CHAPTER 4

RESULT

4.1 Basic characteristics of patients

A total of 72 patients who underwent scheduled total knee replacement were initially enrolled. Two patients were excluded, because of epidural catheter slid out during transfer to the ward in one patient and technical problems with PCA device during the night in the other. Therefore, only 70 patients (35 in each group; the R group = the ropivacaine group and the BF group = the bupivacaine + fentanyl group) were eligible in the study. Patient characteristics were comparable among the groups (Table 4.1).

Table 4.1 Patient characteristics

	Bupivacaine+ Fentanyl (n = 35)	Ropivacaine (n = 35)
Age (yr.)	65.86 (6.43)	67.71 (6.25)
Weight (kg.)	63.12 (11.04)	64.80 (10.80)
Height (cm.)	153.13 (5.40)	152.82 (7.68)
Gender (F/M)	32 / 3	31 / 4
ASA class (I/II/III)	4 / 31 / 0	1 / 33 / 1
Anesthetic time (min.)	144.00 (30.65)	145.44 (19.94)

Values were expressed as mean (SD) ; and numbers of patients

4.2 Primary outcome analysis

The mean pain VAS score at rest and on movement at the different measurement times (4, 8,20,30,and 48 h) were no statistically or clinically significant differences between groups as shown in Figure 4.1 and 4.2 respectively. The mean pain score on movement were more than that of at rest at any of the measurement times. The mean pain score at rest in this study ranged from 14 to 33 mm whereas the mean pain score on movement varied from 22 to 40 mm. Our primary efficacy variable was the overall mean pain score on movement over the 48 hour postoperative period. Since the overall mean pain score either at rest or on movement was measured repeatedly. The mixed model for repeated measures was used; mean pain difference between the R and the BF groups over 48 h postoperative period adjusted for age, ASA physical status, anesthetic and postoperative time at rest and on movement were –1.71 and – 0.93 mm (P = 0.58; 95% CI = -4.4 to 7.8 and P = 0.8; 95% CI = -6.4 to 8.2 respectively). Since the pre-specified difference as equivalence (expert opinion) is 10 mm, the upper and lower values of 95% CI of mean pain VAS difference at rest and on movement were not greater or lower than 10 mm. Therefore, pain relief at rest and on movement over 48 h for postoperative TKR were equivalent compared between 0.15% ropivacaine and 0.0625% bupivacaine plus fentanyl. The effects of age, ASA physical status, anesthetic time, and postoperative time on pain score were tested between the two groups. There were no significant effects of all factors except postoperative time (Table 4.2, 4.3). The pain VAS score at rest and on movement were decreased significantly during the measurement times from 4 hours to 48 hours ($P < 0.001$).

