Turk J Anaesthesiol Reanim 2018; 46(4): 272-5 DOI: 10.5152/TJAR.2018.92331

Original Article / Özgün Araştırma

Quadratus Lumborum Block III for Postoperative Pain After Percutaneous Nephrolithotomy

Quadratum Lumborum III Bloğunun Perkütan Nefrolitotomide Postoperatif Ağrı Üzerine Etkisi

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Cite this article as: Kılıç E, Bulut E. Quadratus Lumborum Block III for Postoperative Pain After Percutaneous Nephrolithotomy. Turk J Anaesthesiol Reanim 2018; 46(4): 272-5.

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Abstract / Öz

Objective: An effective pain control is important in early mobilization and returning to normal daily life following percutaneous nephrolithotomy (PCNL) operations. The use of an intraoperative local anaesthetic or postoperative analgesic has been reported for pain control in PCNL. Transmuscular quadratus block (QLB III) is a regional anaesthetic technique applied under ultrasound guidance. The aim of this study was to investigate the effectiveness of QLB III on postoperative pain in PCNL.

Methods: This prospective, randomized, double-blinded study was carried out at the Dr Ersin Arslan Training and Research Hospital between December 2016 and March 2017. The QLB III block was administered to a total of 44 patients who had undergone elective PCNL under spinal anaesthesia. While half of the patients (Group S, n=22) received 0.2 cc kg^{-1} of 0.9% saline, the other half (Group Q, n=22) received 0.2 mL kg^{-1} of 0.0125 isobaric bupivacain with QLB III. For all patients, the pain level was measured using the visual analog scale (VAS), and the morphine consumptions through patient-controlled analgesia (PCA) were recorded at the postoperative 4, 8, 12, 24, and 48 hours.

Results: The postoperative VAS was found to be statistically significantly higher at the 8^{th}, 12^{th}, and 24^{th} hour in Group S ($p<0.05$). The postoperative morphine consumption was determined to be statistically significantly higher at the 4^{th}, 8^{th}, 12^{th}, and 24^{th} hour in Group S ($p<0.05$).

Conclusion: The QLB III was observed to be effective in pain control and reducing morphine consumption during the postoperative 48 hours follow-up after PCNL.

Keywords: Percutaneous nephrolithotomy, postoperative analgesia, quadratus lumborum block

Amaç: Perkütan nefrolitotomi ameliyatları (PCNL) sonrasında etkin ağrı kontrolü erken mobilizasyon ve normal hayat şartlarına dönmesi için önemlidir. PCNL de ağrı kontrolü için intraoperatif lokal anestezik kullanımı veya postoperatif ağrı kesici kullanımı bildirilmiştir. Transmusküler quadratum bloğu (QLB III) bloğu ultrason eşliğinde uygulanan rejyonal anestezi tekniğidir. Bu çalışmanın amacı perkütan nefrolitotomi operasyonu sonrası oluşan ağrıya QLBIII için etkinliğini gözlemlemektir.

Yöntemler: Prospektif, randomize, çift kör olarak planlanan bu çalışma 1 0cak 2017 ile 1 Nisan 2017 tarihleri arasında Dr Ersin Arslan Eğitim ve Araştırma Hastanesi'nde yapıldı. Spinal anestezi ile elektif PCNL operasyonu olan 44 hasta ya QLB III blok uygulandı hastaların yarısına (grup S, n=22) QLB III blok ile %0,9 salin 0,2 cc kg^{-1} dozundan diğer yarısına (grup Q, n=22) ise QLB III ile %0,0125'lik isobarik bupivakain 0,2 cc kg^{-1} dozundan uygulandı. Hastaların tamamının postoperatif 48 saat (4., 8., 12., 24., 48. saatlar de) vizüel analog skala (VAS) ile ağrı düzeyleri ve hasta kontrollü analjezi ile morfin tüketimleri kayda alındı.

Bulgular: Postoperatif VAS 8, 12. ve 24. saat lerde grup S de istatistiksel olarak anlamlı düzeyde daha yüksekti ($p<0,05$). Postoperatif morfin tüketimi ise 4, 8, 12. ve 24. saatlerde grup S de istatistiksel olarak anlamlı düzeyde daha yüksekti ($p<0,05$).

Sonuç: PCNL operasyonlarında QLB III bloğunun, postoperatif 48 saatlik takipte analjezi kontrolünde ve morfin tüketiminin azaltılmasında etkili olduğu gözlenmiştir.

Anahtar Kelimeler: Perkütan nefrolitotomi, postoperatif analjesi, quadratus lumborum blok III

Introduction

Percutaneous nephrolithotomy (PCNL) is used more frequently than open surgery in the treatment of kidney stones as it is performed through a smaller surgical incision. Postoperative complex pain resulting from the renal capsule dilation and nephrostomy-tube-related stress is reported to prolong the recovery time, reduce patient comfort, and increase the complication rates (1).

