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Contribution of ultrasound-guided transversus abdominis plane block to intraoperative anesthesia in children - randomized controlled study

Çocuklarda ultrason eşliğinde transversus abdominis plane bloğun intraoperatif anesteziye katkısı- randomize kontrollü çalışma

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SUMMARY

Objective: The aim of this study is to investigate the contribution of transversus abdominis plane (TAP) block supported by intravenous ketamine sedation in children on intraoperative anesthesia and analgesia.
Method: A total of 60 patients aged between 2 and 6 years, were included in the study. The patients were divided in three groups;the TAP block and ketamine group; the TAP block by inserting the laryngeal mask(LMA) and sevoflurane grup; and the LMA and sevoflurane group. Peroperative heart rates(HR), mean arterial pressures(MAP), amount of sevoflurane used, postoperative pain scores, number of children needing rescue analgesia, time required for the first analgesia were recorded.
Results: Of the patients average age was 4 ± 1.1. There was no difference between the two block groups, in terms of HR and MAP; HR were higher and MAP were lower in the only sevoflurane group.In the group supported by a TAP block, the amount of sevoflurane used decreased($p<005$). In the postoperative period, the HR, MAP and pain scores were higher in the only sevoflurane group($p <0,05$). Rescue analgesia was applied to less number of patients in the groups with added block. There were longer analgesia durations in the block-supported groups($p<0.05$).
Conclusions: In this study, it was determined that TAP block added to general anesthesia or sedation in pediatric lower abdominal surgery reduced the need for intraoperative anesthesia, provided a more stable intraoperative hemodynamics and analgesia, and provided less pain scores, longer analgesia duration and less analgesia need in the postoperative period.
Keywords: Children;ultrasound-guided transversus abdominis plane block; intraoperative anesthesia

ÖZET

Amaç: Bu çalışmanın amacı,çocuklarda intravenöz ketamin sedasyonuyla desteklenen transversus abdominis plane(TAP) bloğun intraoperatif anesteziye ve analjeziye katkısını araştırmaktır.
Yöntem: 2-6 yaş arası toplam 60 hasta çalışmaya dahil edilmiştir. Hastalar 3 gruba ayrıldı; TAP blok ve ketamin grubu; laringeal maske takılarak(LMA) TAP blok yapılan ve sevofluran grubu; LMA ve sevofluran grubu. Peroperatif kalp hızları(KH), ortalama arter basınçları(OAB), kullanılan sevofluran miktarı, postoperatif ağrı skorları, kurtarma analjezisine ihtiyaç olan çocuk sayısı, ilk analjeziye ihtiyaç duyulan zaman kaydedildi.

Bulgular: Hastaların yaş ortalaması 4±1,1 idi. İki blok grup arasında KH ve OAB açısından fark yoktu; sadece sevofluran grubunda KH daha yüksek ve OAB daha düşüktü. TAP bloğu tarafından desteklenen grupta, kullanılan sevofluran miktarı azalmıştı(p <005). Postoperatif dönemde sadece sevofluran grubunda KH, OAB ve ağrı skorları daha yüksek bulundu(p <0,05). Blok eklenen gruplarda daha az sayıda hastaya kurtarma analjezi uygulandı. Blok destekli gruplarda daha uzun analjezi süreleri vardı(p <0.05).
Sonuç: Bu çalışma ile, pediatrik alt batın cerrahisinde, genel anestezi ya da sedasyona eklenen TAP bloğun, intraoperatif anestezi ihtiyacını azalttığı, daha stabil intraoperatif hemodinami ve analjezi sağladığı, postoperatif dönemde ise daha düşük ağrı skorları, daha uzun analjezi süresi ve daha az analjezi ihtiyacı sağladığı saptanmıştır.
Anahtar sözcükler: çocuk; ultrason eşliğinde transversus abdominis plane(TAP) blok; intraoperatif anestezi
ClinicalTrials.gov.ID: NCT02990975

INTRODUCTION

Regional anesthesia practices are gradually increasing in pediatric patients[1]. Regional anesthesia and analgesia techniques reduce the needof parenteral opioid, increase the quality of postoperative pain control and increase the satisfaction of the patient and his/her family[2].

