta-analysis study reported that WI with preperitoneal wound catheters was as effective a method as epidural analgesia, and was shorter in comparison with the results of the present study 30.Cai et al.,2019 Showed similar results to the present study, WI had the same analgesic effect as TAP block only at the one-hour postoperative time point(27). The present study had limitations, including, not all studies had reviewed for 2 to 24 hours, some studies had used scores that became an impractical mean, some studies had exceeded the data that violated the data, which were excluded from the study.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 2875 - 2887
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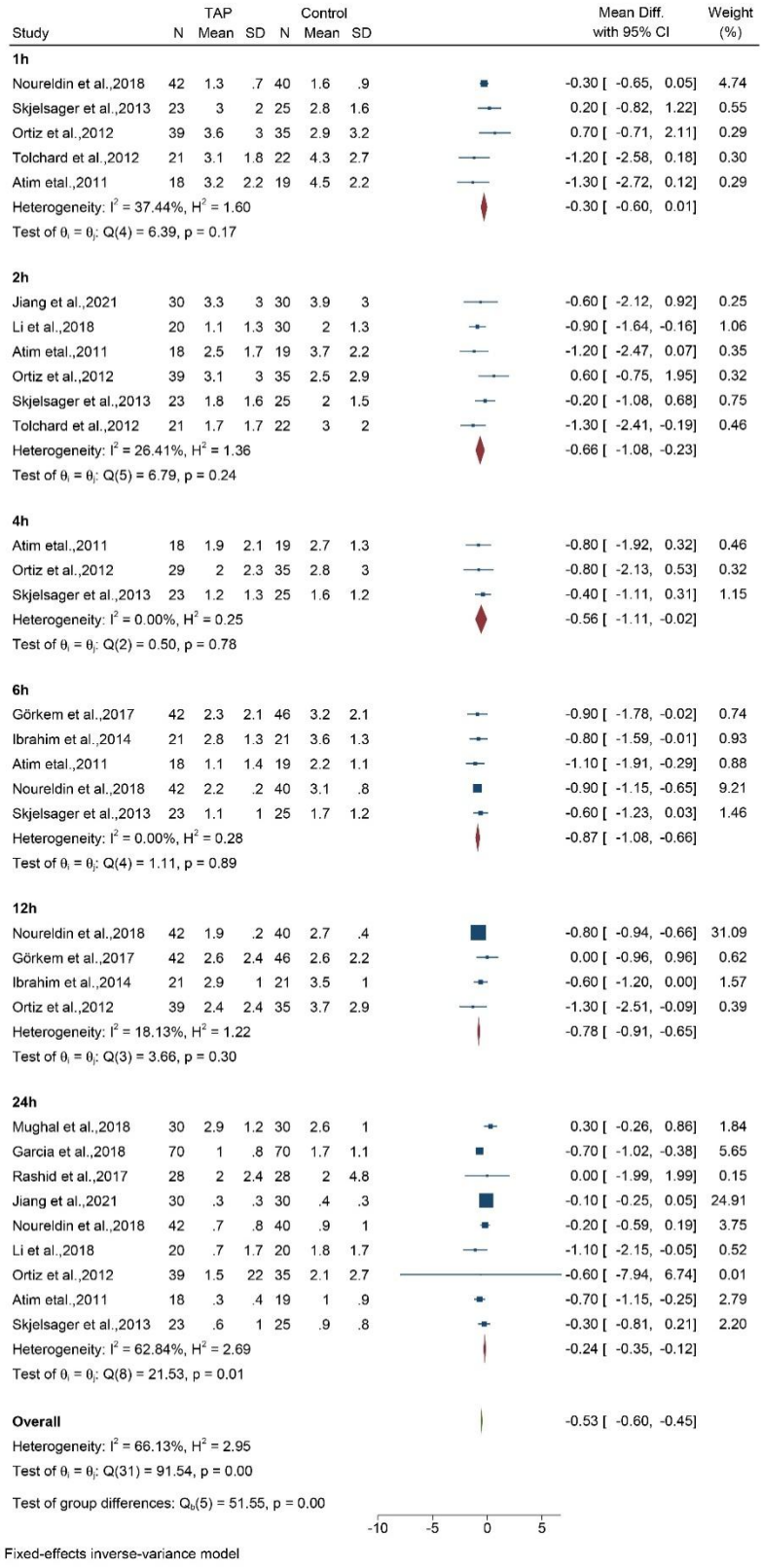

