

# The efficacy of regional analgesia techniques in urological robotic surgeries: a retrospective clinical study

Ürolojik robotik cerrahilerde bölgesel analjezi tekniklerinin etkinliği: retrospektif klinik çalışma

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Geliş tarihi (Submitted): 2022-07-08

Kabul tarihi (Accepted): 2022-10-12

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## Özet

**Amaç:** Robot yardımlı cerrahi, daha küçük kesiler, daha az postoperatif ağrı ve daha az intraoperatif kan kaybı ile günlük aktivitelere daha hızlı dönüş gibi avantajlar sunmaktadır. Torasik epidural analjezi, abdominal cerrahide mükemmel analjezi sağlar. Ancak özellikle torasik epidural analjezinin hipotansif etkisi minimal invaziv cerrahilerin hızlı iyileşmeye olan katkısını gölgede bırakmaktadır. Fasiyal plan blokları bu açıdan daha avantajlı olabilir. Bu çalışmada robotik prostatektomi, nefrektomi ve sistektomi operasyonlarında bölgesel analjezi tekniklerinin etkileri değerlendirildi.

**Gereç ve Yöntemler:** Etik Kurul onayı (2021.467.IRB1.134) alındıktan sonra Ocak 2018 ile Ocak 2022 yılları arasında robotik prostatektomi, nefrektomi ve sistektomi ameliyatı geçiren hastaların kayıtları retrospektif olarak incelendi.

**Bulgular:** Tam dokümantasyona sahip yüz kırk hasta bu çalışmaya dahil edildi. Kullanılan bölgesel analjezi yöntemleri kayıt altına alındı. Epidural analjeziye ek olarak fasiyal plan bloklarının kullanıldığı görüldü. Robotik prostat ameliyatlarında transversus abdominis plan ve rektus kılıf blokları, robotik nefrektomi ameliyatlarında ise transversus abdominis plan bloklarının etkili analjezik özellik gösterdiği görülmüştür.

**Sonuç:** Özellikle robotik prostatektomi operasyonlarında transversus abdominis plan bloğu ve rektus kılıf bloğu kombinasyonu etkili postoperatif analjezi sunmaktadır.

## Abstract

**Objective:** The advantages of robot-assisted surgery include shorter incisions, less postoperative pain, perioperative blood loss, and a faster return to daily functions. Thoracic epidural analgesia (TEA) provides highly satisfactory analgesia in abdominal surgery. However, its hypotensive effect, particularly in minimally invasive procedures, exceeds its contribution to rapid recovery. Fascial plane blocks may be more beneficial in that context. This study evaluated the effects of regional analgesia techniques in robotic prostatectomy, nephrectomy, and cystectomy operations.

**Material and Methods:** Following IRB Ethics Committee approval (2021.467.IRB1.134), the records of patients who had undergone robotic prostatectomy, nephrectomy, and cystectomy surgeries were retrospectively reviewed between January 2018 and January 2022.

**Results:** One hundred and forty patients with full documentation were included in this study. Various regional analgesia methods were used. Fascial plane blocks were seen to be used in addition to epidural analgesia. Transversus abdominis plane (TAP) and rectus sheath blocks exhibited satisfactory results in robotic prostate surgeries and TAP blocks in robotic nephrectomy operations.

**Conclusion:** In robotic prostatectomy and nephrectomy operations, we recommend fascial plane blocks as the first-choice method for postoperative analgesia.

The study was approved by Koç University IRB Ethic Committee (Approval No: 2021.467.IRB1.134, Date: 2021/12/30). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

**Anahtar Kelimeler:** reyonel anestezi, robotik cerrahi, radikal prostatektomi, minimal invaziv cerrahi, fasyal plan blokları

**Keywords:** regional anesthesia, robotic surgery, radical prostatectomy, minimally invasive surgery, fascial plane blocks, recovery after surgery

## INTRODUCTION

Radical prostatectomy (RP), generally practiced in the form of open retropubic RP or robot-assisted RP (RARP), is a commonly employed procedure in cases of localized prostate cancer (1). The benefits of minimally invasive surgery include decreased postoperative pain and a more rapid recovery. The advantages of robot-assisted surgery include shorter incisions, lower postoperative pain, perioperative blood loss, and a faster return to daily functions. It is important that the analgesic techniques employed in minimally invasive procedures should be efficacious and permit rapid mobilization (2).

