



Ultrasound-Guided Rectus Sheath Block in Gynaecological Surgery with Pfannenstiel Incision

Pfannenstiel İnsizyonla Yapılan Jinekolojik Cerrahide Ultrason Eşliğinde Rektus Kılıf Bloğu

Şule Cüneyitoğlu¹, Mediha Türktan², Ebru Biricik², Dilek Özcengiz²

¹Clinic of Anaesthesiology and Reanimation, Aşkım Tüfekçi State Hospital, Adana, Turkey

²Department of Anaesthesiology and Reanimation, Çukurova University Faculty of Medicine, Adana, Turkey

Objective: This study aimed to evaluate the effects of ultrasound-guided rectus sheath block in gynaecological surgery with Pfannenstiel incision.

Methods: After the approval of the ethics committee and the patients' consent, 75 ASA I-II patients who were aged between 20 and 70 years and scheduled for a gynaecological surgery with Pfannenstiel incision were included in this study. After induction of general anaesthesia, patients were randomly divided into three groups. In Group UR patients (n=25), ultrasound-guided rectus sheath block with 0.25% levobupivacaine (0.2 mL kg⁻¹) was performed. In Group SR patients (n=25), surgical rectus sheath block with 0.25% levobupivacaine (0.2 mL kg⁻¹) was applied. In Group T (n=25) patients, tramadol (2 mg kg⁻¹) was intravenously administered 30 min before the end of surgery. Patient-controlled analgesia device was established for postoperative pain relief in all groups. Haemodynamic data and inspired sevoflurane concentration were recorded during the operation. Pain scores, total tramadol consumption, supplemental analgesic requirement and side effects were postoperatively evaluated.

Results: Demographic characteristics, duration of surgery and haemodynamic parameters were similar between the groups. Inspired sevoflurane concentration (%) and VAS scores were significantly lower in Group UR than those in Groups SR and T. Total tramadol consumption was significantly lower in Groups UR and SR than that in Group T. There was no significant difference in the incidence of side effects.

Conclusion: This study demonstrates that ultrasound-guided rectus sheath block helps to provide the effective analgesia without any side effects compared with surgical rectus sheath block and intravenous tramadol for gynaecological surgery with Pfannenstiel incision.

Keywords: Gynecologic surgery, regional anaesthesia, postoperative, analgesia, ultrasound

Amaç: Çalışmamızda, Pfannenstiel insizyonla yapılan jinekolojik cerrahide ultrason eşliğinde uygulanan rektus kılıf bloğunun etki-sini araştırmayı amaçladık.

Yöntemler: Etik kurul onayı ve olguların onamı alındıktan sonra, American Society of Anesthesiologists (ASA) I-II grubu, 20-70 yaş arası, Pfannenstiel insizyonla jinekolojik cerrahi yapılması planlanan 75 hasta çalışmaya dahil edildi. Genel anestezi uygulandıktan sonra olgular randomize olarak üç gruba ayrıldı. Grup UR'ye (n=25) 0,2 mL kg⁻¹ %0,25 levobupivakain ile ultrason eşliğinde rektus kılıf bloğu, Grup SR'ye (n=25) 0,2 mL kg⁻¹ %0,25 levobupivakain ile cerrahi rektus kılıf bloğu uygulandı. Grup T'deki olgulara ise (n=25) cerrahi bitiminden 30 dakika önce intravenöz 2 mg kg⁻¹ tramadol yapıldı. Tüm olgulara postoperatif ağrı kontrolü için hasta kontrollü analjezi cihazı kuruldu. Hemodinamik veriler ve inspire edilen sevofluran konsantrasyonu ameliyat boyunca kaydedildi. Postoperatif dönemde ağrı skorları, toplam tramadol tüketimi, ek analjezik ihtiyacı ve yan etkiler değerlendirildi.

Bulgular: Demografik özellikler, cerrahi süre ve hemodinamik parametreler gruplar arasında benzer bulundu. Grup UR'de inspire edilen sevofluran konsantrasyonu (%) ve VAS skorları Grup SR ve Grup T'ye göre daha düşük saptandı. Toplam tramadol tüketimi Grup UR ve Grup SR'de Grup T'ye göre belirgin düşük bulundu. Gruplar arasında yan etki profili açısından fark saptanmadı.

