Comparison of Intrathecal Morphine plus PCA and PCA alone for Post-Operative Analgesia after Kidney Surgery

Suhattaya Boonmak MD*,
Polpun Boonmak MD*, Piyaporn Bunsaengjaroen MD*,
Somyong Srichaipanha BSc*, Viriya Thincheelong BSc*

** Department of Anesthesiology, Faculty of Medicine, Khon Kaen University, Khon Kaen*

Objective: *To study the use of intrathecal morphine plus PCA for reducing morphine consumption, pain scores, and improving patient-satisfaction.*
Material and Method: *The authors included patients who had received a flank incision for elective kidney surgery. The patients were random into the intrathecal and control groups by block randomization using the sealed envelop technique. The intrathecal group received 0.3 mg of intrathecal morphine before general anesthesia. Patients and providers were not apprised of the treatment. After the operation, both groups received morphine in a PCA pump. Morphine consumption, numeric rating score (NRS, range 0-10) at rest and while coughing, sedation score, nausea vomiting score, and itching score were evaluated at 1, 2, 6, 12, 24, and 48 hr. Patient satisfaction for pain control was recorded.*
Results: *The authors enrolled 80 patients in the present study. Demographic data was comparable between groups. The intrathecal group had less cumulative morphine consumption (p-value < 0.001), less NRS at rest (p-value < 0.001) and while coughing (p-value < 0.001) than the control group. The intrathecal group had a greater itching score than the control group (p-value < 0.001). The sedation score and patient satisfaction for pain control were not significantly different between groups (p-value = 0.55).*
Conclusion: *Intrathecal morphine plus PCA could reduce morphine consumption and improve the analgesic effect over PCA alone postoperatively. Itching was more common in the intrathecal group. Overall, patient satisfaction for pain control was not improved.*

Keywords: *Intrathecal analgesia, Morphine, Patient-controlled analgesia, Postoperative, Pain therapy, Urological surgery*

J Med Assoc Thai 2007; 90 (6): 1143-9
Full text. e-Journal: *http://www.medassocthai.org/journal*

Kidney surgery requires an incision in the flank area that causes significant post operative pain, particularly on the first post operative day. Many methods of pain control have been tried. Intravenous morphine is frequently used because it is convenient and inexpensive but its effectiveness is not satisfactory[1]. Patient-controlled analgesia (PCA) is commonly used for post-operative pain control with greater effectiveness than conventional techniques[2]. Notwithstanding, some patients on PCA still suffer from severe post-operative pain and its side effects[1]. Intrathecal morphine is a simple and efficient method of improving analgesia. The authors therefore studied intrathecal morphine plus PCA for its effectiveness in reducing post operative morphine consumption. The authors also studied pain scores and patient satisfaction with pain control.

Correspondence to : Boonmak S, Department of Anesthesiology, Faculty of Medicine, Khon Kaen University, Khon Kaen 40002, Thailand. Phone & Fax: 043-348-390, E-mail: suhattayab@hotmail.com

Material and Method

After receiving approval from the institution's Research Ethics Board, written informed consent was sought from patients scheduled for elective kidney surgery at Khon Kaen University, Thailand, for participation in a prospective, randomized, double blind controlled trial.

The authors recruited patients undergoing kidney surgery who received a flank incision, between 18 and 65 years of age, with an ASA class of I-II. The authors excluded patients with any contraindication for lumbar puncture, morphine, morbid obesity or an inability to operate the PCA pump.

Patients were divided into the intrathecal and control group by block randomization using the sealed envelope technique. All patients received information about post-operative pain control with a PCA pump. The intrathecal group received 0.3 mL, diluted (1 mg/mL), intrathecal, preservative-free morphine sulfate injected with a 27-gauge Quincke spinal needle at the L3-4 or L4-5 in the lateral position before anesthesia. All patients received general anesthesia, endotracheal intubation, and standard monitoring. Anesthesia was induced with thiopental 3-5 mg/kg and fentanyl 1 g/kg. Tracheal intubation was facilitated with succinylcholine 1.5 mg/kg followed by atracurium 0.5 mg/kg. Anesthesia was maintained with isoflurane and 67% nitrous oxide in oxygen. At the end of surgery, all patients received atropine 0.02 mg/kg and neostigmine 0.05 mg/kg for reversal of the muscle relaxant and extubation.