Transversus abdominis plane (TAP) block is one of the abdominal site blocks used in both anesthesia and postoperative acute pain treatment in surgeries regarding lower abdominal region. It is the process of applying local anesthetic agents to the anatomic neurofascial space between the internal oblique and transversus abdominis muscle in the antero-lateral region of the abdomen. TAP block is a good method in postoperative pain control and also provides opportunity for short interventions related to the abdominal region[3]. As specified in the literature, TAP block application[4-7] that is most frequently used for postoperative analgesia purpose is also used to provide anesthesia although rare[8, 9].

The aim of this study is to investigate the contribution of transversus abdominis plane block supported by intravenous (IV) ketamine sedation in children on intraoperative anesthesia and analgesia.

MATERIAL AND METHODS

The study was conducted after the ethics committee approval was received with resolution no: 09/02of Erzincan University clinical trials ethics committee and written consents of the patient relatives were received. **ClinicalTrials.gov.ID: NCT02990975**

A total of 60 patients aged between 2 and 6 years, who would undergo ASA I-II, elective lower abdominal surgery, were included in the study. The patients, who had a psychiatric disease, had a weight of > 40 kg, suffered from cardiac-pulmonary-neurological diseases, had bleeding disorders, had injections or wound scars in the injection site, and had known allergies to local anesthetics, the duration of surgery is more than 30 minutes, were excluded from the study.

Preoperative management: All the children were brought with established vascular access from the service to the operating room and premedication was performed with 0.1 mg/kg intravenous midazolam to all of them 10 minutes before the operation. Heart rates (HR), peripheral oxygen saturations (SpO2), and mean arterial pressure (MAP) were recorded preoperatively.

Intraoperative management: After anesthesia induction with 2 mg / kg ketamine(Ketalar, Pfizer, Istanbul, Turkey) and 0.01 mg / kg atropine(Atropin Sülfat, Osel, Istanbul, Turkey) was applied to all the cases, the patients were randomly divided into 3 groups by another anesthetist. The anesthesiologist who carried out the study did not know which procedure was applied to which group.

Group 1: Group to which TAP block was applied with 0.4 ml/kg 0.25% bupivacaine (Marcaine, AstraZeneca, Istanbul, Turkey) after ketamine atropine induction and in which the anesthesia maintenance was continued only by ketamine.

Group 2: Group to which the laryngeal mask (LMA) was inserted after ketamine - atropine induction, in which the anesthesia maintenance was continued with sevoflurane(Sevorane Likid, Abdi İbrahim, Istanbul, Turkey) from 2 MAC and oxygen/air mixture, and to which TAP block was applied with 0.4 ml/kg 0.25% bupivacaine

Group 3: Control group: Group to which the laryngeal mask (LMA) was inserted after ketamine - atropine induction, in which the anesthesia maintenance was continued with sevoflurane from

2 MAC and oxygen/air mixture, no block was applied and postoperative analgesics was provided by intravenous paracetamol(Parol, Atabay, Istanbul, Turkey).

TAP block: In the supine position, after the ketamine induction, 38 mm, 6-13MHz linear ultrasound probe was placed as midaxillary and transversebetween the costal edge at the umbilicus level and the iliac crest. External oblique, internal oblique, transversus abdominis muscles and their fascia were viewed. 22 gauge 50 mm pajunk needle was inserted in-plane and frontally and 0.4 ml/kg bupivacaine 0.25% was administered after negative aspiration when inserting into TAP.