Sonuç: Bu çalışma, Pfannenstiel insizyonla yapılan jinekolojik cerrahide, ultrason eşliğinde uygulanan rektus kılıf bloğunun cerrahi rektus kılıf bloğu ve tramadole kıyasla yan etki sıklığını arttırmadan etkin bir analjezi sağlamaya yardımcı olduğunu göstermiştir.

Anahtar kelimeler: Jinekolojik cerrahi, rejyonel anestezi, postoperatif, analjezi, ultrason

Introduction

Regional analgesia is an often preferred technique for postoperative pain management. Recently, rectus sheath block is claimed to be an alternative approach for pain management in abdominal surgery with transverse incision. It is often performed in umbilical and paraumbilical hernia repair in children, laparoscopic gynaecological surgery and cholecystectomy in adults (1, 2). However, incorrect insertion of the needle may cause various complications because the

posterior wall of the rectus sheath extends over the peritoneal cavity. The use of ultrasound reduces the complications with real time imaging (1).

Our hypothesis is that rectus sheath block is superior to intravenous (IV) tramadol, and the use of ultrasound improves the rate of successful block in gynaecological surgery with Pfannenstiel incision. The primary end points of the present study were perioperative sevoflurane and postoperative tramadol consumption. Secondary end points were opioid-related side effects.

Methods

After approval of the ethics committee of Çukurova University, Adana, Turkey (decision number: 12, date:08.07.2010) and patients' consent, 75 patients, American Society of Anesthesiologists (ASA) physical status class I-II, aged between 20 and 70 years, scheduled for gynaecological surgery with Pfannenstiel incision were included in this prospective and randomized study. Exclusion criteria were systemic or local infection, shock, bleeding disorder, anticoagulant therapy, substance sensitivity to local anaesthetics and previous abdominal surgery.

Patients were divided into the following three groups by the computer-generated random numbers on the basis of the surgery type: ultrasound-guided rectus sheath block (UR, n=25), surgical rectus sheath block (SR, n=25) or tramadol (T, n=25). Anaesthesia induction was obtained with iv thiopental (3–5 mg kg⁻¹) and vecuronium bromide (0.1 mg kg⁻¹). Endotracheal intubation was performed after adequate muscle relaxation. Anaesthesia was maintained with 30% O₂+70% N₂O mixture and 1%–2% sevoflurane.

Before skin incision, in Group UR, ultrasound-guided rectus sheath block was performed with a 25-gauge spinal needle using the in-plane technique (MyLab Five ESAOTE, 12–15 MHz linear probe) bilaterally. The injection area was defined where the optimal ultrasonographic visualization of the posterior rectus sheath was obtained. Levobupivacaine 0.25% (0.2 mL kg⁻¹) (maximum 20 mL) was injected in the rectus sheath after a negative aspiration test, and the spread of local anaesthetic was monitored under real-time imaging. Group SR surgical rectus sheath block was applied with levobupivacaine 0.25% (0.2 mL kg⁻¹) (maximum 20 mL) bilaterally during the closure of the fascia. In this technique, the surgeon administered local anaesthetic into the rectus sheath space under direct vision after a negative aspiration test. Group T patients were administered iv tramadol 2 mg kg⁻¹ during fascia closure.

Electrocardiography, heart rate (HR), non-invasive blood pressure (NIBP) and SaPO₂ values were observed using Dräger Primus anaesthesia machine during the operation. Haemodynamic values and inspired sevoflurane concentrations at baseline, 5th, 15th, 30th, 45th, 60th and 75th min were recorded during the operation.

At the end of surgery, all anaesthetic agents were discontinued and neuromuscular blockade was antagonised with IV 0.01 mg kg⁻¹ atropine sulphate and IV 0.03 mg kg⁻¹ neostigmine. The patients were extubated when they were mentally aware, spontaneously breathing and haemodynamically stable. After extubation, all patients were transferred to the post-anaesthesia care unit. Patient controlled analgesia (PCA) device was used (tramadol 0.2 mg kg⁻¹ bolus dose, lock out 10 min) for postoperative pain relief.