Figure2. Forest plot showed postoperative pain score (VAS) at rest within 24 h after surgery

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 2875 - 2887
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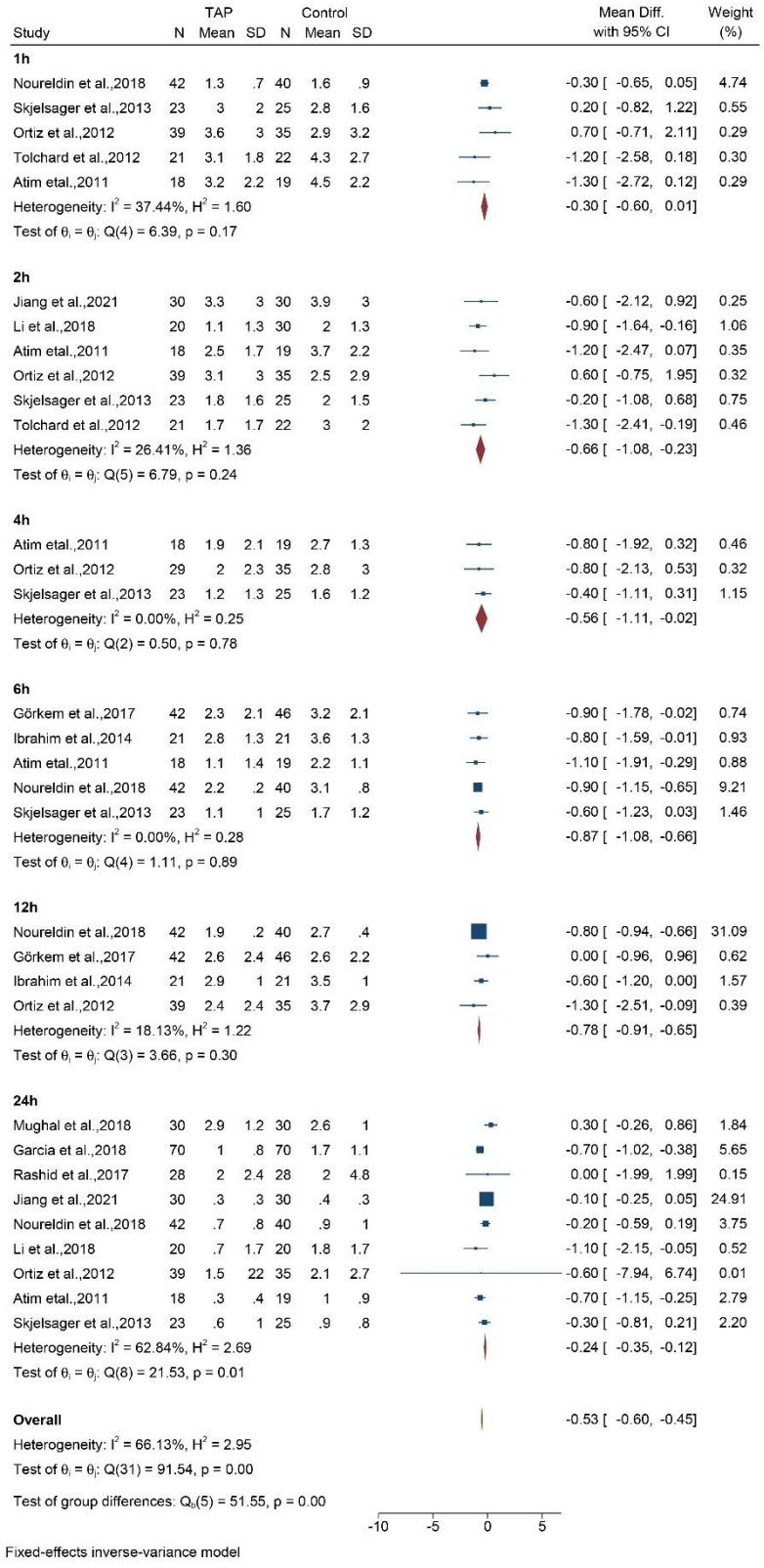

Figure2. Forest plot showed postoperative pain scores during movement within 24 h after surgery

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Received 25 April 2021; Accepted 08 May 2021.