Except for Group 3, all the surgical procedures, during which the block was applied, were started by the skin incision 20 minutes after the block application. 1 mcg/kg intravenous fentanyl was applied during skin incision, when the child moved or if an increase of 20% and more than baseline values was observed in heart rate. If the values did not return to the baseline values within 3 minutes, this dose was repeated and these patients were excluded from the study. Anesthesia depth of all the patients was measured by bispectral index (BIS) and anesthesia management was performed in such a way to keep this depth between 60 and 80 with sedation. During the surgery; HR, SpO2, MAP, BIS measurements and sevoflurane amount (ml/hour) were recorded with 10-minute intervals.

Postoperative management: Pain assessments of the patients, who were taken to the postoperative care unit (PACU) upon the completion of the surgery, were performed via modified Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) and Objective Pain Scale (OPS) as 1 every 30 minutes within the first hour. When CHEOPS $\geq$ 6 or OPS $\geq$ 5, rescue analgesia was performed with 15 mg/kg dose of IV paracetamol and this time was recorded. 15 mg/kg paracetamol was administered to all the patients every 8 hours.

After the patients were taken from the PACU, pain scores, HR, MAP, and SpO2 values were followed up via CHEOPS and OPS for 2^{nd}, 4^{th}, 6^{th}, 8^{th} and 12^{th} hours and the number of children requiring rescue analgesia, time required for first analgesia, and the presence of nausea and vomiting were recorded.

The control group was included in the study because it was the routine practice of our hospital.

Primary purpose of the study: The main purpose of study is to investigate the efficacy of TAP block when added to general anesthesia or sedation on intraoperative anesthesia need (amount of sevoflurane used) and intraoperative analgesia in children who will undergo lower abdominal surgery.

Secondary purpose: is to investigate the contribution of intraoperative TAP block on postoperative analgesia.

Statistical analysis;

It was determined in the power analysis performed by considering that this was a pilot study that a total of 60 patients were required to be included in order to have $\alpha = 0.05$ with 85% power.

Normal distribution was assessed by using analysis of variance,Kolmogorov-Smirnov test, skewness-kurtosis and histogram. While numerical data were presented as mean and standard deviation, categorical data were presented as numbers. Chi-square test was used to compare categorical data between the groups. In the comparison of the means between the groups; Mann-Whitney U test was used for two groups and Kruskal-Wallis test was used for comparison of three or more groups. In multiple comparisons; Tukey's HSD or non-parametric comparison tests were used. All the data were analyzed by using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL) version 20.0 program. In all the analyses, statistical significance level was accepted as $p<0.05$.

RESULTS

Demographic data;

A total of 60 children including 32 boys and 28 girls were included in the study. Average age of the children was 4±1.1. There was no difference among the groups in terms of gender, age.(Table 1).

Table 1. Descriptive datas

		Group 1	Group 2	Group 3 (Control)	Total	p
sex	boy	10	11	11	32	,982
	girl	10	9	9	28	
Total (n)		20	20	20	60	
Age (year)		4,4 ±1,1	3,7 ± 1,2	3,9 ± 1,0		,134
Preop BİS		85,0 ± 3,6	85,0 ± 3,3	87,05 ± 2,9		,212
Preop HR(beat/min)		113,3 ± 14,7	121,5 ± 14,3	122,05 ± 10,0		,147
Preop MAP(mmHg)		94,5 ± 13,4	102,3 ± 13,2	103,95 ± 13,0		,112

*Chi-SquareTests
**TAP: Transversus abdominis plane, preop BİS: preoperative bispectral index, preop HR: preoperative heart rate(beat/min), preop MAP: preoperative mean arterial pressure(mmHg).

Intraoperative data;

In the comparison of intraoperative values among the groups, a difference was observed between mean arterial pressure values in the first 10 minutes after the block application. After 15th minute, during skin incision and after the beginning of the surgery, it was observed that there were significant differences in terms of both HR and MAP ($p<0.05$).