The authors collected demographic data (*i.e.*, sex, age, weight, height, ASA physical status, and duration of operation). In the post anesthesia care unit (PACU), the numeric rating pain score (NRS; range 0-10) was used to evaluate pain. The morphine PCA pump was promptly started in PACU. The PCA regimen was morphine (1 mg/mL), PCA in 1 mg doses, with a lock out interval of 5 min and a 1 hr limit of 10 mg. No nonsteroidal anti-inflammatory drugs were administered during the present study.

Data were recorded by a nurse anesthetist not apprised of the patient groupings. The authors recorded the cumulative morphine consumption, NRS, sedation score (*i.e.*, alert, drowsy, sleeping but responsive to verbal commands, unrousable), the nausea/vomiting score (*i.e.*, none, mild nausea, nausea and vomiting, severe nausea and vomiting), the itching score (*i.e.*, none, light, moderate, severe)[4], complication (respiratory depression, post dural puncture headache (PDPH), hypoxia) at 1, 2, 6, 12, 24 and 48 hr. At 48 hr, the authors recorded patient satisfaction for pain control (*i.e.*, markedly unsatisfactory, slightly unsatisfactory, slightly satisfactory, markedly satisfactory).

The sample size required for each group was based upon: 1) a mean and standard deviation of morphine requirement during the first 24 hr in Davys JM *et al* (mean dose of morphine during the 24 hours after abdominal surgery was 40 $\pm$ 26 mg (control group) and 9 $\pm$ 17 mg (study group)[3]; 2) a type I error of 0.05; 3) effect size of 20 mg (50% reduction) and, 4) a power of test of 80%. A p-value < 0.05 was required for statistical significance. Data analysis was performed using STATA for Windows version 8.0 (Stata Corporation, TX, USA). Cumulative morphine consumption, NRS at rest, NRS while coughing, sedation score, nausea/vomiting score, itching scores, ondansetron dose, and chlorpheniramine dose were analyzed using generalized estimation equations (GEE). Patient-satisfaction for postoperative pain control was analyzed using the Chi-squared for linear trend test.

Results

The authors enrolled 80 patients in the present study. The demographic data in both groups were comparable (Table 1). The intrathecal group had less morphine consumption than the control group during first 48 hr postoperatively (p-value < 0.01) (Fig. 1). GEE coefficient (95%CI) was 9.5 (4.6-14.3). Mean (SD) of morphine consumption at 24 hr in the control group and intrathecal group were 18.8 (17.4) and 36.3 (20.6),

Table 1. Patient characteristics and duration of surgery

	Intrathecal group (n = 40)	Control group (n = 40)
Sex (M/F)	22/18	19/21
Age (yr)	49.8 $\pm$ 9.4	52.2 $\pm$ 8.6
ASA status (I/II)	30/10	27/13
Weight (kg)	58.0 $\pm$ 9.2	57.9 $\pm$ 9.7
Height (cm)	160.4 $\pm$ 8.1	157.8 $\pm$ 9.9
BMI (kg/m^2)	22.6 $\pm$ 3.1	23.2 $\pm$ 2.6
Duration of surgery (min)	146.3 $\pm$ 51.3	149.8 $\pm$ 42.5

Data were presented with mean $\pm$ SD or number

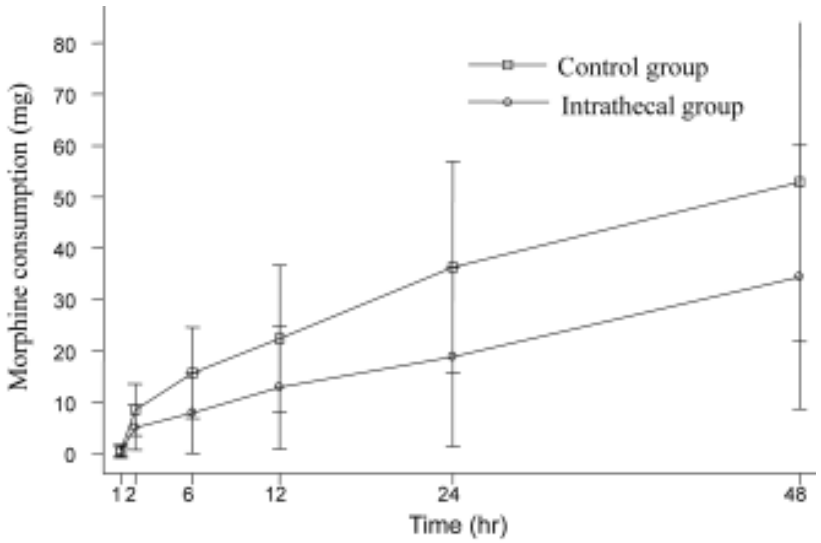

Fig. 1 Cumulative morphine consumption during the first 48 hr (mean ± SD)