RARP results in significant levels of discomfort, particularly during the first 24 h after surgery, deriving from abdominal pain, detrusor contraction, and transurethral catheter irritation (3). Thoracic epidural analgesia (TEA) yields highly satisfactory pain relief in abdominal surgery. However, its hypotensive effect, particularly in minimally invasive procedures, outweighs its contribution to a swift recovery. Fascial plane blocks may therefore be more beneficial (4). The transversus abdominis plane (TAP) block was originally described by Rafi in 2001 and has become one of the most common truncal blocks (5). Fascial plane blocks are effective in the case of somatic pain. Some studies have shown that the visceral pain component may be capable of being controlled. There are several approaches to TAP blocks, depending on the area of innervation/distribution and the location of the surgical incisions (6).

Epidural analgesia has been associated with fewer pulmonary-cardiac complications, shorter hospital stays, and faster recovery. However, the idea that the effects of epidural analgesia on recovery may not be particularly decisive has recently been proposed. Most enhanced recovery guidelines do not refer to epidural analgesia as the gold standard for minimally invasive surgery (7,8).

This study evaluated the effects of regional analgesia techniques in robotic prostatectomy, nephrectomy, and cystectomy operations.

## MATERIAL AND METHODS

Following approval from the local ethical committee (2021.467.IRB1.134), the records of patients who had undergone robotic prostatectomy, nephrectomy, and cystectomy surgeries between January 2018 and January 2022 were reviewed retrospectively.

Patients' demographic data were recorded from preoperative assessment forms and the operation type from the surgery reports. The intraoperative anaesthesia assessment forms were examined to determine whether regional anaesthesia was performed, which regional anaesthesia technique was employed, and the type and quantity of opioids used during surgery. According to patient records and anaesthesia follow-up forms, 0.25% bupivacaine was used in all fascial plane blocks. When the local anaesthetic volumes were examined, 20 ml was used for the TAP block and 10 ml for the rectus sheath block. Postoperative transfer forms to the ward, nurse record forms, and follow-up forms were examined. Pain scores were assessed using a numerical rating scale (NRS) and recorded with vital signs and mobilization. In our clinic, postoperative pain management is provided with a multimodal approach. Paracetamol, a non-steroidal anti-inflammatory drug, is routinely used. Intravenous patient-controlled analgesia (PCA) with morphine is used in patients with no epidural catheter. Intravenous PCA is administered only as a bolus dose in patients undergoing fascial plane block. Postoperative PCA doses for epidural analgesia are standard in our clinic, depending on the type of surgery. In robotic urological surgeries, 0.125% bupivacaine and 2 µg ml<sup>-1</sup> fentanyl are used as epidural PCA, and 5 ml h<sup>-1</sup> infusion is set at a 6 ml bolus and 20 min lockout. We also investigated whether PCA devices were used for postoperative pain monitoring.

**Exclusion Criteria**

Individuals with known histories of cerebrovascular events, Alzheimer’s disease and dementia, insufficient cognitive functions, chronic pain, or receiving long-term opioid therapy were excluded from the research.

**Statistical Analysis**

Statistical analysis was conducted using IBM SPSS Statistics for Windows version 25.0 software (IBM Corp., Armonk, NY, USA). The Shapiro-Wilk test was applied to determine the normality of the distribution of continuous variables. Descriptive statistics were presented using mean and standard deviation for normally distributed variables. The Mann-Whitney U test was applied to compare two dependent non-normally distributed groups and the paired sample t-test in the case of two dependent groups exhibiting normal distribution. Two-sided p-values lower than 0.05 were regarded as statistically significant.

**RESULTS**

The records of 143 robot-assisted prostatectomy, nephrectomy, and cystectomy surgeries were reviewed between January 2018 and January 2022. Three patients were excluded due to a history of cerebrovascular disease, and the study was completed with 140 patients with full documentation. The patients’ demographic and surgical characteristics are shown in Table 1. Prostatectomy was performed in 99 cases (70,7%), nephrectomy in 30 (21,4%), and cystectomy in 11 (7,9%).

We observed that all patients received regional analgesia. Fascial plane blocks were applied to 49 patients

(35%), and epidural analgesia to 91 (65%). Examination of the intraoperative anaesthesia form showed that epidural catheters were inserted from the T8-T9 interspace in 53 patients (58,25%) and the T10-T11 interspace in 38 (41,75%). The distribution of regional analgesia techniques according to the type of surgery performed is shown in Table 2 and Figure 1. Examination of the anaesthesia follow-up forms showed that TAP and rectus blocks were applied in prostatectomy operations and unilateral TAP blocks in nephrectomy operations.

The first 24-h and 24-48-h pain scores retrieved from the postoperative recovery unit and ward nurse follow-up forms are shown in Table 3. Patients who received epidural analgesia had statistically significantly lower pain scores than the other patients who received fascial plane block (p<0.01).

