LESS

Original Article

Laparosc Endosc Surg Sci 2022;29(4):193-199
DOI: 10.14744/less.2022.76993

An effective method for pain control after inguinal hernia repair with TAPP technique: Transversus abdominis plane block a case–control study

Mustafa Sami Bostan

Department of General Surgery, Tokat Gaziosmanpaşa University Medical Faculty, Türkiye

ABSTRACT

Introduction: We aimed to investigate the effects of transversus abdominis plane (TAP block) block on pain control and postoperative analgesic use in patients who underwent laparoscopic transabdominal preperitoneal (TAPP) repair.

Materials and Methods: A single-center retrospective study was conducted to investigate the efficacy of TAP block in patients who were operated on with the laparoscopic TAPP technique for inguinal hernia. The data of 92 patients who were operated with the TAPP technique between 2019 and 2020 were analyzed. The patients were divided into two groups as TAP block applied and not applied. Those who underwent TAP block were also divided into two subgroups as preincisional and postincisional.

Results: The TAP block group (n=34) was statistically the same as the control group (n=58) in terms of age, gender, and body mass index. Visual analog scale scores in the TAP block group were statistically lower in the first 24 h ($p<0.001$) and on the 10th day ($p<0.001$) compared to the control group. The level of nonsteroidal anti-inflammatory administered intravenously in the first 24 h and orally in the first 10 days after discharge was significantly lower in the TAP block group ($p<0.001$ and $p<0.001$, respectively). There was no statistical difference in the preincisional or postincisional application of TAP block.

Conclusion: TAP block reduces pain and analgesic use in the early period after the TAPP procedure

Keywords: Laparoscopic transabdominal preperitoneal repair, Nonsteroidal anti-inflammatory drug, Transversus abdominis plane block, Visual analog scale

Introduction

Inguinal hernia repair is one of the most commonly performed surgeries worldwide. Postoperative (acute/chronic) pain is one of the most pressing problems for clinicians after inguinal hernia repair. Studies have shown that factors such as preoperative anxiety, preoperative pain on the inguinal region, intraoperative damage to the inguinal nerve, and young age have an effect on postoperative pain.[1-3]

Laparoscopic hernia repairs are becoming more common with the technological development and the progress in minimally invasive surgical techniques. It has been demonstrated by many studies with a high level of evi-

Received: 17.10.2022 **Revision:** 02.12.2022 **Accepted:** 03.12.2022
Correspondence: Mustafa Sami Bostan, M.D., Tokat Gaziosmanpaşa Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, Tokat, Türkiye
e-mail: mustafasamibostan@gmail.com

dence that post-operative pain is less in laparoscopic hernia repairs compared to open surgery.[4,5] However, the persistence of pain after laparoscopic hernia repair despite less pain has led clinicians to different pain control methods. Studies have been conducted on different methods such as local infiltration anesthesia, quadratus lumborum block, rectus sheet block, and ilioinguinal nerve block.[6-8] One of these methods is transversus abdominis plane (TAP) block. TAP block has been used in different abdominal surgeries with successful results.[9-12] TAP block, which is also applied in open hernia repairs, has been shown to be successful in postoperative pain control.[13] We have seen that studies on TAP block are mostly focused on open hernia repair, since it is less common in laparoscopic hernia repair. For this reason, we aimed to investigate the effects of TAP block on pain control and the need for postoperative analgesic use in patients who underwent laparoscopic transabdominal preperitoneal (TAPP) repair.

Materials and Methods

A single-center retrospective study was planned to investigate the efficacy of TAP block in patients who were operated with the laparoscopic TAPP technique for inguinal hernia. Approval was obtained from Tokat Gaziosmanpaşa University Clinical Research Ethics Committee (22-KAEK-213). The data of the patients who were operated with this technique between 2019 and 2020 were evaluated.

Patients over the age of 18 who underwent laparoscopic TAPP surgery for inguinal hernia were included in the study. Patients who were converted to open surgery, whose data could not be accessed, who did not come to the postoperative follow-up, and who were re-operated due to post-operative complications were excluded from the study.