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Received / Geliş Tarihi : 02.02.2018
Accepted / Kabul Tarihi : 20.03.2018

An ultrasound (US)-guided quadratus lumborum block (QLB) was first described by Blanco for controlling postoperative pain following abdominal surgery (2). Sauter et al. (3) defined a novel technique for the lumbar plexus block through defining the Shamrock sign. Børglum et al. (4) defined the transmuscular quadratus lumborum block using the Shamrock sign. While the local anaesthetic (LA) is injected into the anterolateral margin of the quadratus lumborum (QL) muscle in the original technique defined by Blanco, in trasmuscular quadratus lumborum block (QLB III) LA is injected between the QL and the psoas major (PM) muscles under US guidance (3, 4). A successful use of QLB has been reported for peri-operative analgesia in pyeloplasty operations (5).

Opioids, which are used for controlling postoperative pain, have significant side effects (1). Multi-nodal analgesic regimen and regional anaesthesia methods have been reported to decrease the side effects, in addition to providing an effective postoperative pain control (6, 7).

This study aims at providing an effective postoperative pain control with minimal side effects through QLB III in patients undergoing PCNL.

Methods

This prospective, randomized, double-blinded study was conducted at the Dr Ersin Arslan Training and Research Hospital between December 2016 and March 2017 after the ethics committee's approval had been obtained from Gaziantep University Ethics Committee (2016. 316). A total of 44 patients aged between 18 and 60 years, with ASA I and II physical conditioning, who had undergone PCNL under spinal anaesthesia were included in the study. The patients were randomly allocated to two groups. The anaesthesiologists and the surgeon were blinded to the groups.

The patients who did not agree to participate, who were addicted to alcohol or drugs, who had chronic pain syndrome, diabetes mellitus, hypertension, atherosclerotic cardiovascular diseases, and those who were using daily analgesic were excluded from the study.

A standard monitoring of the patients was carried out after they were taken to the operating room (noninvasive arterial pressure, heart rate, oxygen saturation). The administration of 0.9% saline solution was begun with the dose of 3 mL kg^{-1} h^{-1} intravenously using an 18-gauge needle. All patients were administered spinal anaesthesia with 15 mg hyperbaric bupivacaine (Bustesin, Vem Drug Company, Istanbul, Turkey) and 20 μg fentanyl (Talinat, Vem Drug Company, Istanbul, Turkey) using a 26-gauge pencil spinal needle (Egemen Medikal, Izmir, Turkey) from L3-L4 or L4-L5 inter-vertebral space. Ten minutes after the spinal anaesthesia, the patients were placed in the semilateral position so that the related kidney was in an upside position for the QLB. The convex probe (3c5s, Mindray, Shenzhen, China) of the US (M5, Mindray, Shenzhen, China) was advanced upward until the three-walled muscle could be observed in accordance with the surgical sterilization rules. The probe was advanced toward the posterolateral until the hook sign was observed. The Shamrock sign was defined through considering the processus lateralis landmark of the spine, and the drug was administered between the QL and the PM by hydrodissection using the transmuscular approach. While the patients in Group S were administered 0.2 cc kg^{-1} of 0.9% saline, those in Group Q were administered 0.2 mL kg^{-1} of 0.0125% isobaric bupivacain (Bustesin, Vem drug Company, Istanbul, Turkey). The PCNL was performed by placing the patients in the operating position following spinal anaesthesia and QLB, and they were followed up with standard monitoring during the operation.

For patient-controlled analgesia (PCA), morphine was administered to all patients through an intravenous pump device. The pump was adjusted to provide 1 mg morphine at each loading, but not infusion. The patients were instructed to use the pump when VAS was 4 or above, where 0 defines "no pain" and 10 defines "the worst pain he or she had ever experienced." The pain level was followed up with VAS, and the morphine consumption was recorded during the postoperative 48 hours by a researcher who was not a member of the surgical team (at the 4^{th}, 8^{th}, 12^{th}, 24^{th}, and 48^{th} hour).

The power analysis was carried out based on the study, which investigated the morphine consumption following PCNL (7). The power was determined as 80%, and α was calculated as 0.05. A minimum of 21 patients was estimated to be in each group, and 22 patients were determined with a 5% loss.

Statistical analysis

The results were expressed as minimum, maximum, median, mean (±standard deviation), and the patient number was recorded. The Kolmogorov-Smirnov Z test (parametric data) was used as the normalization test. The Student's t test was used for the parametric variables, and the Mann-Whitney U test was used for the non-parametric variables. A p-level of <0.05 was accepted as statistically significant. Statistical analyses were performed using the Statistical Package for the Social Sciences 15 (SPSS Inc.; Chicago, IL, USA) program.

Results

The demographic characteristics and operative times of the patients are presented in Table 1. No difference was found between the groups with regard to demographic characteristics and the operative times.

The VAS at the postoperative 8^{th}, 12^{th}, and 24^{th} hour was observed to be statistically significantly higher in Group S (Table 2; $p \leq 0.05$).