A comparison of the first 24 h NRS scores among patients receiving epidural analgesia and fascial plane blocks during prostatectomy and nephrectomy operations is shown in Table 4. Patients who underwent fascial plane block with TEA in prostatectomy and nephrectomy operations exhibited lower pain scores than those in epidural fascial plane blocks (p<0.05). Patients receiving epidural analgesia appear to have registered lower pain scores. Low pain scores were also noteworthy in patients who underwent fascial plane blocks. The doses of iv PCA used in patients with fascial plane blocks were examined. Forty-eight hours of morphine consumption according to the iv PCA doses in patients who underwent prostatectomy and nephrectomy is shown in Table 5.

**Table 1.** Patients’ demographic and surgical characteristics [(number of patients (%), mean ± SD)]

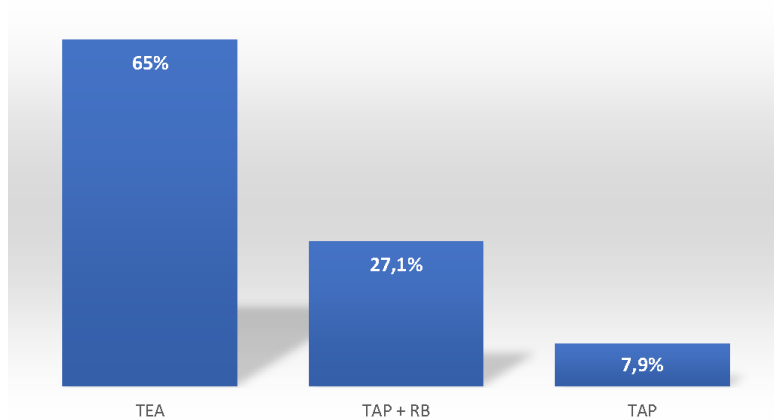
|                           |            |
|---------------------------|------------|
| Age (years)               | 49.7       |
| BMI (kg m <sup>-2</sup> ) | 35.4 ± 7.7 |
| Hypertension              | 99 (77,7%) |
| Diabetes Mellitus         | 57 (40,7%) |
| Coronary Artery Disease   | 7 (5%)     |

BMI: Body mass index

**Table 2.** Distribution of the regional analgesia techniques according to the types of surgery performed [number of patients (%)]

|               | TEA        | TAP + RB   | TAP        |
|---------------|------------|------------|------------|
| Prostatectomy | 61 (61,6%) | 38 (38,4%) | -          |
| Nephrectomy   | 19 (63,3%) | -          | 11 (36,7%) |
| Cystectomy    | 11 (100%)  | -          | -          |

TEA: Thoracic epidural analgesia, TAP: Transversus abdominis plane block, RB: Rectus sheath block

**Figure 1.** Distribution of the regional analgesia techniques employed in robotic surgeries

TEA: Thoracic epidural analgesia, TAP: Transversus abdominis plane block, RB: Rectus sheath block

**Table 3.** A comparison of first 48-hour pain scores (NRS) for regional analgesia techniques in robotic surgeries

|               | TEA      | TAP+RB  | TAP     |
|---------------|----------|---------|---------|
| 0 – 24 hours  | 0.9±0.7* | 2±0.6   | 5.1±1.3 |
| 24 – 48 hours | 0.5±0.3* | 1.7±0.6 | 3.1±0.6 |

NRS: Numerical rating scale, TEA: Thoracic epidural analgesia, TAP: Transversus abdominis plane block, RB: Rectus sheath block,

\*Compare between TEA and other fascial plane blocks  $p < 0,01$

**Table 4.** A comparison of first 24-hour pain scores (NRS) for regional analgesia techniques in robotic prostatectomy and nephrectomy surgeries

|     | Prostatectomy |        | Nephrectomy |         |
|-----|---------------|--------|-------------|---------|
|     | TEA           | TAP+RB | TEA         | TAP     |
| NRS | 0.7±0.6*      | 2±0.6  | 1.1±0.7+    | 3.3±1.5 |

NRS: Numerical rating scale, TEA: Thoracic epidural analgesia, TAP: Transversus abdominis plane block, RB: Rectus sheath block,

\*Comparison of patients who underwent fascial plane block with TEA in prostatectomy operations  $p < 0,05$

+Comparison of patients who underwent fascial plane block with TEA in nephrectomy operations  $p < 0,05$

**Table 5.** Postoperative 48-hour intravenous morphine consumption of patients in robotic surgeries with fascial plane blocks (Mean  $\pm$  SD)

|               | Prostatectomy  | Nephrectomy    |
|---------------|----------------|----------------|
| Morphine (mg) | 5.7 $\pm$ 2.6* | 25.5 $\pm$ 8.1 |

\*p&lt;0,05

The high opioid consumption in nephrectomy patients is particularly noteworthy. This result suggests that only tap block alone may be insufficient in postoperative pain management in nephrectomy operations.