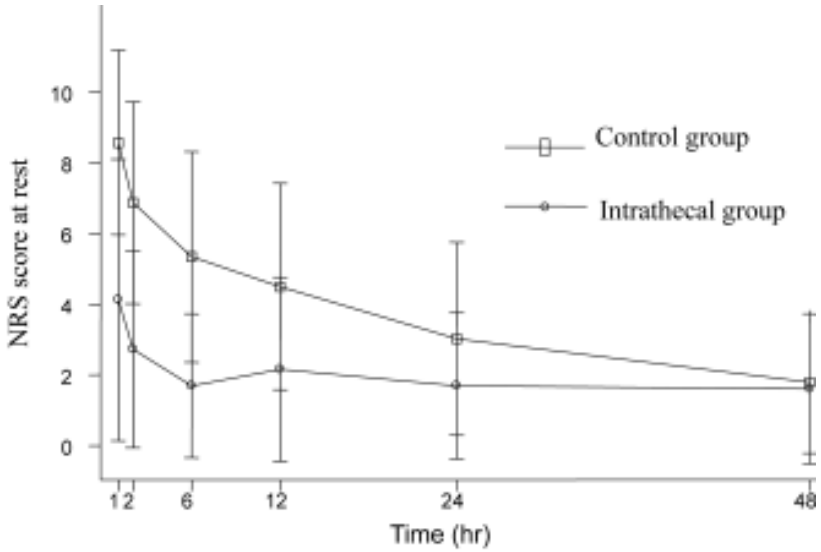

Fig. 2 Numeric rating pain score at rest during the first 48 hr (mean ± SD)

respectively. Mean (SD) of morphine consumption at 48 hr in the control group and intrathecal group were 34.4 (25.7) and 52.9 (31.1), respectively.

The intrathecal group had less NRS at rest than the control group during the first 48 hr postoperatively (p-value < 0.01) (Fig. 2). GEE coefficient (95%CI) was 2.7 (1.9-3.5). The intrathecal group had less NRS while coughing than the control group during first 48 hr postoperatively (p-value < 0.01) (Fig. 3). GEE coefficient (95%CI) was 2.5 (1.6-3.4). The intrathecal group had a greater itching score than the control group during the first 48 hr postoperatively (p-value < 0.001) (Table 2). GEE coefficient (95%CI) was -0.2 (-0.3, -0.14). Chlorpheniramine was used more frequently for control of itching in the spinal group than the control group (p-value = 0.018). The sedation score was not significantly different between the groups (p-value = 0.547). The control group had less nausea/vomiting

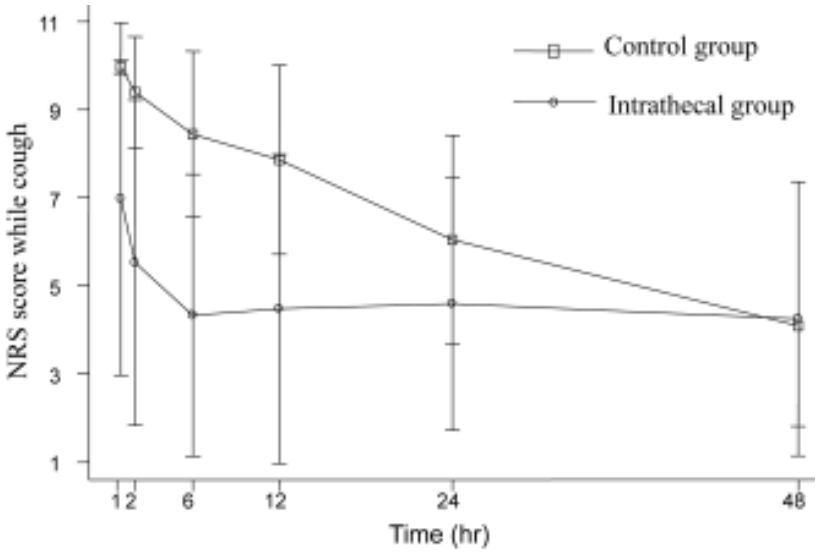

Fig. 3 Numeric rating pain score while coughing during the first 48 hr (mean ± SD)