Haemodynamic parameters, total tramadol consumption, VAS scores and potential side effects, such as nausea, vomiting, pruritus and bradycardia were recorded at 5th, 15th, 30th min and 1th, 2th, 4th, 6th, 8th, 12th, 18th h postoperatively. Pain was evaluated by the visual analogue scale (VAS, 0=no pain, 10=worst pain) and additional analgesic agent was administered to patients when VAS score was >6. Nausea and vomiting were evaluated by a 5-point scale (0=no nausea, 4=retching and/or vomiting), and if it was >2, antiemetic agent was administered to the patients.

Statistical analysis

Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) 18.0 package program was used for statistical analysis of data. While categorical measurements (nausea, vomiting etc.) were summarized as number, continuous measurements (age, weight, height etc.) were summarized as mean and standard deviation. Repeated measures analysis was used to evaluate the changing of continuous measurements of patients at different times (NIBP, HR etc.) during the intraoperative and postoperative follow-up. Independent samples (Kruskal–Wallis) or as an alternative ANOVA test was used to detect instant differences between the groups. The Bonferroni-corrected Mann–Whitney U test was used as the post hoc test. For all statistical analysis, a p value of <0.05 was considered significant.

Results

Demographic characteristics were similar between the groups as shown in Table 1. There was no statistically significant difference between the groups in terms of haemodynamics.

Table 1. Demographic characteristics of the groups

	Group UR (n=25) (mean±SD)	Group SR (n=25) (mean±SD)	Group T (n=25) (mean±SD)
Age (year)	45.2±12.1	44.0±7.3	44.2±9.6
Weight (kg)	66.4±14.9	68.7±12.0	74.5±22.9
Height (cm)	164.0 ±5.1	163.8±4.7	162.8±4.7
Duration of surgery (minutes)	72.0±12.3	66.6±9.8	73.8±12.9
ANOVA test			
Group UR: Ultrasound-guided rectus sheath block Group			
Group SR: Surgical rectus sheath block Group			
Group T: Tramadol Group			

Inspired sevoflurane concentration was significantly lower in Group UR than that in the other groups except for the 5th min (p=0.001) (Table 2). VAS scores were significantly lower in Group UR than those in the other groups at 30th min and 1th, 2th and 4th h (p=0.021, p=0.020, p=0.045 and p=0.044, respectively) (Table 3). Total tramadol consumption was significantly lower in Group UR and SR than that in Group T (p=0.0001) (Table 4).

Nausea was observed in two, three and eight patients in Group UR, Group SR and Group T, respectively (p>0.05). Vomiting was observed in two patients in Groups UR and SR, four patients in Group T (p>0.05). Gastrointestinal function was better in Group UR than that in other groups, and it was statistically significant. Passing gas and faeces were observed in five patients in Group UR, one patient in Group SR and none of the patients in Group T in 24 h postoperatively.

Table 2. Perioperative concentration of sevoflurane (%)

	Group UR (n=25) (mean±SD)	Group SR (n=25) (mean±SD)	Group T (n=25) (mean±SD)
5 th min	1.9±0.4	1.9±0.2	1.9±0.2
15 th min	1.4±0.4*	1.9±0.2	1.8±0.3
30 th min	1.2±0.4*	1.8±0.3	1.9±0.2
45 th min	1.0±0.4*	1.5±0.4	1.7±0.3
60 th min	0.8±0.3*	1.2±0.5	1.5±0.5
75 th min	0.9±0.3*	1.3±0.6	1.3±0.5

*p<0.005, compared with Group SR and T, Kruskal–Wallis test
 Group UR: Ultrasound-guided rectus sheath block Group
 Group SR: Surgical rectus sheath block Group
 Group T: Tramadol Group