When examining the amount of intraoperative anesthetics, the aim of the study; it was determined that the amount of sevoflurane used significantly reduced in the group supported by tap block (Table 2). Additionally, no statistically significant difference was observed between the group 1 and the group 2 in terms of the intraoperative HR and MAP measurements (Table 3).

Table 2. Intraoperative datas

		Group 1	Group 2	Group 3 (Control)	p
0. minute	Heart rate(beat/min),	113,8 ± 15,4	122,0 ± 15,2	122,5 ± 10,7	,154
	MAP(mmHg)	93,9 ± 12,5	99,2 ± 12,0	82,0 ± 3,8	**,000****
5. minute	Heart rate	117,5 ± 15,2	123,2 ± 15,9	123,2 ± 9,7	,441
	MAP	94,3 ± 10,2	99,4±8,3	84,7 ± 5,9	**,000****
10. minute	Heart rate	111,8 ± 15,4	119,3 ± 15,7	122,7 ± 11,0	,090
	MAP	94,2 ± 10,2	96,0 ± 9,1	85,8 ± 6,2	**,000****
15. minute	Heart rate	107,2 ± 12,0	114,8 ± 12,3	121,5 ± 9,9	**,001****
	MAP	90,6 ± 9,3	92,3 ± 6,8	84,7 ± 5,2	**,003****
20. minute	Heart rate	105,5 ± 12,7	109,3 ± 12,9	121,7 ± 10,1	**,000****
	MAP	88,0 ± 9,5	87,6 ± 9,7	82,2 ± 4,4	**,042****
Skin incision	Heart rate	109,3 ± 11,3	107,8 ± 11,9	124,3 ± 7,7	**,001****
	MAP	92,6 ± 12,9	92,7 ± 14,2	86,4 ± 6,1	**,038****
10. minute	Heart rate	107,4 ± 14,1	108,6 ± 14,4	123,4 ± 7,6	**,003****
	MAP	89,1 ± 10,4	87,7 ± 11,2	85,0 ± 2,9	,593
20. minute	Heart rate	105,2 ± 13,1	105,2 ± 11,9	119,7 ± 9,7	**,001****
	MAP	89,2 ± 11,8	87,4 ± 11,5	85,3 ± 2,7	,846
30. minute	Heart rate	104,3 ± 14,6	103,3 ± 14,3	120,7 ± 10,3	**,001****
	MAP	89,9 ± 13,2	86,7 ± 12,1	85,2 ± 5,1	,660
Sevoflurane (ml/h)		0	12±0,3	19 ± 0,3	**,000****

*One way Anova** The mean difference is significant at the 0.05 level.
MAP: mean arterial pressure