TAP Block Technique

TAP block was performed under general anesthesia with USG guidance. With a 22G needle, 75 mg of bupivocaine diluted with 20 ml of saline was applied to the layer between the internal oblique and the transversus abdominis. TAP block was applied just before the beginning of the operation (preincisional) or immediately after the end of the operation (postincisional) while the patient was still under general anesthesia. TAP block was applied unilaterally in unilateral hernia repairs and bilaterally in bilateral hernia repairs.

Surgery

The surgical procedure was performed by a single surgeon. It was performed with the standard 3-port technique (10 mm umbilical camera port, 2 5 mm working ports). Polypropylene mesh was used. The mesh is fixed with absorbable fixation device. The peritoneum was closed with absorbable sutures. In the unilateral laparoscopic TAPP standard procedure, one of the ports is entered into the umbilicus and the other is entered into the opposite side, and local anesthesia was applied to the port incisions after the ports were removed so that the ipsilateral TAP block would not be effective on the pain caused by this port incision, so that it would not affect our results.

Follow-up

The patients were divided into two groups as TAP block group and control group. Demographic profile and body mass index (BMI) of participants were recorded. Those who underwent TAP block were also divided into two subgroups as preincisonal and postincisional. Patients who did not have post-operative TAP block were routinely administered 20 mg of tenoxicam IV in 2 intermittent doses. The pain status of the patients who underwent TAP block was followed closely and 20 mg of tenoxicam was administered IV in 2 doses, intermittently according to the pain status. In all patients, 50 mg of tramadol was added to the treatment according to their pain status. Analgesic treatments were recorded.

Visual analog scale (VAS) scores of the patients were recorded on the 1st post-operative day. VAS scores at 1st and 10th day were asked by independent observer (nurse). Patients were prescribed 800 mg ibuprofen tablets at discharge. They were asked to take it when there was pain, to come for the control on the 10th day after the operation and to record how much analgesic they took until the control. VAS scores and the amount of analgesics they used were recorded on the 10th day postoperatively.

Statistical Methods

Statistical analyses of the data were conducted using the SPSS (Version 22.0, SPSS Inc., Chicago, IL, USA) software. Descriptive statistics of numerical data were presented using mean±standard deviation or median (min-max) based on the normal distribution of data. Frequency distributions of categorical data were reported as numbers and percentages (%). Proportion

comparisons or correlations between categorical variables were conducted using the Chi-square test or Fisher's exact test. The normality distribution of the data was assessed with the Shapiro–Wilk test. To compare data that were normally distributed between two independent groups, the Student's t-test was used, and the Mann–Whitney U test was used to compare data that were not normally distributed. Statistical comparisons of numerical data between three independent groups were performed using one-way ANOVA or Kruskal–Wallis test, depending on data normal distribution. To determine the groups from which the difference was found in comparisons found to be significantly different, the Tukey test was used for post hoc pairwise comparisons following the ANOVA test, and the Dunn-Bonferroni test following the Kruskal–Wallis test. P<0.05 was accepted as the statistical significance level.

Results

A total of 92 patient data were analyzed in the study. The mean age of the patients was 50.76±14.91 (min-max: 21–76). The mean BMI of the patients was 27.10±4.68 (min-max: 18.8–51.6). TAP block was not applied in 63% (n=58) of the patients, preincisional was applied in 21.7% (n=20), and postincisional was performed in 15.2% (n=14). The ages and BMI of the patients were statistically similar between control group and TAP block group (preincisional+postincisional) [respectively, p=0.665, p=0.672, Table 1].

The sex distribution of the patients was statistically similar between control group and TAP block group [p=1.000, Table 1]. The distribution of diagnosis, recurrence surgery, and use of opioid-derived analgesics was statistically similar between the groups [p=0.811, p=0.690, p=0.097, Table 1]. The distribution of post-operative intravenous nonsteroidal anti-inflammatory (NSAIDs) usage rates between the groups was

Table 1. Comparison of demographic and clinical characteristics between groups with and without transversus abdominis plane (TAP) block