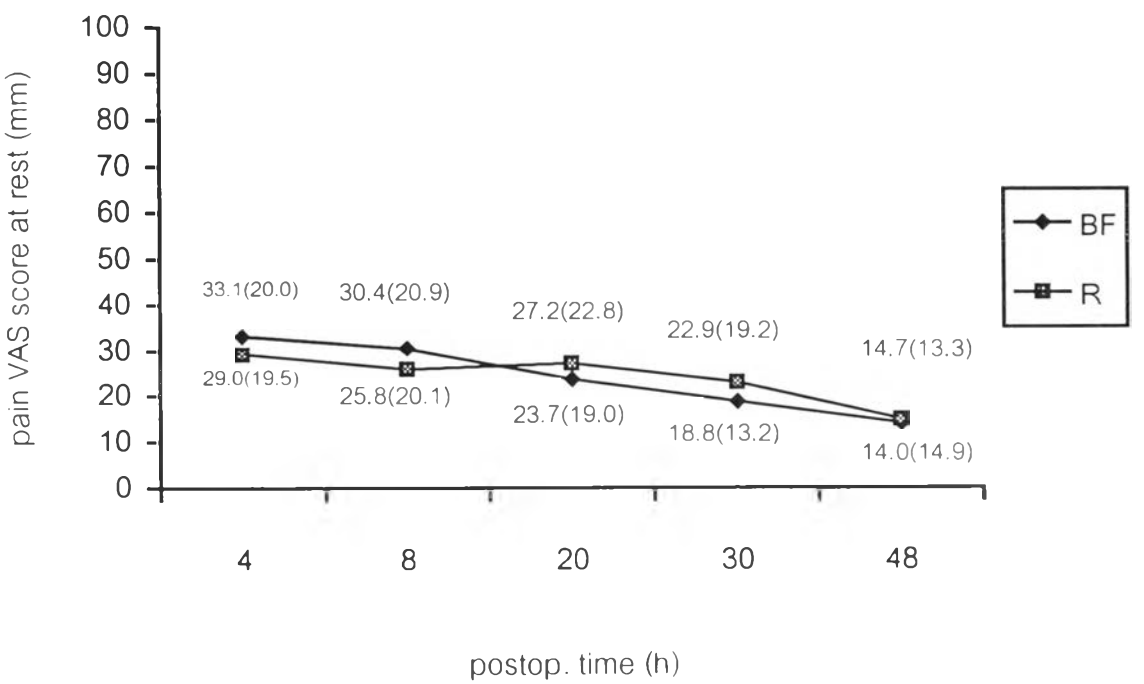

Fig 4.1 Pain VAS score (0-100 mm) at rest at 4, 8, 20, 30, 48 hours

There was no significant difference between groups. Mean (SD) was shown.

(BF = bupivacaine + fentanyl group; R = ropivacaine group.)

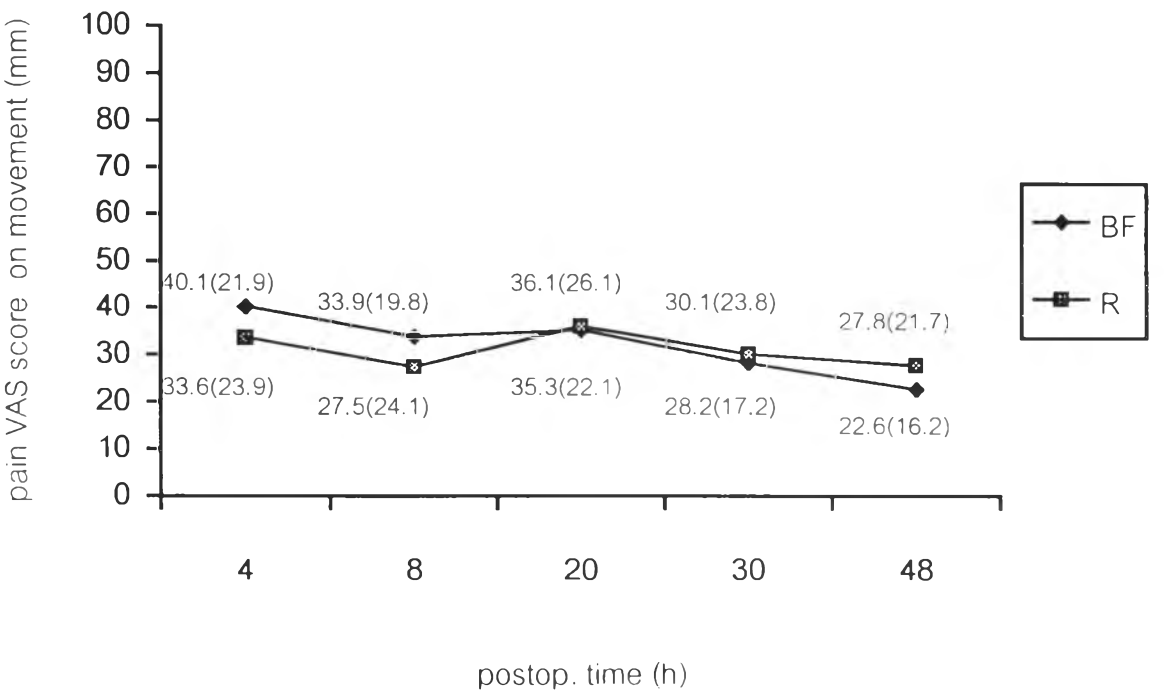

Fig 4.2 Pain VAS score (0-100 mm) on movement at 4, 8, 20, 30, 48 hours. There was no significant difference between groups. Mean (SD) was shown. (BF = bupivacaine + fentanyl group; R = ropivacaine group)

Table 4.2 The different estimate of the overall mean pain score over 48 h at rest was tested by mixed model for repeated measurement. No significant effects of the PCEA analgesic solution (R and BF group), age, ASA physical status, and anesthetic time but postoperative time on 48 hour pain VAS score at rest.