Table 3. Groups comparisons

		Group 1& Group 2		Group 2 & Group 3 (control)	
0. minute	Heart rate(beat/min),	113,8 ± 15,4	122,0 ± 15,2	122,0 ± 15,2	122,5 ± 10,7
	p	**,071**		**,912**	
	MAP(mmHg)	93,9 ± 12,5	99,2 ± 12,0	99,2 ± 12,0	82,0 ± 3,8
	p	**,162**		**,000****	
5. minute	Heart rate	117,5 ± 15,2	123,2 ± 15,9	123,2 ± 15,9	123,2 ± 9,7
	p	**,174**		**,978**	
	MAP	94,3 ± 10,2	99,4 ± 8,3	99,4 ± 8,3	84,7 ± 5,9
		,075		**,000****	
10. minute	Heart rate	111,8 ± 15,4	119,3 ± 15,7	119,3 ± 15,7	122,7 ± 11,0
	p	**,090**		**,433**	
	MAP	94,2 ± 10,2	96,0 ± 9,1	96,0 ± 9,1	85,8 ± 6,2
	p	**,505**		**,000****	
15. minute	Heart rate	107,2 ± 12,0	114,8 ± 12,3	114,8 ± 12,3	121,5 ± 9,9
	p	**,035****		**,058**	
	MAP	90,6 ± 9,3	92,3 ± 6,8	92,3 ± 6,8	84,7 ± 5,2
	p	**,476**		**,002****	
20. minute	Heart rate	105,5 ± 12,7	109,3 ± 12,9	109,3 ± 12,9	121,7 ± 10,1
	p	**,314**		**,001****	
	MAP	88,0 ± 9,5	87,6 ± 9,7	87,6 ± 9,7	82,2 ± 4,4
	p	**,897**		**,048****	
Skin incision	Heart rate	109,3 ± 11,3	107,8 ± 11,9	107,8 ± 11,9	124,3 ± 7,7
	p	**,705**		**,000****	
	MAP	92,6 ± 12,9	92,7 ± 14,2	92,7 ± 14,2	86,4 ± 6,1
	p	**,990**		**,128**	
10. minute	Heart rate	107,4 ± 14,1	108,6 ± 14,4	108,6 ± 14,4	123,4 ± 7,6
	p	**,780**		**,001****	
	MAP	89,1 ± 10,4	87,7 ± 11,2	87,7 ± 11,2	85,0 ± 2,9
	p	**,631**		**,346**	
20. minute	Heart rate	105,2 ± 13,1	105,2 ± 11,9	105,2 ± 11,9	119,7 ± 9,7
	p	**,990**		**,000****	
	MAP	89,2 ± 11,8	87,4 ± 11,5	87,4 ± 11,5	85,3 ± 2,7
	p	**,590**		**,550**	
30. minute	Heart rate	104,3 ± 14,6	103,3 ± 14,3	103,3 ± 14,3	120,7 ± 10,3
	p	**,826**		**,000****	
	MAP	89,9 ± 13,2	86,7 ± 12,1	86,7 ± 12,1	85,2 ± 5,1
	p	**,386**		**,694**	

*Multiple Comparison **The mean difference is significant at the 0.05 level.
MAP: mean arterial pressure

When examining which group caused the differences between intraoperative heart rate and mean arterial pressures; it was observed that there was no difference between the group 1 and the group 2, but statistically significant differences were observed between both groups with block and the group 3. In general, in the control group with no block was applied, it is observed that the heart rates were higher and mean arterial pressures were lower (Table 3). In the groups to which block was applied, lower heart rates and higher MAP values were observed.

Postoperative data:

As in the intraoperative values, the difference among the groups in terms of postoperative values was significant. At all the hours monitored, the heart rates and MAP were higher in the group 3 however, this difference was significant in the first 6 hours. After the 6th hour, the heart rate and MAP were high in the group 3 but this was not statistically significant.

When CHEOPS and OPS values were compared in the pain assessment, significant differences were observed only in the first 2 hours, at 4th and 6th hours (Table 4).

During the follow-ups, the differences between the times, at which analgesia is needed for the first time, were also significant ($p<0.01$). Again, in the groups 1 and 2, 6 patients needed analgesia in the early period, on the other hand, 12 patients in the group 3, required analgesic and nausea and vomiting were observed only in the group 3 (Table 4).