	No TAP (n=58)	TAP (preinc.+postinc.) (n=34)	Total	p
Sex				
Male	53 (91.4%)	32 (94.1%)	85 (92.4%)	1.000[b]
Female	5 (8.6%)	2 (5.9%)	7 (7.6%)	
Diagnosis				
Right	27 (46.6%)	15 (44.1%)	42 (45.7%)	0.811[a]
Left	19 (32.8%)	10 (29.4%)	29 (31.5%)	
Bilateral	12 (20.7%)	9 (26.5%)	21 (22.8%)	
Recurrence surgery				
No	48 (82.8%)	27 (79.4%)	75 (81.5%)	0.690[a]
Yes	10 (17.2%)	7 (20.6%)	17 (18.5%)	
Post-op intravenous NSAIDs				
No	0 (0%)	23 (67.6%)	24 (26.1%)	<0.001[a]
Yes	58 (100%)	11 (32.4%)	68 (73.9%)	
Opioid analgesic				
No	45 (77.6%)	31 (91.2%)	76 (82.6%)	0.097[a]
Yes	13 (22.4%)	3 (8.8%)	16 (17.4%)	
Age	50.24±16.14	51.65±12.72	50.76±14.91	0.665[c]
BMI	26.94±5.18	27.37±3.75	27.1±4.68	0.672[c]
VAS 1th day scores	4 (2–6)	2.5 (1–4)	3.5 (2–5)	<0.001[d]
VAS 10th day scores	2 (0–3)	0 (0–0)	1 (0–2)	<0.001[d]
Number of oral NSAIDs after discharge	8 (4.75–14)	3.5 (2–5.25)	6 (3–14)	<0.001[d]

[a]Chi-square test with n (%), [b]Fisher's exact test with n (%), [c]Student's t test with mean±Standard deviation, [d]Mann–Whitney U test with median (Quartiles: Q1-Q3).

statistically significantly different [p<0.001, Table 1]. Post-operative intravenous NSAIDs were used in 32.4% (n=11) of the TAP block group, while post-operative intravenous NSAIDs were used in 100% (n=58) of the control group.

The 1st and 10th day VAS scores were significantly different between control group and TAP block group (p<0.001, p<0.001, respectively). The 1st and 10th day VAS scores were higher in the control group than in the TAP block group (Table 1). The number of oral NSAIDs use after discharge was higher in the control group than the TAP block group [p<0.001, Table 1].

The age and BMI of the patients were not statistically different between the control group, in which preincisional TAP block was applied and postincisional TAP block was applied [p=0.909, p=0.914, Table 2]. The sex distribution of the patients was statistically similar between the groups [p=1.000, Table 2]. The distribution of diagnosis, recurrence surgery, and opioid analgesic use rates was not statistically different between the groups [p=0.807, p=0.796, p=0.125, Table 2]. The distribution of post-operative intravenous NSAIDs usage rates was statistically different between the groups [p<0.001, Table 2]. According to post hoc pairwise comparison results, the rates of postoperative intravenous

Table 2. Comparison of demographic and clinical characteristics between transversus abdominis plane (TAP) block groups

	No TAP (n=58)	TAP (preinc.) (n=20)	TAP (postinc.) (n=14)	p	Post-hoc p
Sex					
Male	53 (91.4%)	19 (95%)	13 (92.9%)	1.000[b]	-
Female	5 (8.6%)	1 (5%)	1 (7.1%)		
Diagnosis					
Right	27 (46.6%)	10 (50%)	5 (35.7%)	0.807[b]	-
Left	19 (32.8%)	6 (30%)	4 (28.6%)		
Bilateral	12 (20.7%)	4 (20%)	5 (35.7%)		
Recurrence surgery					
No	48 (82.8%)	16 (80%)	11 (78.6%)	0.796[b]	-
Yes	10 (17.2%)	4 (20%)	3 (21.4%)		
Post-op intravenous NSAIDs					
No	1 (1.7%)	12 (60%)	11 (78.6%)	<0.001[a]	1–2: <0.001
Yes	57 (98.3%)	8 (40%)	3 (21.4%)		1–3: <0.001
					2–3: 0.295
Opioid analgesic					
No	45 (77.6%)	17 (85%)	14 (100%)	0.125[b]	-
Yes	13 (22.4%)	3 (15%)	0 (0%)		
Age	50.24±16.14	51.80±11.87	51.43±14.3	0.909[c]	-
BMI	26.94±5.18	27.37±4.27	27.38±3.02	0.914[c]	-
VAS 1th day scores	4 (2–6)	2.5 (2–4)	2.5 (0–4)	0.013[d]	1–2: 0.099
					1–3: 0.043
					2–3: 1.000
VAS 10th day scores	2 (0–3)	0 (0–0)	0 (0–1)	<0.001[d]	1–2: <0.001
					1–3: 0.013
					2–3: 1.000
Number of oral NSAIDs after discharge	8 (4.75–14)	4 (3–5.75)	2 (1.5 – 4.5)	<0.001[d]	1–2: 0.005
					1–3: 0.001
					2–3: 1.000