The quality of the selected study was high in the present meta-analysis and low to moderate heterogeneity was observed between the results of the studies. Also, there was no heterogeneity in the working method of heterogeneous studies, which is anadvantage for better presentation of evidence. Further RCT studies with high sample size, examination time, types of surgical interventions, and examination of anesthetic volume are required. The present study only examined patients over 16 years of age, requiring meta-analysis to examine the pediatric population as well.

Conclusion

Present systematic review and meta-analysis showed there was statistically significant difference between Transversus abdominis plane block and wound infiltration without liposome anesthetics in adult patients in postoperative pain at rest at 2h-24 h after surgery, except In the first hour, also there was statistically significant difference between Transversus abdominis plane block and wound infiltration without liposome anesthetics in adult patients in postoperative pain during movement at 2h-24 h after surgery, except In the first hour. Meta-analysis showed that Transversus abdominis plane block could lead to more effective analgesia than wound infiltration without liposome anesthetics in adult patients in 2 to 24 hours after surgery.

References

1. Schug S. 2011–the global year against acute pain. SAGE Publications Sage UK: London, England; 2011.
2. Tsai H-C, Yoshida T, Chuang T-Y, Yang S-F, Chang C-C, Yao H-Y, et al. Transversus abdominis plane block: an updated review of anatomy and techniques. BioMed research international. 2017;2017.
3. Moher D, Liberati A, Tetzlaff J, Altman DG, Altman D, Antes G, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement (Chinese edition). Journal of Chinese Integrative Medicine. 2009;7(9):889-96.
4. Higgins J, Altman D, Gøtzsche P, Jüni P, Moher D, Oxman A, et al. Cochrane bias methods group; cochrane statistical methods group. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials BMJ. 2011;343(7829):d5928.
5. Jiang X-j, Li Z, Li Q, Zhang H-y, Tang X-h, Zhu T. Comparison of single-injection ultrasound-guided thoracic paravertebral block with transversus abdominis plane block in peritoneal dialysis catheter implantation: a randomized controlled trial. Trials. 2021;22(1):1-9.
6. Kargar R, Minas V, Gorgin-Karaji A, Shadjoo K, Padmehr R, Mohazzab A, et al. Transversus abdominis plane block under laparoscopic guide versus port-site local anaesthetic infiltration in laparoscopic excision of endometriosis: a double-blind randomised placebo-controlled trial. BJOG: An International Journal of Obstetrics & Gynaecology. 2019;126(5):647-54.

7. Noureldin EH, Mohamed EA, Mohamed AA. Laparoscopic-guided transversus abdominis plane block versus trocar site local anesthetic infiltration in gynecologic laparoscopy. Gynecological Surgery. 2018;15(1):1-6.
8. Li Q, Tang X, Tao T, Zhang W, Qin W, Zhang J, et al. A randomized controlled trial of comparing ultrasound-guided transversus abdominis plane block with local anesthetic infiltration in peritoneal dialysis catheter implantation. Blood purification. 2018;45(1-3):8-14.
9. Mughal A, Khan A, Rehman J, Naseem H, Waldron R, Duggan M, et al. Laparoscopic-assisted transversus abdominis plane block as an effective analgesic in total extraperitoneal inguinal hernia repair: a double-blind, randomized controlled trial. Hernia. 2018;22(5):821-6.
10. Ruiz-Tovar J, Garcia A, Ferrigni C, Gonzalez J, Levano-Linares C, Jimenez-Fuertes M, et al. Laparoscopic-guided transversus abdominis plane (TAP) block as part of multimodal analgesia in laparoscopic Roux-en-Y gastric bypass within an enhanced recovery after surgery (ERAS) program: a prospective randomized clinical trial. Obesity surgery. 2018;28(11):3374-9.
11. Görkem Ü, Koçyiğit K, Toğrul C, Güngör T. Comparison of bilateral transversus abdominis plane block and wound infiltration with bupivacaine for postoperative analgesia after cesarean delivery. Journal of the Turkish German Gynecological Association. 2017;18(1):26.
12. Rashid A, Gorissen K, Ris F, Gosselink M, Shorthouse J, Smith A, et al. No benefit of ultrasound-guided transversus abdominis plane blocks over wound infiltration with local anaesthetic in elective laparoscopic colonic surgery: results of a double-blind randomized controlled trial. Colorectal Disease. 2017;19(7):681-9.
13. Tawfik MM, Mohamed YM, Elbadrawi RE, Abdelkhalek M, Mogahed MM, Ezz HM. Transversus abdominis plane block versus wound infiltration for analgesia after cesarean delivery: a randomized controlled trial. Anesthesia & Analgesia. 2017;124(4):1291-7.
14. Elamin G, Waters PS, Hamid H, O'Keeffe HM, Waldron RM, Duggan M, et al. Efficacy of a laparoscopically delivered transversus abdominis plane block technique during elective laparoscopic cholecystectomy: a prospective, double-blind randomized trial. Journal of the American College of Surgeons. 2015;221(2):335-44.
15. Aydogmus M, Sinikoglu S, Naki M, Ocak N, Sanlı N, Alagol A. Comparison of analgesic efficiency between wound site infiltration and ultra-sound-guided transversus abdominis plane block after cesarean delivery under spinal anaesthesia. Hippokratia. 2014;18(1):28.
16. Ibrahim M, El Shamaa H. Efficacy of ultrasound-guided oblique subcostal transversus abdominis plane block after laparoscopic sleeve gastrectomy: A double blind, randomized, placebo controlled study. Egyptian Journal of Anaesthesia. 2014;30(3):285-92.
17. Skjelsager A, Ruhnau B, Kistorp T, Kridina I, Hvarness H, Mathiesen O, et al. Transversus abdominis plane block or subcutaneous wound infiltration after open radical prostatectomy: a randomized study. Acta Anaesthesiologica Scandinavica. 2013;57(4):502-8.
18. Ortiz J, Suliburk JW, Wu K, Bailard NS, Mason C, Minard CG, et al. Bilateral transversus abdominis plane block does not decrease postoperative pain after laparoscopic cholecystectomy when compared with local anesthetic infiltration of trocar insertion sites. Regional Anesthesia & Pain Medicine. 2012;37(2):188-92.
19. Tolchard S, Davies R, Martindale S. Efficacy of the subcostal transversus abdominis plane block in laparoscopic cholecystectomy: Comparison with conventional port-site infiltration. Journal of anaesthesiology, clinical pharmacology. 2012;28(3):339.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 2875 - 2887
Received 25 April 2021; Accepted 08 May 2021.