Mobilization problems due to hypotension have been observed in patients receiving epidural analgesia. Mobilization was limited on the first postoperative day in five patients with cystectomy, four with prostatectomy, and four with nephrectomy. No mobilization problems were observed in patients who underwent fascial plane block. No complications deriving from fascial plane blocks were observed.

## DISCUSSION

The findings of this retrospective study show that effective analgesia can be provided by a combination of TAP block and RB. However, TEA is known to provide the standard gold analgesia.

Ultrasound-guided TAP blocks are applied in a range of different locations. The anticipated analgesia pattern is heterogeneous and depends on the particular approach adopted. The subcostal approach is most frequently recommended for upper abdominal procedures, while the lateral and posterior approaches are suitable for lower abdominal procedures (9,10). Chiancone et al. reported that TAP block provided satisfactory analgesia in robotic prostate surgeries in a 93-case series (11). Pain management in patients undergoing robot-guided procedures can be uncertain and difficult. Most studies have not reported any serious side effects. The effective analgesic properties and easy applicability of the TAP block are causing it to grow in popularity (12). Rogers et al. showed that the TAP block results in significantly lower opioid consumption in the first postoperative 24-hour period in robot-assisted prostatectomy surgeries (13). Taninishi et al. investigated the effectiveness of the TAP block in robotic prostatectomy, performing a TAP block that

compared 0.9% saline solution and 0,375% ropivacaine. The authors described the TAP block as effective in using a local anesthetic (5). In their retrospective study of robot-assisted laparoscopic prostatectomy operations, Shahait et al. compared TAP blocks with local anaesthesia instead of port incision and observed significantly lower pain scores with TAP blocks (14). Procedure-specific postoperative pain management guidelines have been published and recommend TAP blocks as the first-choice regional analgesia technique in the case of laparoscopic/robotic RP (8,15). The results of the present study also show that TAP blocks can establish effective analgesia in robotic surgery. We think adding the rectus sheath block to the TAP block enhances patient comfort. Our results for opioid consumption with the TAP block are much lower than the figures reported in the previous literature. We attribute this to adding the rectus sheath block to the TAP block.

Some studies have shown that TEA and general anaesthesia improve intraoperative ventilation/oxygenation. It is also reported to affect clinical and radiological pulmonary complications (16,17) positively. A combination of general and epidural anaesthesia may reduce the severity of diaphragmatic dysfunction in the postoperative period following robot-assisted laparoscopic RP compared to conventional general anaesthesia (18). Studies have also shown that combined general and thoracic epidural anaesthesia positively affect NO inactivation and oxidative stress (19).

The rectus sheath block is a particularly popular abdominal wall block. The injection of a local anaesthetic between the rectus muscle and posterior rectus sheath results in the blockade of the anterior cutaneous branches of the lower thoracic spinal nerves. Rectus sheath block exhibits effective analgesic properties in robotic prostatectomy (20,21). The present study shows that a rectus sheath block was added to the TAP block in robotic surgeries, the aim being to enhance the po-

tency of the TAP block. Based on the study results, we think that the superior postoperative analgesic efficacy observed derives from the use of this combination.

### CONCLUSION

Urologic robotic surgeries are procedures that require meticulous pain control. Despite their minimally invasive nature, the expected postoperative pain severity is by no means minimal. Fascial plane blocks can be used instead of epidural analgesia in minimally invasive surgeries. The combination of TAP and RB seems to be a good choice for postoperative analgesia, especially in robotic prostatectomy operations.

### Conflict of Interest

The authors declare to have no conflicts of interest.

### Financial Disclosure

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

### Informed Consent

Informed consent was obtained from all individual participants included in the study.

### Ethical Approval

The study was approved by Koç University IRB Ethical Committee (Approval No: 2021.467.IRB1.134, Date: 2021/12/30) and written informed consent was received from all participants. The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

### Author Contributions

Conception and design; SKC, ATD, MK, ÖE, Data acquisition; SKC, ATD, MK, Data analysis and interpretation; SKC, ATD, MK, ÖE, Drafting the manuscript; SKC, ATD, Critical revision of the manuscript for scientific and factual content; SKC, ÖE, Statistical analysis; SKC, ATD, Supervision; ÖE.

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