[a]Chi-square test with n (%); [b]Fisher's exact test with n (%); [c]ANOVA with mean±Standard deviation (Tukey post hoc test), [d]Kruskal–Wallis test with median (Quartiles: Q1–Q3) (Dunn-Bonferroni post hoc test).

NSAIDs use in the control group (100%) were significantly higher than the rates of post-operative intravenous NSAIDs use in both preincisional (40%) and postincisional (21.4%) TAP blocks (respectively, p<0.001, p<0.001).

The 1st and 10th day VAS scores were significantly different between control group, preincisional TAP block, and postincisional TAP block (respectively, p=0.013, p<0.001). According to the post hoc pairwise comparison test results, the 1st day VAS scores of the control group were significantly higher than the 1st day VAS scores of the group who underwent postincisional TAP block (p=0.043). There was no significant difference between the VAS scores of the other groups [p>0.05, Table 2]. The 10th-day VAS scores of the control group were significantly higher than the 10th-day VAS scores of the groups that underwent both preincisional and postincisional TAP blocks (respectively, p<0.001, p=0.013). There was no significant difference between the VAS scores of the other groups [p>0.05, Table 2]. The distribution of VAS 1st and 10th day scores between control group and TAP block group is shown in Figure 1. The distribution of VAS 1st and 10th day scores among the control group, preincisional TAP block and postincisional TAP block is shown in Figure 2.

The number of oral NSAIDs use after discharge in the control group was significantly higher than the number of post-discharge oral NSAIDs use in the groups with both preincisional and postincisional TAP blocks (respectively, p=0.005, p=0.001). There was no significant difference between the number of oral NSAIDs used by the other groups after discharge [p>0.05, Table 2]. The distribution of the number of oral NSAIDs use among the TAP block groups is shown in Figure 3.

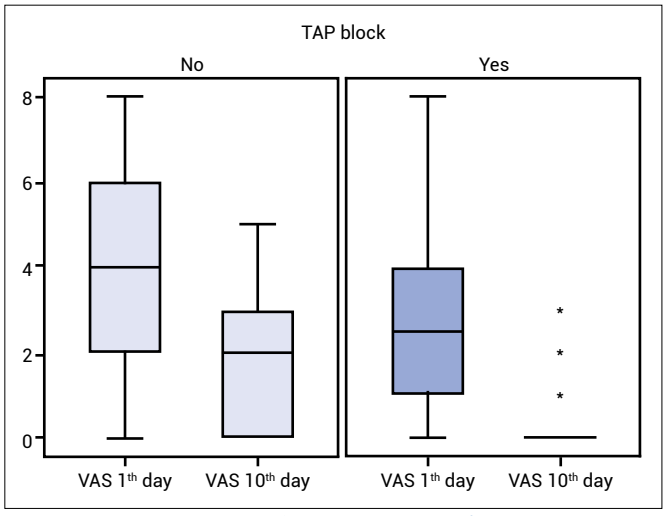

Figure 1. Distribution of VAS 1st and 10th day scores between groups with and without TAP block.