Table 3. Postoperative VAS scores of the groups

	Group UR (n=25) (mean±SD)	Group SR (n=25) (mean±SD)	Group T (n=25) (mean±SD)
5 th min	2.7±2.3	3.0±2.3	3.0±2.3
15 th min	3.3±2.1	3.1±2.1	3.2±1.7
30 th min	3.4±1.6*	3.9±1.6	4.4±1.1
1 th h	3.6±1.3*	3.8±1.7	4.3±1.3
2 th h	2.9±1.4*	3.6±1.4	3.8±1.4
4 th h	2.7±1.2*	3.4±1.4	3.6±1.3
6 th h	2.9±1.3	3.3±1.3	3.0±1.1
8 th h	2.6±1.2	3.3±1.3	3.0±1.1
12 th h	2.4±1.2	2.4±1.1	2.2±1.0
24 th h	1.9±1.1	2.1±1.1	2.3±1.4

*p<0.05, compared with Group SR and T, Kruskal–Wallis test
 VAS: Visual Analog Scale
 Group UR: Ultrasound-guided rectus sheath block Group
 Group SR: Surgical rectus sheath block Group
 Group T: Tramadol Group

Discussion

We found that ultrasound-guided rectus sheath block provided superior analgesia compared with surgical rectus sheath block and IV tramadol. In our study, ultrasound guidance increased the success of block and reduced the incidence of side effects.

T7-12 and L1 nerves innervate anterior abdominal wall. These nerves pass between the internal oblique and transversus abdominis muscles in the transversus abdominis plane. Rectus sheath comprises external oblique, internal oblique and transversus abdominis muscle aponeurosis and local anaesthetic injection into this area provides analgesia of anterior abdominal wall (3, 4). Rectus sheath block may be performed with anatomical landmark technique, surgical technique and ultrasound guided technique. Anatomical landmark technique requires significant expertise and may cause block failure due to intraperitoneal spread of local anaesthetic, vascular or visceral structure injury (5). Surgeon or anaesthesiologists may apply surgical technique, and it provides direct vision of the rectus sheath space (5). Ultrasound guidance has various advantages because it provides optimal needle positioning and monitors the distribution of local anaesthetic. In recent years, ultrasound has been widely used in regional anaesthesia. This technique allows non-invasive real time imaging, higher success rate of block, shorter block onset time, lower local anaesthetic dose and reduced complications (6-9). Furthermore, our results revealed that ultrasound guidance improves the success rate of the block.

In gynaecological surgery, IV opioids, nonsteroidal anti-inflammatory drugs, local anaesthetic infiltration to the surgical area and peripheral nerve blockades may be preferred for postoperative pain management. Tramadol is generally safe for postoperative analgesia, although dose-dependent adverse

Table 4. Total tramadol consumption in groups (mg)

	Group UR (n=25) (mean±SD)	Group SR (n=25) (mean±SD)	Group T (n=25) (mean±SD)
5 th min	7.9±7.8*	7.8±7.3*	88.6±32.7
15 th min	14.5±10.0*	13.0±10.0*	126.9±78.2
30 th min	25.9±13.8*	24.5±13.5*	162.3±48.4
1 th h	42.4±24.1*	37.2±17.0*	168.2±36.6
2 th h	68.7±59.2*	57.5±27.7*	196.6±37.4
4 th h	97.0±65.3*	81.3±40.2*	231.8±60.7
6 th h	135.6±76.8*	106.3±52.7*	262.1±69.8
8 th h	166.9±90.0*	147.1±88.7*	312.0±105.0
12 th h	186.7±97.6*	189.4±108.7*	368.1±140.9
24 th h	209.2±124.2*	198.9±115.4*	390.4±148.5

*p<0.005, compared with Group T, Kruskal–Wallis test.
 Group UR: Ultrasound-guided rectus sheath block Group
 Group SR: Surgical rectus sheath block Group
 Group T: Tramadol Group

effects may occur, such as vomiting, nausea, constipation, headache and dizziness (10). The rectus sheath block provides excellent analgesia for midline incisions around the umbilicus and laparoscopic surgery (7, 11, 12). It has been shown to provide better analgesia than intraperitoneal or intracision-al local anaesthetic infiltration in gynaecological surgery (13). Moreover, ultrasound-guided rectus sheath block provided superior analgesia compared with local anaesthetic infiltration of the surgical site for umbilical hernia repair in children (14, 15). However, there are no studies that compared the effects of ultrasound-guided rectus sheath block, surgical rectus sheath block and iv tramadol on postoperative pain relief in the literature. In this study, we found that ultrasound-guided rectus sheath block provides better analgesia than the other two methods.

