

Does a prilocaine 2% injection into the nephrostomy tract have a role in acute pain management after a lower caliceal puncture during a percutaneous nephrolithotomy? A prospective randomized study with 100 patients

PNL operasyonu alt kaliks girişi sonrası trakta %2 prilokain enjeksiyonunun akut ağrı kontrolündeki etkinliği; 100 hastalık prospektif randomize çalışma

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ABSTRACT

Objective: The aim of this study is to evaluate the effect of a prilocaine 2% injection on the acute management of pain after a lower caliceal puncture during a percutaneous nephrolithotomy.

Materials and Methods: In this prospective randomized study, which was conducted between March, 2009 and April, 2010, 100 patients who underwent percutaneous nephrolithotomy (PCNL) were enrolled in this study. In group 1, 10 ml of saline was infiltrated. In group 2, after the operation, 10 ml of prilocaine 2% was infiltrated into the layers instead of saline. The postoperative VAS scores at 2, 4 and 24 hours and the additional analgesia requests were noted and evaluated. As a rescue analgesia, meperidine 1 mg/kg was administered intramuscularly if necessary.

Results: All of the patients requested additional analgesia within 2 hours of the operation. In 4 hours, however, 38 patients (76%) in group 1 and 14 patients (28%) in group 2 requested an additional analgesic. This difference was strongly significant ($p=0.000$). In 24 hours, 7 (14%) and 4 (8%) patients request additional analgesia in groups 1 and 2, respectively, which was not statistically significant ($p=0.33$).

Conclusion: The results of our prospective randomized study suggest that the infiltration of prilocaine 2% near the nephrostomy tract has an effect on the acute management of pain after a lower caliceal puncture during PCNL.

Key words: Kidney stone; local anesthetic; nephrostomy; percutaneous nephrolithotomy; postoperative pain.

ÖZET

Amaç: Çalışmada PNL operasyonu sırasında %2 prilokain'in cilt, cilt altı, kas ve fasya tabakalarına enjeksiyonunun akut postoperatif ağrıya olan etkisini değerlendirmek amaçlandı.

Gereç ve Yöntem: Mart 2009-Nisan 2010 arasında PNL uygulanan 100 hasta çalışmaya dahil edildi. Birinci gruptaki hastalara postoperatif 10ml SF 23G iğne ile enjekte edilirken, ikinci gruptaki hastalara aynı işlem %2 prilokain ile yapıldı. Postoperatif 2., 4. ve 24. saatlerde VAS skorları ve ek analjezik ihtiyaçları değerlendirildi. Gerekli olan hastalara IM 1mg/kg meperidin kurtarıcı ağrı kesici olarak uygulandı.

Bulgular: Dışlanma kriterlerine sahip olmayan 100 PNL hastasından grup 1 ve 2'de 50'er hasta yer aldı. Tüm hastalar postoperatif 2.saatte ek analjeziğe ihtiyaç duyular. Postoperatif 4.saatte 1.grupta 38 (%76), 2.grupta 14 (%28) hasta ek analjeziğe ihtiyaç duydu. Postoperatif 24. saatte ise grup 1 ve 2'de sırasıyla; 7 (%14), 4 (%8) hastada ek analjezik ihtiyacı oldu. Postoperatif 2. ve 24. saatlerde gruplar arasında anlamlı fark saptanmazken, 4.saatteki fark istatistiksel olarak kuvvetli şekilde anlamlı bulunmuştur ($p=0.000$). VAS skorları açısından ise postoperatif değerler anlamlı bulunmamıştır fakat grup 2'de VAS skorlarının 2., 4. ve 24. saatlerde azalma eğiliminde olduğu göze çarpmıştır.

Sonuç: Prospektif randomize çalışmamızda PNL sonrası nefrostomi tüpü yanından %2 prilokain enjeksiyonunun akut ağrı yönetiminde etkili ve güvenli olduğunu iddia ediyoruz.

Anahtar sözcükler: Böbrek taşı; lokal anestezi; nefrolitotomi; perkütan nefrostomi; postoperatif ağrı.

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Submitted:
01.02.2012

Accepted:
20.03.2012

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Introduction

Percutaneous nephrolithotomy (PCNL) is an effective and safe method for the treatment of large kidney stones, and it has become a routinely used technique worldwide. The pain perception of patients undergoing PCNL, especially during the first few hours after the operation, is the most bothersome problem and may increase morbidity. The authors of recent studies have suggested that the placement of the nephrostomy tube or its thickness has a role in the postoperative discomfort and pain.^[1-3] The nephrostomy tube needs to be left in place in most cases. Thus, several studies have focused on the injection of local anesthetics into the operative tract.^[4-6] Various outcomes have been reported.