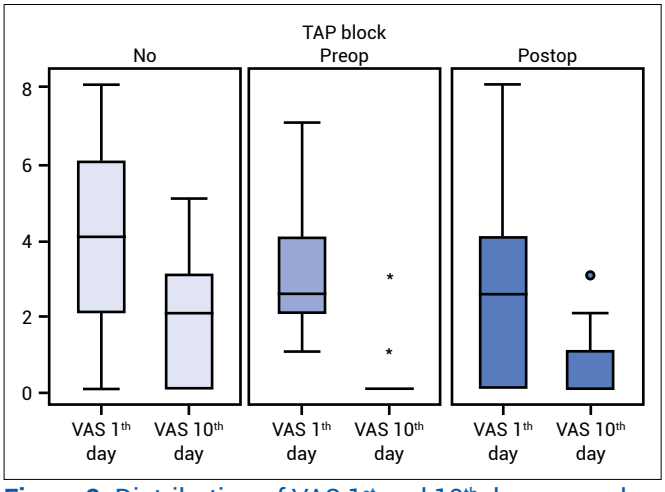

Figure 2. Distribution of VAS 1st and 10th day scores between groups without TAP block, pre-op TAP block, and post-operative TAP block groups.

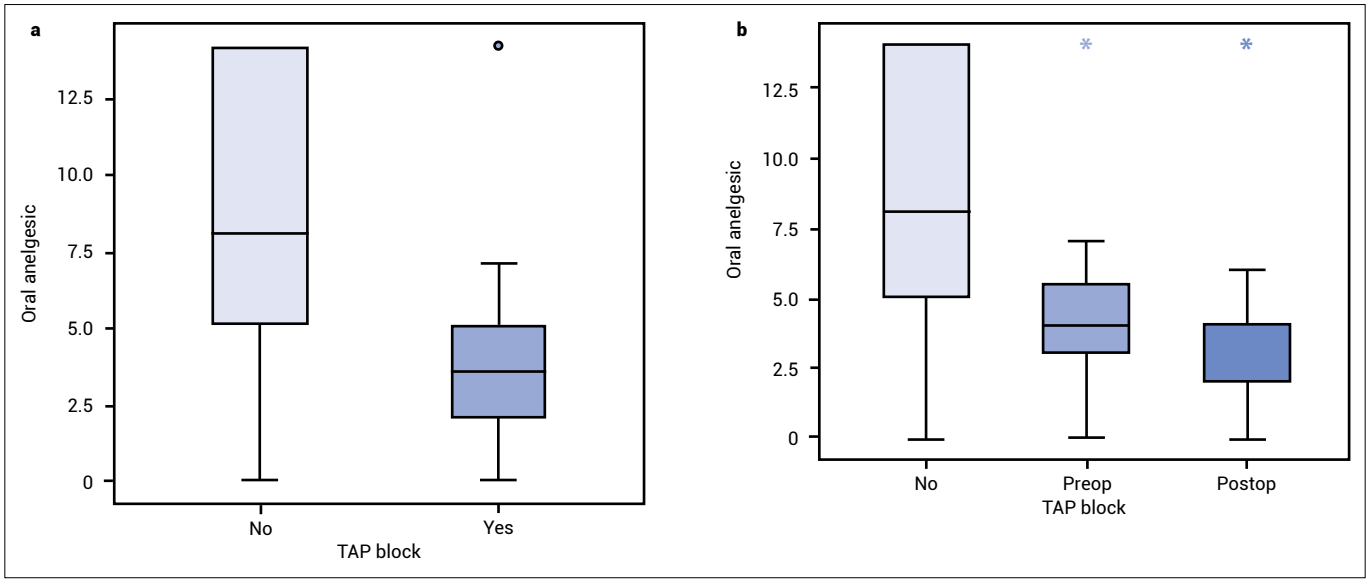

Figure 3. Distribution of the number of oral analgesic use among the TAP block groups.