Effects	Different estimate	P value	95 % CI	
			Lower	Upper
Group (R/BF)	-1.71	0.58	-4.39	7.81
Age (yr)	-0.30	0.25	-0.81	0.21
ASA class (I/II/III)	-0.84	0.89	-13.57	11.89
Anesthetic time (min)	-0.00	0.98	-0.13	0.12
Postop. Time (min)	-0.38	< .001	-0.48	-0.27

R = ropivacaine group; BF = bupivacaine + fentanyl;

Table 4.3 The different estimate of the overall mean pain score over 48 h on movement was tested by mixed model for repeated measurement. No significant effects of the PCEA analgesic solution (R and BF group), age, ASA physical status, and anesthetic time but postoperative time on 48 hour pain VAS score on movement.

Effect	Different estimate	P value	95% CI	
			Lower	Upper
Group (R/BF)	-0.93	0.80	-6.41	8.26
Age (yr)	-0.59	0.06	-1.21	0.02
ASA class (I/II/III)	-1.06	0.89	-16.16	14.04
Anesthetic time (min)	0.04	0.58	-0.11	0.19
Postop Time (min)	-0.21	0.001	-0.34	-0.09

R = ropivacaine group; BF = bupivacaine + fentanyl;.

4.3 Secondary outcome analysis

However, patients in the R group consumed more PCEA volume significantly than those in the BF group over 20, 30, and 48 h (Figure 4.3). The maximal dose of rescue analgesic drug over 48 h (Tramadol) in the bupivacaine and the ropivacaine groups were 150 and 300 mg respectively. There was no significant difference in number of patients requiring rescue analgesic drug over 48 h compared between the BF and the R groups (Table 4.4). For the safety evaluation, which includes motor block, vomiting episodes and severity, pruritus severity, sedation effects and cardiovascular and respiratory complications. There were two patients in the R group who had grade 3 modified Bromage's scale at 4 h and 20 h (Table 4.5). Both recovered from grade 3 to grade 1 Bromage's motor block scale within the next period of assessment. There was no patients in this study who had cardiovascular and respiratory complications. There were no significant difference in vomiting episodes and severity except pruritus severity where more patients in the BF group experienced more severe pruriyus than those in the R group (Table 4.5). In addition, patients in the BF group seemed to be more sedated than whom in the R group but not significant except at 30 h postoperative period (Table 4.6). The patients' opinion concerning the quality of pain relief was assessed at the end of the study. Thirty-five patients (94%) in the BF group instead of only 25 patients (71%) in the R group rated their satisfaction on the pain treatment programme as excellent or good which were significant different. However, none of the patient in both groups considered their satisfaction as poor (Table 4.7).