Prilocaine is an amide-type local anesthetic with a medium duration of action and is used for a number of anesthetic techniques, particularly injection anesthesia and nerve blocks. Its terminal half-life is 1.6 hours, but the half-life differs based on the metabolism of the patient.

The aim of our study was to evaluate the efficacy of postoperative prilocaine 2% injection into the skin, underskin, muscle and fascia layers in the acute pain management after a lower caliceal puncture during PCNL. Patient comfort and pain were evaluated via a visual analog scale (VAS) and the request for opioids at 2, 4 and 24 hours postoperatively.

Materials and methods

Between March, 2009 and April, 2010, 100 patients who underwent PCNL were enrolled in this study. The patients who required an upper/middle caliceal puncture or multiple punctures, were morbidly obese, experienced serious bleeding during or after the operation, had a previous history of kidney operations or had a delayed recovery (a sustained extravasation of opaque material on the postoperative antegrade pyelography) were excluded from the study.

Before the operation, age, body mass index (BMI), preoperative hemoglobin, creatinine levels and the stone burden of the patients were recorded. The kidney stones were evaluated by intravenous urography or computerized tomography.

The PCNL operations were performed by 2 different experienced surgeons. All of the punctures were subcostal and were directed towards the lower calyx under fluoroscopy. We used Uromax dilators (Boston Scientific Medical devices, USA) for the dilation of the tract. After the sheath was inserted, an Olympus 25F continuous flow system rigid nephroscope was used to fragment the stones, and the fragments were then removed by suction via an ultrasonographic lithotripter. After each operation, a 14 F

nephrostomy tube was inserted. In group 1, 10 ml of saline was injected through the skin, underskin, muscle and fascia with a 23-gauge spinal needle. In group 2, similarly to group 1, prilocaine 2% 10 ml was injected into the layers instead of saline. The postoperative hematocrit and the levels of creatinine were evaluated. Intravenous 4x1 paracetamol was administered to all patients. The postoperative VAS scores at 2, 4 and 24 hours and the additional analgesic requests were noted and evaluated. The VAS scores ranged from 0 to 10, with 0 being no pain and 10 being unbearable pain. As a rescue analgesic, meperidine 1 mg/kg was administered intramuscularly if necessary.

The patients were followed-up if they had any complaints or residual fragments. The nephrostomy tube was withdrawn on the second postoperative day if there was no fever, hematuria or opaque extravasation, and then the patients were discharged.

The statistical analysis was performed using SPSS 13.0 (SPSS, Chicago, IL). The chi-squared and independent samples tests were used, and a value of $p < 0.05$ was considered to be statistically significant.

Results

A total of 100 patients underwent PCNL, and 50 each were assigned to groups 1 and 2. None of these patients met the exclusion criteria mentioned above. No major complications occurred during and after the operations. The characteristics of the patients are provided in Table 1.

Of the patients, 69 were male, and 31 were female; 45 of the operated kidneys were on the right, and 55 were on the left. There was no significant difference between the two groups with respect to the patient characteristics ($p > 0.05$).

All of the patients in both groups requested additional analgesia in the 2 hours after the operation. In 4 hours, however, 38 patients (76%) in group 1 and 14 patients (28%) in group 2 requested additional anesthetic. This difference was strongly significant ($p = 0.000$). In 24 hours, 7 (14%) and 4 (8%) patients requested additional analgesia in groups 1 and 2, respectively, which was not statistically significant ($p = 0.33$) (Figure 1).

The VAS scores are summarized in Table 2. There were no significant differences between the groups at 2, 4 and 24 hours, but there was a trend of the decreasing VAS scores in group 2 at those times.

Just before discharge, the patients were evaluated with a KUB and antegrade pyelography; 77% of the patients were stone-free, and the remaining 23% had clinically insignificant residual fragments and were scheduled for follow-up.

Discussion

The treatment of renal stones has been improving over the course of the last three decades as different treatment techniques, such as extracorporeal shock-wave lithotripsy and PCNL, have been invented.^[4] Large kidney stones can be safely and effectively treated with PCNL.^[5] Although PCNL is a less invasive treatment compared with open surgery, pain management after PCNL is still a challenge for urologists.

The authors of recent studies suggested that the placement of the nephrostomy tube or its thickness has a role in the postoperative discomfort and pain,^[1-3] with more pain perception occurring as the thickness of the nephrostomy tube increased. In our clinical practice, we use a nephrostomy tube in almost all of our patients after PCNL, usually with a thickness of 14 F. We think that 14 F is not thick enough to cause discomfort but not too narrow to prevent effective draining.