Discussion

Since the description of TAP block in 2001,[14] it has been observed that TAP block is effective in providing pain control after abdominal surgeries and its use has become widespread. Similar to abdominal surgeries, the effectiveness of TAP block has been demonstrated in providing pain control in inguinal hernia repair.[15,16] In a systematic review including randomized controlled trials, TAP block was shown to be effective in postoperative pain control after inguinal hernia surgery.[17] In the guideline published by The HerniaSurge Group in 2018, field blocks were strongly recommended for postoperative pain control in all open hernia repairs, but no recommendation was made for laparoscopic hernia repairs due to insufficient evidence.[18]

In this study, it was revealed that TAP block (preincisional/postincisional) provides low VAS scores in the first 24 h after surgery and in the first 10 days after discharge, and reduces the use of analgesics in patients who underwent TAPP surgery by the same surgeon. In our study, in which analgesics were given with close pain monitoring, 67.6% of the patients in the TAP block group did not need intravenous NSAID use, while all (100%) patients in the other group were given intravenous NSAIDs. Opioid-derived drugs are widely used in postoperative pain control. Opioid-derived drugs are highly preferred due to their strong analgesic effects. However, due to the fact that they have some side effects and are addictive, the search for effective analgesics as an alternative to opioids has come to the fore. In this direction, two randomized controlled studies have shown that the use of a combination of Paracetamol and NSAID in addition to TAP block reduces opioid use in all patients.[19,20] Although TAP block was shown to reduce opioid use in a large population retrospective study in which metamizole was routinely used, it was shown that NSAID use was higher in the TAP block group.[21]

In our study, however, no statistically significant difference was observed between the two groups in terms of tramadol use. These results support that non-opioid drugs such as paracetamol and NSAIDs are the primary choice for pain control as a clinical approach. It was observed that the use of oral NSAIDs after discharge was statistically significantly less in the TAP block group compared to the other group. When the VAS results in our study were examined, it was seen that the VAS scores were statistically significantly lower in the TAP block group on both the post-operative day 1 and the 10th day, and the pain completely disappeared on the 10th day in the TAP block group. In addition, it was revealed that there was no statistically significant difference between the preincisional and postincisional application of TAP block in terms of analgesic use and VAS scores while the patients were under general anesthesia. In a randomized controlled study on the application of TAP block in patients who underwent open hysterectomy, they showed that preincisional application was more effective in post-operative pain control than postincisional.[22] We cannot compare this study with our own because of the different surgical procedure, especially the use of open surgical technique.

The limitations of the study are the retrospective nature of the study, the small population of patients included in the study, and the lack of long-term results related to chronic pain.

Conclusion

TAP block reduces pain and therefore analgesic use in the early period after the TAPP procedure. Considering that surgeons focus especially on surgery and its results, we believe that methods such as TAP block should not be ignored in post-operative pain control. However, multicenter, randomized studies with long-term results are needed for chronic pain control.

Disclosures

Ethichs Committee Approval: Approval was obtained from Tokat Gaziosmanpaşa University Clinical Research Ethics Committee (22-KAEK-213).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

References

1. Lo CW, Chen YT, Jaw FS, Yu CC, Tsai YC. Predictive factors of post-laparoscopic inguinal hernia acute and chronic pain: prospective follow-up of 807 patients from a single experienced surgeon. Surg Endosc 2021;35:148–58. [CrossRef]
2. Nishikawa M, Fukuda T, Okazaki M. Predictive factors of postoperative acute pain in laparoscopic inguinal hernia repair in men: A single-centre retrospective study in Japan. J Perioper Pract 2022:17504589211054371. [CrossRef]
3. Erdogan E, Ozenc E. Factors associated with acute and chronic pain after inguinal herniorraphy. Rom J Anaesth Intensive Care 2018;25:31–5. [CrossRef]
4. Scheuermann U, Niebisch S, Lyros O, Jansen-Winkeln B, Gockel I. Transabdominal Preperitoneal (TAPP) versus Lichtenstein operation for primary inguinal hernia repair - A systematic review and meta-analysis of randomized controlled

trials. BMC Surg 2017;17:55.