Morphine consumptions at the postoperative 4^{th}, 8^{th}, 12^{th}, and 24^{th} hour were observed to be statistically significantly higher in Group S (Table 3) ($p \leq 0.05$).

Table 1. Demographic data

	Group S	Group Q	p
Age (year)	32.59±3.37	32.27±3.76	0.76
Gender (male/female)	10/12	9/13	0.76
ASA (I/II)	7/15	6/16	0.74
Body mass index (BMI)	28.18±1.94	28.4±1.68	0.68
Operation time (minutes)	62.72±5.71	61.59±6.43	0.61

Table 2. VAS for each group

	Group S	Group Q	p
VAS 4th hour	1.59±0.73 (1-3)	1.27±0.7 (0-2)	0.14
VAS 8th hour	6±1.66 (4-8)	0.54±0.5 (0-2)	0.0001*
VAS 12th hour	4.59±1.09 (2-6)	0.77±0.75 (0-2)	0.0001*
VAS 24th hour	3.45±1.01 (2-6)	0.95±0.84 (0-2)	0.0001*
VAS 48th hour	0.9±0.68 (0-2)	0.63±0.78 (0-2)	0.2

*p<0.05. VAS: visual analog scale

Table 3. Morphine consumption for each group (mg)

	Group S	Group Q	p
Morphine 4th hour	1.63±1.09	0.59±0.73	0.001*
Morphine 8th hour	8.68±2.67	1.45±1.43	0.00*
Morphine 12th hour	13.8±12.46	7.86±1.98	0.00*
Morphine 24th hour	28.5±5.74	10.22±2.79	0.00*
Morphine 48th hour	5.4±1.33	4.45±2.59	0.13

*p<0.05. VAS: visual analog scale

Discussion

We observed the effect of QLB III on the postoperative analgesic efficacy and the amount of analgesic consumption in patients who undergo PCNL under spinal anaesthesia. We determined that the VAS and the amount of morphine consumption were lower at the postoperative 8th, 12th, 24th, and 48th hours in patients who received QLB III with isobaric bupivacaine.

Several techniques such as the paravertebral block, spinal and epidural block, local anaesthetic infiltration, and systemic analgesic use have been recommended for postoperative analgesia in PCNL (6-11). To the best of our knowledge, there are no studies in the literature investigating the use of QLB in PCNL.

Blanco et al. (12) reported that QLB was effective in postoperative pain control for the patients undergoing cesarean section under spinal anaesthesia. Blanco et al. (13) also observed that the QLB was more effective than the transvers abdominal plane block for the postoperative pain control in patients undergoing caesarean section. The use of QLB has been reported in the literature for postoperative pain control in abdominal operations and thigh operations (14-17). Baidya et al. (5) used the QLB successfully for the postoperative pain control in children undergoing pyeloplasty. The present study aims at a better postoperative pain control through the QLB III in patients undergoing PCNL. For this purpose, isobaric marcaine was administered through the QLB III block under US guidance following spinal anaesthesia. The VAS was found to be significantly lower in the group that received isobaric bupivacain through the QLB III block at the postoperative 8th, 12th, and 24th hour.

The use of morphine for pain control after numerous operations has been reported in the literature (12, 18, 19). Lojanapiwat et al. (20) used morphine for postoperative pain in their study investigating the effect of peri-tubular analgesic infiltration on the postoperative analgesic use in PCNL. Similarly, we used intravenous morphine with the PCA method for postoperative pain. We determined that the amount of morphine consumption was significantly lower at the postoperative 4th, 8th, 12th, and 24th hour in the group that received isobaric bupivacain.

The present study has some limitations. Opioid-related side effects were not evaluated, which is limitation of this study. Similarly, we did not include the total amount of morphine consumption in our study. This is another limitation to our study.

Conclusion

We consider the QLB III to be an effective method for reducing the postoperative pain score and the analgesic consumption.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gaziantep University School of Medicine (2016. 316)

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

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - E.K.; Design - E.K., E.B.; Supervision - E.K.; Resources - E.B.; Materials - E.B.; Data Collection and/or Processing - E.K.; Analysis and/or Interpretation - E.K., E.B.; Literature Search - E.K.; Writing Manuscript - E.K., E.B.; Critical Review - E.K.; Other - E.K., E.B.

Conflict of Interest: Authors have no conflicts of interest to declare.

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

Etik Komite Onayı: Bu çalışma için etik komite onayı Gaziantep Üniversitesi Tıp Fakültesi'nden (2016. 316) alınmıştır.

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

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - E.K.; Tasarım - E.K., E.B.; Denetleme - E.K.; Kaynaklar - E.B.; Malzemeler - E.B.; Veri Toplanması ve/veya İşlemesi - E.K.; Analiz ve/veya Yorum - E.K., E.B.; Literatür Taraması - E.K.; Yazıyı Yazan - E.K., E.B.; Eleştirel İnceleme - E.K.; Diğer - E.K., E.B.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

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

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