score than intrathecal group (p-value = 0.044). However, the ondansetron dose was comparable (p-value = 0.284). At 48 hrs, post operative pain control, mean patient-satisfaction, and range in the intrathecal and control groups were not statistically significant (p-value = 0.208) (Table 3). The authors did not encounter any respiratory depression, PDPH, or hypoxia.

Discussion

Kidney surgery produces marked post-operative pain because of wound movement during breathing and damage to muscles. PCA could improve post operative pain after kidney surgery as it has excellent patient acceptance vis- -vis analgesia improvement and for greater post surgery activity than conventional techniques. PCA also causes minimal post-operative complications (*i.e.*, the risk of pulmonary complications), no drug-seeking behavior, and minimal sedation[1,2].

PCA with intrathecal morphine is used after several operations. Intrathecal morphine during abdominal surgery could decrease PCA morphine consumption; however, it does not improve analgesia on the second day or patient satisfaction[3]. By contrast, intrathecal morphine decreases the length of hospital stay and post-operative morphine requirement after several types of operations[5-7].

The intrathecal morphine dose for kidney surgery varies from 0.2-0.65 mg[8]. A high dose was associated with better analgesia but more side effects, whereas 0.2-0.4 mg of intrathecal morphine was accepted for the most operations. The authors found that 0.3 mg intrathecal morphine improved analgesia without any report of complications; any non-serious side effects were comparable with other reports. The presented data showed less cumulative morphine consumption, less NRS at rest, and less NRS while coughing in the intrathecal group during the first 24 hr postoperatively.

Itching and nausea/vomiting were common during intrathecal morphine. The incidence of itching was 36% (95% CI 23-54) but chlorpheniramine reduced itching in most patients. As in other reports, the incidence of itching was 37-46% but not severe as it was treatable with naloxone and ondansetron[8-10].

The authors did not find any respiratory depression or PDPH in the present study. In other studies, there was a low incidence of respiratory depression (overall 3%) and PDPH (overall 0.54%), which was not the case in the present study[8].

Good post operative pain management might improve patient satisfaction, but the authors found that patient satisfaction was not significantly different despite the reduced pain score using intrathecal morphine. The patients who received PCA had a high satisfaction score, which might be the cause of the non-statistically significant difference. Further study in a larger study might detect the statistical difference.

In conclusion, intrathecal morphine could improve analgesia and reduce morphine consumption in the first 24-hr, post-operative period, with itching

Table 2. Sedation score, Nausea/vomiting score, Itching score

	Time (hr)					
	1	2	6	12	24	48
Sedation score						
Intrathecal group						
alert	24	33	32	29	39	39
drowsy	14	6	5	3	1	1
sleeping but responsive to verbal commands	2	1	0	0	0	0
unrousable	0	0	0	0	0	0
Control group						
alert	17	30	31	33	40	40
drowsy	22	10	7	3	0	0
sleeping but responsive to verbal commands	0	0	0	0	0	0
unrousable	1	0	0	0	0	0
Nausea/vomiting score *						
Intrathecal group						
none	38	34	32	24	24	36
mild nausea	0	2	3	5	14	4
nausea and vomiting	2	3	2	3	2	0
severe nausea and vomiting	0	1	0	0	0	0
Control group						
none	37	38	35	34	33	35
mild nausea	2	2	2	2	6	5
nausea and vomiting	1	0	1	0	1	0
severe nausea and vomiting	0	0	0	0	0	0
Itching score *						
Intrathecal group						
none	40	33	22	18	26	35
light	0	7	14	14	12	5
moderate	0	0	1	0	2	0
severe	0	0	0	0	0	0
Control group						
none	40	38	37	33	35	40
light	0	2	1	3	5	0
moderate	0	0	0	0	0	0
severe	0	0	0	0	0	0

* p-value < 0.05 between groups

Table 3. Patient satisfaction for pain control

	Intrathecal group (n = 40) : n (%)	Control group (n = 40) : n (%)	p-value
Markedly unsatisfactory	0 (0)	0 (0)	0.208
Slightly unsatisfactory	2 (50)	4 (100)	
Slightly satisfactory	18 (45)	21 (52.5)	
Markedly satisfactory	20 (50)	15 (37.5)	

during between groups. No serious complications (*i.e.*, respiratory depression, hypoxia, and PDPH) were reported; however, intrathecal morphine did not improve patient satisfaction for pain control.