5. Bullen NL, Massey LH, Antoniou SA, Smart NJ, Fortelny RH. Open versus laparoscopic mesh repair of primary unilateral uncomplicated inguinal hernia: a systematic review with meta-analysis and trial sequential analysis. Hernia 2019;23:461–72. [CrossRef]
6. Takebayashi K, Matsumura M, Kawai Y, Hoashi T, Katsura N, Fukuda S, et al. Efficacy of transversus abdominis plane block and rectus sheath block in laparoscopic inguinal hernia surgery. Int Surg 2015;100:666–71. [CrossRef]
7. Zhou Y, Chen M, Zhang Y, Zhou H, Yu X, Chen G. Ilioinguinal/iliohypogastric nerve block versus transversus abdominis plane block for pain management following inguinal hernia repair surgery: A systematic review and meta-analysis of randomized controlled trials. Medicine (Baltimore) 2019;98:e17545. [CrossRef]
8. Makhni R, Attri JP, Kaur H, Markam KK. Comparison of ultrasound-guided transversus abdominis plane (TAP) block and quadratus lumborum (QL) block in inguinal hernia surgery. Indian J Anaesth 2022;66:122–5. [CrossRef]
9. Peltrini R, Cantoni V, Green R, Greco PA, Calabria M, Bucci L, et al. Efficacy of transversus abdominis plane (TAP) block in colorectal surgery: a systematic review and meta-analysis. Tech Coloproctol 2020;24:787–802. [CrossRef]
10. Yetneberk T, Chekol B, Teshome D. The efficacy of TAP block versus ilioinguinal block for post-cesarean section pain management: A systematic review and meta-analysis. Heliyon 2021;7:e07774. [CrossRef]
11. Yeap YL, Wolfe JW, Kroepfl E, Fridell J, Powelson JA. Transversus abdominis plane (TAP) block for laparoscopic live donor nephrectomy: Continuous catheter infusion provides no additional analgesic benefit over single-injection ropivacaine. Clin Transplant 2020;34:e13861.
12. Khoja HR, Kunchagi DK, Joshi PK, Om P. Efficacy of laparoscopic guided transversus abdominis plane block in post operative analgesia requirement in elective laparoscopic cholecystectomy. Int Surg J 2021;8:925–9. [CrossRef]
13. Demir HB, Atalay A, Uc C, Fırat Ö, Ersin S. Tension-free inguinal hernia repair with transversus abdominis plane (TAP) block in elderly high-risk patients. ANZ J Surg 2022;92:2500–4.
14. Rafi AN. Abdominal field block: a new approach via the lumbar triangle. Anaesthesia 2001;56:1024–6.
15. Kumar S. Laparoscopically guided ilioinguinal nerve block for groin hernia repair. J Laparoendosc Adv Surg Tech A 2006;16:562–4. [CrossRef]
16. Chamzin A, Frountzas M, Gkiokas G, Kouskouni E, Xanthos T, Michalopoulos NV. The effect of intraoperative transversus abdominis plane blocking on postoperative pain after laparoscopic transabdominal pre-peritoneal (TAPP) groin hernia repair. Front Surg 2022;9:834050. [CrossRef]
17. Ma N, Duncan JK, Scarfe AJ, Schuhmann S, Cameron AL. Clinical safety and effectiveness of transversus abdominis plane (TAP) block in post-operative analgesia: a systematic review and meta-analysis. J Anesth 2017;31:432–52.
18. HerniaSurge Group. International guidelines for groin hernia management. Hernia 2018;22:1–165. [CrossRef]
19. Theodoraki K, Papacharalampous P, Tsaroucha A, Vezakis A, Argyra E. The effect of transversus abdominis plane block on acute and chronic pain after inguinal hernia repair. A randomized controlled trial. Int J Surg 2019;63:63–70. [CrossRef]
20. Arora S, Chhabra A, Subramaniam R, Arora MK, Misra MC, Bansal VK. Transversus abdominis plane block for laparoscopic inguinal hernia repair: a randomized trial. J Clin Anesth 2016;33:357–64. [CrossRef]
21. Paasch C, Fiebelkorn J, Berndt N, De Santo G, Aljedani N, Ortiz P, et al. The transversus abdominis plane block reduces the cumulative need of analgesic medication following inguinal hernia repair in TAPP technique: a retrospective single center analysis among 838 patients. Hernia 2020;24:1371–8.
22. Ambooken E, Chirayath JJ, Raghavan P. A comparison of preincisional and postincisional ultrasound guided transversus abdominis plane block. J Anaesthesiol Clin Pharmacol 2021;37:406–10. [CrossRef]