Table 4. Postoperative datas

		Group 1	Group 2	Group 3 (Control)	p
PACU 0 minute	Heart rate(beat/min),	103,6 ± 16,5	106,4 ± 17,6	122,2 ± 14,6	**,006****
	MAP(mmHg)	87,2 ± 12,7	84,7 ± 13,2	89,6 ± 4,3	,152
	CHEOPS	1,1 ± 0,6	1,0 ± 0,6	3,9 ± 2,2	**,000****
	OPS	0,4 ± 0,6	0,3± 0,7	3,8 ± 2,4	**,000****
PACU 30. minute	Heart rate	107,8 ± 13,0	109,6 ± 14,7	122,7 ± 11,3	**,005****
	MAP	91,4 ± 14,2	87,2 ± 14,0	87,5 ± 6,1	,458
	CHEOPS	0,9 ± 0,8	0,9 ± 0,7	3,8 ± 1,4	**,000****
	OPS	0,5 ± 0,8	0,6 ± 1,0	3,7 ± 1,4	**,000****
PACU 60 minute	Heart rate	108,1 ± 13,3	110,3 ± 13,9	121,4 ± 11,1	**,030****
	MAP	91,1 ± 11,1	92,2 ± 10,4	87,2 ± 6,2	,334
	CHEOPS	1,5 ± 1,1	1,6 ± 1,3	3,2 ± 1,0	**,000****
	OPS	1,8 ± 1,5	2,0 ± 1,9	3,4 ± 1,5	**,031****
PACU 2. hour	Heart rate	108,0 ± 12,6	112,4 ± 13,7	121,9 ± 9,8	**,006****
	MAP	89,5 ± 13,5	87,8 ± 12,3	86,4 ± 7,1	,777
	CHEOPS	2,2 ± 2,3	2,5 ± 2,8	3,9 ± 1,9	**,003****
	OPS	2,6 ± 2,3	2,7 ± 2,6	3,7 ± 2,2	,060
PACU 3. hour	Heart rate	106,8 ± 13,3	107,9 ± 13,3	118,9 ± 9,9	**,022****
	MAP	88,0 ± 12,0	89,2 ± 11,3	85,7 ± 4,4	,682
	CHEOPS	1,8 ± 1,5	2,1 ± 1,9	2,5 ± 1,2	,411
	OPS	1,8 ± 1,4	2,0 ± 1,9	2,1 ± 1,2	,553
PACU 4. hour	Heart rate	107,1 ± 13,2	107,3 ± 12,7	120,6 ± 8,7	**,004****
	MAP	87,0 ± 10,8	84,1 ± 10,6	86,2 ± 5,5	,706
	CHEOPS	1,7 ± 1,0	1,6 ± 1,0	2,5 ± 1,2	**,026****
	OPS	1,8 ± 1,1	1,8 ± 1,1	2,9 ± 1,6	**,005****
PACU 6. hour	Heart rate	109,2 ± 15,3	110,2 ± 14,9	123,6 ± 12,2	**,009****
	MAP	90,4 ± 9,7	91,1 ± 9,4	89,9 ± 4,5	,261
	CHEOPS	2,1 ± 1,6	2,4 ± 1,9	3,6 ± 1,9	**,022****
	OPS	2,0 ± 2,0	2,1 ± 1,8	4,0 ± 2,5	**,001****
PACU 8. hour	Heart rate	108,6 ± 16,2	112,8 ± 17,8	122,5 ± 12,6	,071
	MAP	90,8 ± 11,6	89,0 ± 11,4	87,7 ± 5,3	,326
	CHEOPS	3,6 ± 1,5	3,7 ± 1,4	3,6 ± 0,9	,714
	OPS	3,8 ± 1,3	3,8 ± 1,5	3,6 ± 0,8	,945
PACU 12. hour	Heart rate	111,5 ± 14,3	114,0 ± 15,2	119,6 ± 9,9	,274
	MAP	90,2 ± 12,4	88,6 ± 13,1	85,3 ± 4,8	,078
	CHEOPS	2,7 ± 1,9	1,9 ± 1,5	2,4 ± 0,5	,252
	OPS	2,9 ± 2,0	2,2 ± 1,8	2,4 ± 0,5	,297
Analgesia		6,2 ± 3,4	4,9 ± 3,0	2,1 ± 1,7	**,000****
Rescue analgesia		6/20	6/20	12/20	**,021****
Nausea and Vomiting		0/20	0/20	8/20	**,000****

*One way Anova ** The mean difference is significant at the 0.05 level.

MAP: mean arterial pressure, CHEOPs; modified Children's Hospital of Eastern Ontario Pain Scale, OPS; Objective Pain Scale.