Acknowledgements

The authors wish to thank Dr. Somboon Thienthong and Dr. Kachit Pachirat for being research consultants and Mr. Bryan Roderick Hamman for his assistance with the English-language presentation of the manuscript.

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การศึกษาเปรียบเทียบการระงับปวดด้วยการใช้เครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำอย่างเดียว กับการใช้ร่วมกับยามอร์ฟีนทางช่องไขสันหลังในการระงับปวดหลังการผ่าตัดไต

สุหัทยา บุญมาก, พลพันธ์ บุญมาก, ปิยะพร บุญแสงเจริญ, สมยงค์ ศรีชัยปัญหา, วิริยา ถิ่นชีลอง

วัตถุประสงค์: *เพื่อศึกษาการใช้ยามอร์ฟีนทางช่องไขสันหลังร่วมกับการใช้เครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำ ในการช่วยลดการใช้ยาระงับปวด ความรุนแรงของการปวด และเพิ่มความพึงพอใจของผู้ป่วยในการระงับปวด*

วัสดุและวิธีการ: *ทำการศึกษาในผู้ป่วยที่รับการผ่าตัดไตที่มีแผลที่สีข้าง ผู้ป่วยจะถูกแบ่งเป็นบล็อคสุ่มเข้ากลุ่มทดลองและกลุ่มควบคุมเป็นกลุ่มได้รับยามอร์ฟีนทางช่องไขสันหลังร่วมกับการใช้เครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำ ซึ่งจะได้รับยามอร์ฟีน 0.3 มก.ทางช่องไขสันหลัง และกลุ่มที่ใช้เครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำเพียงอย่างเดียว โดยผู้ป่วยทุกรายจะได้รับการวางยาสลบตามมาตรฐาน ภายหลังการผ่าตัดจะได้รับการควบคุมความปวดด้วยเครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำ และทำการเก็บข้อมูลปริมาณยามอร์ฟีนที่ใช้ ค่าคะแนนความปวดขณะพักและขณะไอ (ค่าคะแนน 0-10) อาการง่วงซึม อาการคลื่นไส้อาเจียน อาการคันตามช่วงเวลาที่กำหนด (1, 2, 6, 12, 24 และ 48 ชั่วโมงหลังผ่าตัด) และ ที่เวลา 48 ชั่วโมงทำการบันทึกความพึงพอใจของผู้ป่วยในการระงับปวด*

ผลการศึกษา: *ทำการศึกษาผู้ป่วย 80 ราย พบว่ากลุ่มที่ได้รับยามอร์ฟีนทางช่องไขสันหลัง ร่วมกับการใช้เครื่องควบคุมความปวด ด้วยตนเองทางหลอดเลือดดำมีการใช้ยามอร์ฟีนสะสมและค่าคะแนนความปวดขณะพักและขณะไอน้อยกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ ($p < 0.001$) แต่พบมีอาการคันสูงกว่าอย่างมีนัยสำคัญทางสถิติ ($p < 0.001$) โดยที่ อาการง่วงซึม อาการคลื่นไส้อาเจียน และความพึงพอใจของผู้ป่วยในการระงับปวดไม่แตกต่างกัน ($p = 0.055$)*

สรุป: *การใช้เครื่องควบคุมความปวดด้วยตนเองทางหลอดเลือดดำร่วมกับยามอร์ฟีนทางช่องไขสันหลังในการระงับปวดหลังผ่าตัดไตสามารถลดการใช้ยามอร์ฟีนสะสมและทำให้ควบคุมความปวดได้ดีขึ้นกว่าการใช้เครื่องให้ยาระงับปวดด้วยตนเองทางหลอดเลือดดำเพียงอย่างเดียว แต่อย่างไรก็ตามไม่สามารถเพิ่มความพึงพอใจของผู้ป่วยในการระงับปวดได้*