20. Atim A, Bilgin F, Kilickaya O, Purtuloglu T, Alanbay I, Orhan M, et al. The efficacy of ultrasound-guided transversus abdominis plane block in patients undergoing hysterectomy. Anaesthesia and intensive care. 2011;39(4):630-4.
21. Albi-Feldzer A, Mouret-Fourme E E, Hamouda S, Motamed C, Dubois P-Y, Jouanneau L, et al. A double-blind randomized trial of wound and intercostal space infiltration with ropivacaine during breast cancer surgery: effects on chronic postoperative pain. Anesthesiology. 2013;118(2):318-26.
22. Abbas M, Hamade A, Choudhry M, Hamza N, Nadeem R, Ammori B. Infiltration of wounds and extraperitoneal space with local anesthetic in patients undergoing laparoscopic totally extraperitoneal repair of unilateral inguinal hernias: a randomized double-blind placebo-controlled trial. Scandinavian Journal of Surgery. 2010;99(1):18-23.
23. Kwikiriza A, Kiwanuka J, Firth P, Hoeft M, Modest V, Ttendo S. The analgesic effects of intrathecal morphine in comparison with ultrasound-guided transversus abdominis plane block after caesarean section: a randomised controlled trial at a Ugandan regional referral hospital. Anaesthesia. 2019;74(2):167-73.
24. Bhardwaj S, Devgan S, Sood D, Katyal S. Comparison of local wound infiltration with ropivacaine alone or ropivacaine plus dexmedetomidine for postoperative pain relief after lower segment cesarean section. Anesthesia, essays and researches. 2017;11(4):940.
25. Mohta M, Rani A, Sethi AK, Jain AK. Efficacy of local wound infiltration analgesia with ropivacaine and dexmedetomidine in tubercular spine surgery–A pilot randomised double-blind controlled trial. Indian journal of anaesthesia. 2019;63(3):182.
26. Braito M, Dammerer D, Schlager A, Wansch J, Linhart C, Biedermann R. Continuous wound infiltration after hallux valgus surgery. Foot & ankle international. 2018;39(2):180-8.
27. Cai Q, Gao M-l, Chen G-y, Pan L-h. Transversus abdominis plane block versus wound infiltration with conventional local anesthetics in adult patients underwent surgery: a systematic review and meta-analysis of randomized controlled trials. BioMed research international. 2020;2020.