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FEATURED ARTICLE

Postoperative Respiratory Depression

Guest Editors:

Toby N. Weingarten
Frances Chung
David R. Hillman

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SOCIETY OF CRITICAL CARE ANESTHESIOLOGISTS
SOCCA

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PAIN MEDICINE 16

Pain management in bilateral versus unilateral total knee arthroplasty

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INTRODUCTION: Total knee arthroplasty can be performed in the form of a one-stage bilateral procedure or a unilateral procedure. Adequate analgesia decreases complications and increases functional recovery. The aim of this study is to investigate whether patients undergoing one-stage bilateral total knee arthroplasty and those undergoing unilateral total knee arthroplasty differed in their responses to a standard intravenous patient-controlled analgesia protocol.

METHODS: Data from patients with the physiological status I-III according to American Society of Anesthesiologists, aged 18-99 years, undergoing one-stage bilateral or unilateral total knee arthroplasty (TKA) under spinal anesthesia in Dokuz Eylul University Hospital between January 2014 and December 2017 and offered a standard intravenous patient-controlled analgesia with morphine were retrospectively reviewed. Demographic data, Visual Analogue Scale scores and postoperative complications were examined. The total dose of analgesics consumed, analgesia demands, doses delivered and the ratio of delivered doses to demands in 0-24 hours and 24-48 hours after surgery available in the patient-controlled analgesia (PCA) pump monitoring forms were recorded. Patients planned to have TKA in the hospital where this study was conducted are firstly recommended spinal anesthesia. Following the standard monitoring, the patients are administered spinal anesthesia through vertebral spaces L2-3 or L3-4 when seated. To achieve spinal anesthesia, bupivacaine heavy 2,5 - 3ml (12,5-15mg) and morphine (0.1 - 0.2mg) are administered intrathecally. Intravenous PCA is utilized after surgery. PCA is achieved by an intravenous 1mg bolus of morphine with a lockout interval of 20 min.

RESULTS: Patient records about 927 cases were enrolled and data about 192 patients fulfilling the inclusion criteria were retrospectively analyzed. Records about 68 patients who had one-stage bilateral total knee arthroplasty and 124 patients who had unilateral total knee arthroplasty were accessed. The rate of the gender female was higher in both groups of the patients. The preoperative hospital stay and the total hospital stay were longer in the unilateral total knee arthroplasty group. The patient-machine interaction in patient-controlled analgesia gives hints at many issues. Examination of demands and delivered doses recorded by the machine can help to evaluate patient adherence to the analgesia offered. The total number of pressing the button refers to the number of demands and shows needs for analgesics and the severity of anxiety[1]. At intervals when the machine is not locked, the successful administration of analgesia demanded by the patient refers to the amount of delivered analgesics and shows the severity of pain[2]. The ratio of delivery to demand is the indicator of the compatibility between the patients and PCA machine. Increased ratios show that the programmed dose and lockout interval have been well adjusted with the patient needs while decreased ratios show that the patient needed to press the pump button more frequently during lockout intervals. This can be attributed to patient anxiety, failure to offer adequate information to the patient about the machine, insufficient doses of analgesics and long lockout intervals[3]. The analgesia demands and analgesic doses delivered and utilized by the patients with one-stage bilateral total knee arthroplasty were significantly higher in 0-24 hours and 24-48 hours after surgery. The ratio of delivery to demand was not significantly different between the groups Side-effects of the analgesia were similar in both groups. Visual Analogue Scale scores in 24-48 hours after surgery were higher in the patients with unilateral total knee arthroplasty.

CONCLUSION: To conclude, the patients with bilateral TKA had higher analgesic consumptions after surgery. However, their VAS scores were lower possibly due to their higher analgesic consumptions, and VAS scores were acceptable in both patient groups. When the lack of a significant difference in side-effects due to morphine consumptions and the ratio of delivery to demand are considered, the analgesic agent used in the PCA protocol, its dose and lockout interval can be considered to provide safe and effective analgesia in both groups.