We excluded the patients who were morbidly obese, experienced serious bleeding during or after the operation, had a previous history of kidney operations or had a delayed recovery to suppress other factors that may affect pain perception. In addition, the saline and prilocaine groups were matched according to the patient characteristics, and there were no significant differences between the two groups.

Several recent studies have focused on the injection of some local anesthetics into the operation tract that have a long duration of action, such as bupivacaine and levobupivacaine.^[4-6] However, the patient numbers in these studies were too low to have statistical power. Our study involves a larger number of patients than other similar studies. In addition, the method of this trial gives price to outcomes due to its prospective nature.

To the best of our knowledge, this trial is the first to evaluate the effect of a local anesthetic with medium duration effect (prilocaine 2%). The comparison between bupivacaine and prilocaine shows that bupivacaine produces a higher pain response than prilocaine. The disadvantage of prilocaine is its lack of a long duration effect.^[7] Its effects lasts a maximum of 6 hours after the injection. Thus, prilocaine may only have a role in acute pain management after PCNL. We think the pain during the initial hours after this operation is more substantial than that in the later hours, so the aim of this study was to evaluate the effect of prilocaine 2% on the acute management of pain after PCNL.

All of the patients in groups 1 and 2 requested additional analgesic in the 2 hours after the operation. In 4 hours, however, 38 patients (76%) in group 1 and 14 patients (28%) in group 2 requested additional analgesia, which was a strongly significant difference

Table 1. Characteristics of the patients (n=100)

	Mean values and range	Std. deviation
Age	45 (20-71)	12.96
BMI	26.7 (19.5-35.2)	4.05
Stone burden (mm ²)	491.8 (102-1950)	433.2
Operative time	101.7 (40-250)	204
Preoperative hematocrit	42.1 (30.2-52.1)	4.63
Preoperative creatinin	0.93 (0.6-1.4)	0.16
Postoperative hematocrit	37.9 (27.5-46.4)	4.83
Postoperative creatinin	0.99 (0.6-1.6)	0.2

Table 2. The means and p values of the visual analog score of the patients at 2, 4 and 24 hours postoperatively (n=50 each for groups 1 and 2)

		Mean	p value	Std. deviation
VAS 2 h	Group 1	7.16	0.93	0.17
	Group 2	6.08		0.17
VAS 4 h	Group 1	3.48	0.9	0.18
	Group 2	2.42		0.19
VAS 24 h	Group 1	1.43	0.29	0.2
	Group 2	1.18		0.16

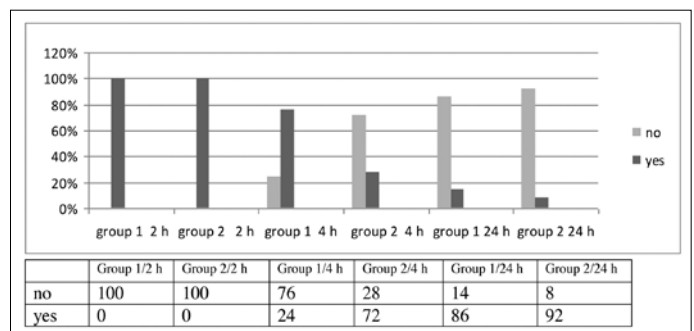


Figure 1. Comparison of the percentage of patients in the groups according to the request for postoperative analgesia at 2, 4 and 24 hours. Yes: request for additional analgesia; No: no request for additional analgesia.

($p=0.000$). In 24 hours, 7 (14%) and 4 (8%) patients requested analgesia in groups 1 and 2, respectively, which was not statistically significant ($p=0.33$). We think these data are indicative of the effect time of prilocaine. The maximum effect was obtained 4 hours after the operation according to analgesia request. After 24 hours postoperatively, the effect of the drug had subsided, and there was no significant difference between the groups.

Despite these data, there was no statistically significant difference in the VAS scores between the groups at 2, 4 and 24 hours. However, there was a trend of decreasing VAS scores in group 2 at 2, 4 and 24 hours. Further trials with greater numbers of patients are necessary to confirm the outcomes of this trial.

Reduced meperidine requirements due to the efficacy of prilocaine injection may reduce the treatment costs and avoid the side effects of meperidine. Thus, we think that the infiltration of prilocaine 2% has an effect on acute pain management after PCNL in this regard.

Further investigations with more patients may clarify the utility of local anesthetics after PCNL.

Conclusion

The results of our prospective randomized study suggest that the infiltration of prilocaine 2% near the nephrostomy tract is effective in the acute management of pain after a lower caliceal puncture during PCNL. Reduced meperidine requirements during the first postoperative hours may result in fewer side effects and improved patient comfort. Further investigations with increased numbers of patients may clarify the utility of local anesthetics after PCNL.

Conflict of interest

No conflict of interest was declared by the authors.

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