When examining which group caused the differences in the postoperative period, it was observed that heart rate, CHEOPS,OPS values were significantly higher in the first 6 hours in the group 3. It was observed that the values in both groups, to which block was applied, were similar(Table 5).

Table 5. Groups comparisons in postoperative periods

		Group 1& Gruop 2		**Group 2 & Group 3 (control)**	
PACU 0 minute	Heart rate(beat/min),	103,6±16,5	106,4±17,6	106,4±17,6	122,2 ± 14,6
	p	**604**		**004****	
	MAP(mmHg)	87,2 ± 12,7	84,7 ± 13,2	84,7 ± 13,2	89,6 ± 4,3
	p	**475**		**163**	
	CHEOPS	1,1 ± 0,6	1,0 ± 0,6	1,0 ± 0,6	3,9 ± 2,2
	p	**891**		**000****	
	OPS	0,4 ± 0,6	0,3 ± 0,7	0,3 ± 0,7	3,8 ± 2,4
	p	**793**		**000****	
PACU 30. minute	Heart rate	107,8±13,0	109,6±14,7	109,6±14,7	122,7±11,3
	p	**675**		**003****	
	CHEOPS	0,9 ± 0,8	0,9 ± 0,7	0,9 ± 0,7	3,8 ± 1,4
	p	**999**		**000****	
	OPS	0,5 ± 0,8	0,6 ± 1,0	0,6 ± 1,0	3,7 ± 1,4
	p	**776**		**000****	
PACU 60 minute	Heart rate	108,1±13,3	110,3 ± 13,9	110,3 ± 13,9	121,4 ± 11,1
	p	**607**		**013****	
	CHEOPS	1,5 ± 1,1	1,6 ± 1,3	1,6 ± 1,3	3,2 ± 1,0
	p	**795**		**000****	
	OPS	1,8 ± 1,5	2,0 ± 1,9	2,0 ± 1,9	3,4 ± 1,5
	p	**654**		**017****	
PACU 2. hour	Heart rate	108,0 ± 12,6	112,4 ± 13,7	112,4 ± 13,7	121,9 ± 9,8
	p	**308**		**028****	
	CHEOPS	2,2 ± 2,3	2,5 ± 2,8	2,5 ± 2,8	3,9 ± 1,9
		699		**074**	
PACU 3. hour	Heart rate	106,8 ± 13,3	107,9 ± 13,3	107,9 ± 13,3	118,9 ± 9,9
	p	**798**		**012****	
PACU 4. hour	Heart rate	107,1 ± 13,2	107,3 ± 12,7	107,3 ± 12,7	120,6 ± 8,7
	p	**961**		**002****	
	CHEOPS	1,7 ± 1,0	1,6 ± 1,0	1,6 ± 1,0	2,5 ± 1,2
	p	**885**		**010****	
	OPS	1,8 ± 1,1	1,8 ± 1,1	1,8 ± 1,1	2,9 ± 1,6
	p	**902**		**008****	
PACU 6. hour	Heart rate	109,2 ± 15,3	110,2 ± 14,9	110,2 ± 14,9	123,6 ±12,2
	p	**831**		**005****	
	CHEOPS	2,1 ± 1,6	2,4 ± 1,9	2,4 ± 1,9	3,6 ± 1,9
	p	**611**		**044****	
	OPS	2,0 ± 2,0	2,1 ± 1,8	2,1 ± 1,8	4,0 ± 2,5
	p	**875**		**003****	
Analgesia		6,2 ± 3,4	4,9 ± 3,0	4,9 ± 3,0	2,1 ± 1,7
	p	**154**		**003****	
Rescue analgesia		6/20	6/20	6/20	12/20
	p	**999**		**047****	
Nausea and Vomiting		0/20	0/20	0/20	8/20
	p	**999**		**,000****	

*One way Anova ** The mean difference is significant at the 0.05 level.
MAP: mean arterial pressure, CHEOPS; modified Children's Hospital of Eastern Ontario Pain Scale, OPS; Objective Pain Scale.