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Tables

Table 1. Demographic Features of the Patients

	Bilateral TKA n (%) or mean (±SD)	Unilateral TKA n (%) or mean (±SD)	p
Age (years)	64.51 (±8.04)	67.34 (±10.63)	0.055
Gender			
Female	58 (%85.3)	90 (%72.6)	**0.045***
Male	10 (%14.7)	34 (27.4)	
Weight (kg)	80.85 (±11.00)	81.09 (±13.76)	0.203
Height (cm)	163 (±6.8)	162 (±7.77)	0.143
Body Mass Index (cm^2/kg)	30.43 (±3.97)	31.81 (±4.68)	0.054
ASA scores			
ASA I	6 (%8.8)	7 (%5.6)	0.079
ASA II	51 (%75.0)	79 (%63.7)	
ASA III	11 (%16.2)	38 (%30.6))	
Smoking status (Yes/No)	17/51 (%25.0/%75.0)	20/104 (%16.1/%83.9)	0.136
Comorbidities			
Cardiovascular	43 (%63.3)	84 (%67.7)	0.528
Respiratory System	7 (%10.3)	23 (%18.5)	0.132
Endocrine System	23 (33.8)	42 (%33.9)	0.995
Neurological System	1 (%1.5)	7 (%5.6)	0.264
Chronic Renal Failure	1 (%1.5)	3 (%)	1.000
Obesity	37 (%54.4)	84 (%67.7)	0.067
Obstructive Sleep Apnea Syndrome	0	4 (%3.2)	0.299
***p<0.05: significant difference**			
SD: standard deviation			

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Table 2. Preoperative Hospital Stay and Total Hospital Stay

	Bilateral TKA n (%) or Mean (±SD)	Unilateral TKA n (%) or Mean (±SD)	p
Preoperative hospital Stay (days)	2.55 (±1.88)	4.08 (±3.50)	**0.003***
Total Hospital Stay (days)	9.17 (±2.98)	12.95 (±6.91)	**<0.001***
***p<0.05: statistically significant difference** **SD: Standard Deviation**			

Table 3. Information about PCA Uses

	Bilateral TKA Mean (±SD)	Unilateral TKA Mean (±SD)	p
24 hours			
Delivery	10.16 (±7.02)	7.53 (±5.52)	**<0.001***
Demand	27.22 (±60.58)	13.00 (±15.88)	**<0.001***
Ratio of Delivery to Demand	0.61 (±0.64)	0.68 (±0.25)	0.059
Total Morphine Consumption (mg)	8.92 (±7.04)	6.01 (±5.15)	**0.001**
24-48 hours			
Delivery	8.17 (±5.16)	6.13 (±4.43)	**0.010***
Demand	14.05 (±12.18)	9.13 (±6.77)	**0.007***
Ratio of Delivery to Demand	0.67 (±0.23)	0.73 (±0.23)	0.099
Total Morphine Consumption (mg	7.07 (±5.44)	4.79 (±3.83)	**0.004***
Total			
Delivery	18.20 (±8.61)	13.63 (±8.28)	**<0.001***
Demand	39.95 (±60.70)	22.10 (±19.49)	**<0.001***
Ratio of Delivery to Demand	0.65 (±0.29)	0.60 (±0.21)	0.137
Total Morphine Consumption (mg	15.75 (±8.79)	10.80 (±7.59)	**<0.001***
***p<0.05: statistically significant difference** **SD: standard deviation**			

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Table 4. VAS Scores of the Patients

	Bilateral TKA Mean (±SD)	Unilateral TKA Mean (±SD)	p
Maximum VAS score in the recovery room	0.85 (±1.24)	1.02 (±1.26)	0.311
VAS score at rest in 0-24 hours	4.05 (±2.06)	4.00 (±1.81)	0.849
VAS score at rest in 24-48 hours	2.52 (±2.32)	3.29 (±2.17)	**0.030***
***p<0.05: statistically significant difference SD: standard deviation**			

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