The rectus sheath block is sufficient to provide surgical anaesthesia as well as postoperative analgesia for vertical midline laparotomy incision and laparoscopic procedures (16-19). However, it can be combined with other blocks to achieve a wider blockade for transverse incisions below the umbilicus (20). In our study, we combined the rectus sheath block with postoperative PCA for gynaecological surgery with Pfannenstiel incision.

The occurrence of nausea and vomiting is associated with the effect of anaesthetic gases, surgical procedure and use of opioids in patients undergoing gynaecological surgery (21-23). In our study, the incidence of nausea vomiting was not different between the groups; however, it was higher in Group T patients. When we compared time to normalization of gastrointestinal function at the first 24 h, it was statistically shorter in Group UR and SR. Increased nausea-vomiting and prolonged time to normalization of gastrointestinal function in Group T patients may have been related to higher rate of tramadol consumption.

The limitations of this study were we could not measure blood levels of tramadol and evaluate the spread of local anaesthetic.

Conclusion

Ultrasound-guided rectus sheath block helps to provide effective and reliable postoperative analgesia without serious side effects, reduces anaesthetic and analgesic agent consumption in patients undergoing gynaecological surgery with Pfannenstiel incision.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Çukurova University Faculty of Medicine.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - Ş.C., M.T., E.B., D.Ö.; Design - Ş.C., M.T., E.B., D.Ö.; Supervision - Ş.C., M.T., E.B., D.Ö.; Funding - Ş.C., M.T., E.B., D.Ö.; Materials - Ş.C., M.T., D.Ö.;

Data Collection and/or Processing - Ş.C., M.T.; Analysis and/or Interpretation - Ş.C., M.T., D.Ö.; Literature Review - Ş.C., E.B., M.T.; Writer - Ş.C., M.T.; Critical Review - Ş.C., M.T., E.B., D.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Komite Onayı: Bu çalışma için etik komite onayı Çukurova Üniversitesi Tıp Fakültesi'nden alınmıştır.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - Ş.C., M.T., E.B., D.Ö.; Tasarım - Ş.C., M.T., E.B., D.Ö.; Denetleme - Ş.C., M.T., E.B., D.Ö.; Kaynaklar - Ş.C., M.T., E.B., D.Ö.; Malzemeler - Ş.C., M.T., D.Ö.; Veri toplanması ve/veya işlemesi - Ş.C., M.T.; Analiz ve/veya yorum - Ş.C., M.T., D.Ö.; Literatür taraması - Ş.C., E.B., M.T.; Yazıyı yazan - Ş.C., M.T.; Eleştirel İnceleme - Ş.C., M.T., E.B., D.Ö.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

References

1. Willschke H, Bösenberg A, Marhofer P, Johnston S, Kettner SC, Wanzel O, et al. Ultrasonography-guided rectus sheath block in paediatric anaesthesia- a new approach to an old technique. *Br J Anaesth* 2006; 97: 244-9. [\[CrossRef\]](#)
2. Isaac LA, McEwen J, Hayes JA, Crawford MW. A pilot study of rectus sheath block for pain control after umbilical hernia repair. *Pediatric Anesthesia* 2006; 16: 406-9. [\[CrossRef\]](#)
3. Sinnatamby C. Last's anatomy. Regional and applied. Chapter 5. Abdomen, 10 th edition. Edinburgh: Churchill and Livingstone; 2000: 218-20.
4. Moore K, Agur A. Essential clinical anatomy. Chapter 2. Abdomen. Baltimore, MD: Lippincott Williams and Wilkins; 2006: 81-6.
5. Crosbie EJ, Massiah NS, Achiampong JY, Dolling S, Slade RJ. The surgical rectus sheath block for post-operative analgesia: a modern approach to an established technique. *Eur J Obstet Gynecol Reprod Biol* 2012; 160: 196-200. [\[CrossRef\]](#)
6. Marhofer J. Ultrasound guidance in regional anesthesia. *Br J Anaesth* 2005; 94: 7-17. [\[CrossRef\]](#)
7. Dolan J, Lucie P, Geary T, Smith M, Kenny GN. The rectus sheath block: accuracy of local anesthetic placement by trainee anesthesiologists using loss of resistance or ultrasound guidance. *Reg Anesth Pain Med* 2009; 34: 247-50. [\[CrossRef\]](#)
8. Gray AT. Ultrasound-guided regional anesthesia. *Anesthesiology* 2006; 104: 368-73. [\[CrossRef\]](#)
9. Jose Maria B. Ultrasound-guided umbilical nerve block in children: a brief description of a new approach. *Pediatric Anesthesia* 2007; 17: 44-50. [\[CrossRef\]](#)
10. Khosravi MB, Khezri S, Azemati S. Tramadol for pain relief in children undergoing herniotomy: a comparison with ilioinguinal and iliohypogastric blocks. *Paediatr Anaesth* 2006; 16: 54-8. [\[CrossRef\]](#)