In the first follow-up hour requiring analgesia, it was observed that analgesia was needed in 6.2 hours in average in the block group 1; in 4.9 hours in average in the block group 2; and in 2.1 hours in average in the group 3.

DISCUSSION

In this study, it was determined that TAP block added to general anesthesia or sedation in pediatric lower abdominal surgery decreased the need of intraoperative anesthesia. TAP block provided a more stable intraoperative hemodynamics and also increased both intraoperative and postoperative analgesia periods.

Pediatric patients are subject to various abdominal surgery procedures requiring perioperatively sufficient pain relief. In recent years, ultrasound-guided TAP block has gained popularity for intraoperative and postoperative pain management in pediatrics[10, 11]. Tekelioğlu et al., emphasized that, in short interventions involving the abdominal region via colostomy with mild sedation and TAP block, ultrasound-guided TAP block has provided opportunity for an effective and reliable surgery accompanied by sedation and also long-term postoperative pain control[8]. Also in the study conducted by Alsadek et al.,to compare the caudal block and TAP block, they observed that HR and MAP were always higher in the group without block; however, this difference was not significant[9]. Collaterally in the present study, higher heart rates, lower MAP and increased response to surgical stimulation were observed in the group 3 and this response was found to be statistically significant ($p<0.05$).

This study revealed that since the lack of difference between the group 1 and group 2 in terms of intraoperative hemodynamics that ketamine-supported TAP block anesthesia can be used alone as a successful anesthetic technique in pediatric lower abdominal surgery. However, more extensive studies are required in this issue.

When examining the amount of intraoperative anesthetic use, which was the aim of the present study, the amount of sevoflurane required to provide the anesthesia depth at the same level was found to be significantly higher in the group 3. Even though there was no similar study in the literature, in their study Kim et al., specified that the caudal block added to general anesthesia reduced the use of intraoperative sevoflurane but this difference was not significant[12]. This is associated with the reduction of peri-operative stress response by regional anesthesia[2].

In pediatric patients, TAP block provides an efficient analgesia in various surgeries such as laparotomy, appendectomy, nissen fundoplication, pyloromyotomy, major abdominal wall surgeries and colostomy opening-closure[13]. In the study conducted by Alsadek et al. to compare the caudal block and TAP block, they observed that TAP block was superior than the caudal block due to lower pain score, less need for additional analgesics and higher family satisfaction[9]. Carney et al., applied TAP to 40 children who underwent open appendectomy and observed that it was superior than placebo at the 48th postop hour[14]. Similarly,Shaaban et al., determined that high-volume TAP block application provided a better analgesia than the wound site infiltration in the children to whom appendectomy was applied and in this study, the first time ofanalgesic need was significantly longer in the TAP block group (6,4 +- 1.5 h) and the dose and number of cumulative analgesics were significantly lower [15]. In parallel to the literature, in the present study the longest analgesia duration was observed in the ketamine-supported TAP block group and this period was determined as 6.2 ± 3.4 hour. The duration of analgesia in the group 2 was significantly higher than the only sevoflurane group. CHEOPS and OPS scores were lower in both groups, to which the block was added, during 12 hours

followed, and HR and MAP were higher in the group with no block, and rescue analgesia need and nausea-vomiting rate was higher in the group with no block.

The present study has some limitations; firstly we could not think about and assess the postoperative agitation effect of sevoflurane[16]. Secondly, because our hospital encourages early discharge, our follow-up period is limited with 12 hours. Longer follow-ups may determine the action time of TAP block clearer.

CONCLUSION

In this study, it was determined that TAP block added to general anesthesia or sedation reduced the need for intraoperative anesthesia in pediatric lower abdominal surgery. TAP block provided a more stable intraoperative hemodynamics, intraoperative analgesia, and provided less pain scores, longer analgesia duration and less analgesia need in the postoperative period.

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