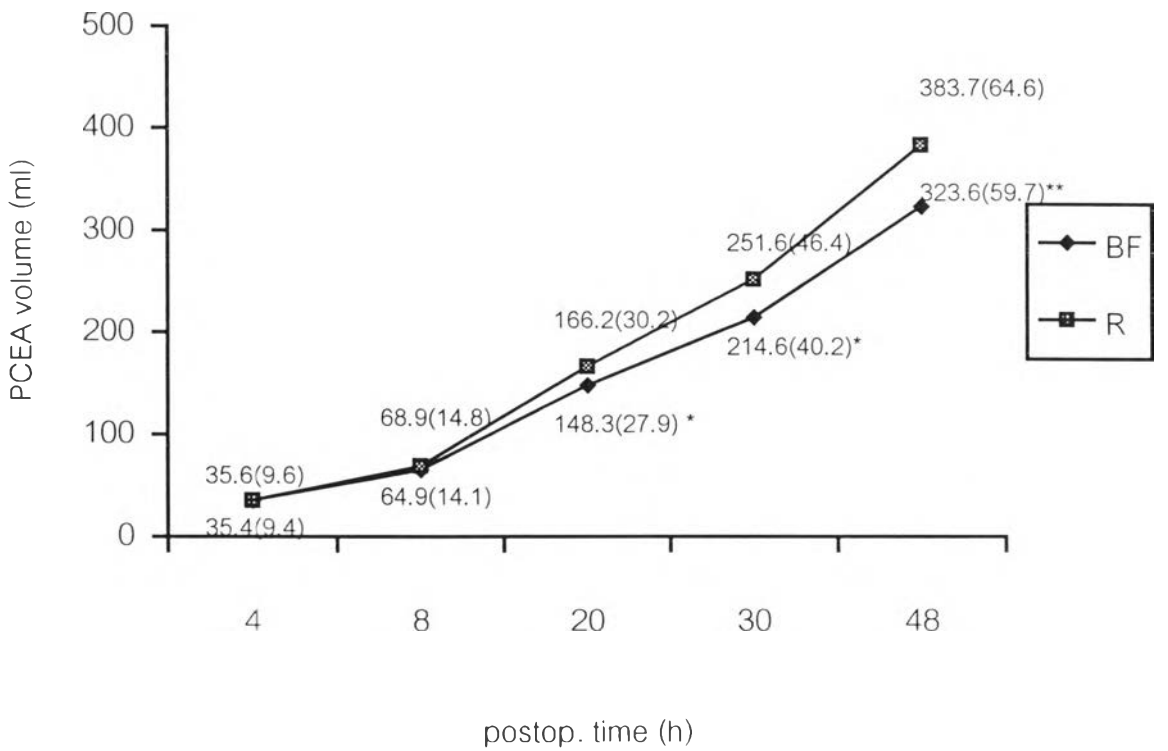

Fig 4.3 Mean consumption of PECA volume at 4, 8, 20, 30 and 48 hour postoperative period. Mean(SD) was shown, BF = bupivacaine + fentanyl group, R= ropivacain group. (* P< 0.05;** P< 0.001)

Table 4.4 Numbers of patients requiring rescue analgesic drug (Tramadol)

	Bupivacaine + Fentanyl (n)	Ropivacaine (n)
Consumption of Tramadol over 48 h		
0 mg	24	14
50 mg	6	8
100 mg	4	2
150 mg	1	2
200 mg	0	2
250 mg	0	1
300 mg	0	1

Values were numbers of patients. Chi square for trend; P value = 0.144

Table 4.5 Vomiting episodes and severity, pruritus severity and degree of motor blockade.

	Bupivacaine + Fentanyl	Ropivacaine	P value
Vomiting episodes			
- during 20 h	1 (0-9)	1 (0-5)	0.399
- during 20 - 48 h	0 (0-2)	0 (0-2)	0.911
Vomiting severity (01/2/3)			
- during 20 h	10 / 5 / 18 /1	14 / 8 /13 / 0	0.143
- during 20 - 48 h	30 / 1 / 4/ 0	31 / 2 / 2 / 0	0.538
Pruritus severity (0/1/2/3)			
- during 20 h	20 / 8 / 7 / 0	30 / 4 / 1 / 0	0.005
- during 20 - 48 h *	24 / 3 / 8 / 0	31 / 2 / 2 / 0	0.032
Motor blockade (0/1/2/3)			
- at 4 h	32 / 3 / 0 / 0	31 / 3 / 0 / 1	0.144
- at 8 h	33 / 2 / 0 / 0	31 / 2 / 2 / 0	0.229
- at 20 h	34 / 1 / 0 / 0	32 / 2 / 0 / 1	0.249
- at 30 h	33 / 2 / 0 / 0	31 / 4 / 0 / 0	0.673
- at 48 h	34 / 1 / 0 / 0	31 / 4 / 0 / 0	0.356

Values were expressed as median (range); and numbers of patients.

Severity of side effects was assessed as: 0 = none; 1= yes; but not require treatment; 2 = yes; that require and relief by treatment; 3 = yes; but not relief by treatment.

Degree of motor blockade; 0 = no motor block; 1 = hip blocked; 2 = knee blocked; 3 = hip, knee and ankle blocked. (* statistical significance)

Table 4.6 Sedation score at 4,8, 20, 30, 48 hour postoperative periods

	Bupivacaine + Fentanyl(n)	Ropivacaine (n)	P value
Sedation score (1/2/3/4)			
- at 4 h	26 / 8 / 1 / 0	31 / 3 / 1 / 0	0.208
- at 8 h	23 / 10 / 1 / 0	27 / 6 / 0 / 0	0.141
- at 20 h	31 / 4 / 0 / 0	31 / 4 / 0 / 0	0.645
- at 30 h	27 / 8 / 0 / 0	34 / 1 / 0 / 0	0.028
- at 48 h	33 / 2 / 0 / 0	34 / 1 / 0 / 0	0.404

Values were expressed as number of patients. (* stasistical significance)

Sedation scores 1 = awake & alert;

2 = mildly sedated, easily to wake up with call ;

3 = moderately sedated, easily to wake up with touch ;

4 = deeply sedated & difficult to wake up

Table 4.7 Patients' satisfaction on postoperative PCEA after total knee replacement procedure.

	Bupivacaine + Fentanyl (n)	Ropivacaine (n)
Patients' satisfaction		
Excellent	27	18
Good	6	7
Fair	2	10
Poor	0	0

Values were expressed as numbers of patients.

Chi square for trend; P = 0.008 (statistical significance)