11. Smith BE, Suchak M, Siggins D, Challands J. Rectus sheath block for diagnostic laparoscopy. *Anaesth* 1988; 43: 947-8. [\[CrossRef\]](#)
12. Muir J, Ferguson S. The rectus sheath block – well worth remembering. *Anaesth* 1996; 51: 893-4. [\[CrossRef\]](#)
13. Azemati S, Khosravi MB. An assessment of the value of rectus sheath block for postlaparoscopic pain in gynecologic surgery. *J Minim Invasive Gynecol* 2005; 12: 12-5. [\[CrossRef\]](#)
14. Gurnaney HG, Maxwell LG, Kraemer FW, Goebel T, Nance ML, Ganesh A. Prospective randomized observer-blinded study comparing the analgesic efficacy of ultrasound-guided rectus sheath block and local anaesthetic infiltration for umbilical hernia repair. *Br J Anaesth* 2011; 107: 790-5. [\[CrossRef\]](#)
15. Dingeman RS, Barus LM, Chung HK, Clendenin DJ, Lee CS, Tracy S, et al. Ultrasonography-guided bilateral rectus sheath block vs local anesthetic infiltration after pediatric umbilical hernia repair: a prospective randomized clinical trial. *JAMA Surg* 2013; 148: 707-13. [\[CrossRef\]](#)
16. Ferguson S, Thomas V, Lewis I. The rectus sheath block in paediatric anaesthesia: new indications for an old technique? *Paediatr Anaesth* 1996; 6: 463-6. [\[CrossRef\]](#)
17. Husain NK, Ravalia A. Ultrasound-guided ilio-inguinal and rectus sheath nerve blocks. *Anaesthesia* 2006; 61: 1126. [\[CrossRef\]](#)
18. Sandeman DJ, Dille AV. Ultrasound-guided rectus sheath block and catheter placement. *ANZ J Surg* 2008; 78: 621-3. [\[CrossRef\]](#)
19. Yentis SM, Hills-Wright P, Potparic O. Development and evaluation of combined rectus sheath and ilioinguinal blocks for abdominal gynaecological surgery. *Anesthesia* 1999; 54: 475-9. [\[CrossRef\]](#)
20. Finnerty O, Carney J, McDonnell JG. Trunk blocks for abdominal surgery. *Anaesthesia* 2010; 65: 76-83. [\[CrossRef\]](#)
21. Jorgensen H, Formsgaard JS, Dirks J, Wetterslev J, Andreasson B, Dahl JB. Effect of epidural bupivacaine vs combined epidural bupivacaine and morphine on gastrointestinal function and pain after major gynaecological surgery. *Br J Anaesth* 2001; 87: 727-32. [\[CrossRef\]](#)
22. Stanley G, Appadu B, Mead M. Dose requirements, efficacy and side effects of morphine and pethidine delivered by patient-controlled analgesia after gynaecological surgery. *Br J Anaesth* 1996; 76: 484-6. [\[CrossRef\]](#)
23. Woodhouse A, Mather L. The effect of duration of dose delivery with patient controlled analgesia on the incidence of nausea and vomiting after hysterectomy. *Br J Clin Pharmacol* 1998; 45: 57-62. [\[CrossRef\]](#)