Local Infiltration Analgesia (LIA) technique for pain control after total Joint replacement surgery

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ABSTRACT

Background : Total Joint Replacement surgery usually causes significant postoperative pain and it is one main reason for worrisome patients to postpone or deny surgery, aside from delay ambulation and hence delay recovery and discharge. Various methods of postoperative pain control have clinically been applied nowadays. The novel, Local Infiltration Analgesia (LIA) technique, provides satisfactory, effective, safe, simple and practical pain control to patients underwent total joint replacement surgery.

Method : 100 patients were recruited into this study. 50 patients were having total knee replacement (TKR) surgery whereas the others 50 patients were having Total Hip replacement (THR) surgery. All surgeries were done by same surgeon and same surgical technique. Difficult, revision and infected cases were excluded. All patients received the LIA pain control technique, by indwelling spinal catheter into the joint after surgery was done and before wound closure. Visual analogue pain score was evaluated immediately after surgery and throughout 2 days of postoperative care. The amount of Morphine given to the patients and level of pain score were collected and analyzed.

Results : Out of 50 patients underwent total knee replacement, there were 5 patients had pain score more than 4 and received Morphine to control the pain. Whereas, 3 of 50 patients underwent total hip replacement had pain score higher than 4 and received Morphine. There was no serious complication related to this pain control technique.

Conclusion : Local Infiltration anesthesia (LIA) pain control technique is simple but very effective to decrease postoperative pain. Most of patients were satisfied with only minimal postoperative pain. There was no side effect such as drowsiness and vomiting unlike in those patients who received Morphine. And there was no serious complication or unexpected events.

Keywods : Postoperative pain control (postop pain)

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Background

Total joint replacement surgery has been continuously increasing Worldwide. As more of people live longer and are also more active than in the past, degenerative arthritis knee and hip prevalence are higher and those who need surgical treatment are also dramatically increase. Aside from being afraid of risks from surgery, post-operative pain is another major worrisome for many patients.

Nowadays, multi-modal analgesia[1] has been used to alleviate the postoperative pain. Those include pre-emptive analgesia,[2] intra-articular injection, epidural block and patients controlled anesthesia. None of these techniques provides complete pain control without possible complications. Some techniques need very meticulous technique and care.

Morphine has been used as a strong analgesia and is used in every institutions for postoperative pain control in major surgery patients. However, morphine usually has some side effects such as dizziness, drowsiness, sedation, vomiting and respiratory depression. Those side effects usually delay patients from early ambulation and hence delay recovery and prolonged hospitalization.[3] Besides, Morphine is well accepted to increase risk of falling and fracture especially in elderly patients.

Local Infiltration anesthesia (LIA) was firstly described[4] as a simple, practical and effective pain control technique, and also help avoidance increase likelihood of morphine or other opioids consumptions,[5] thus avoid opioids' sedation effect and facilitate rapid physiological recovery in order to enable early mobilization and discharge. This practical technique has not been widely used especially in Thailand.

A fine epidural catheter is placed intra-articular before wound closure.A mixture of medication such as ketorolac[6] and Bupivacaine hydrochloride was injected into operated jointed through this epidural catheter in day 1 and day 2 after operation. The catheter was removed after injection of the medication in the second day.

Pain score and amount of morphine required by the patients were recorded and were used to analyze the efficacy of this pain control technique.

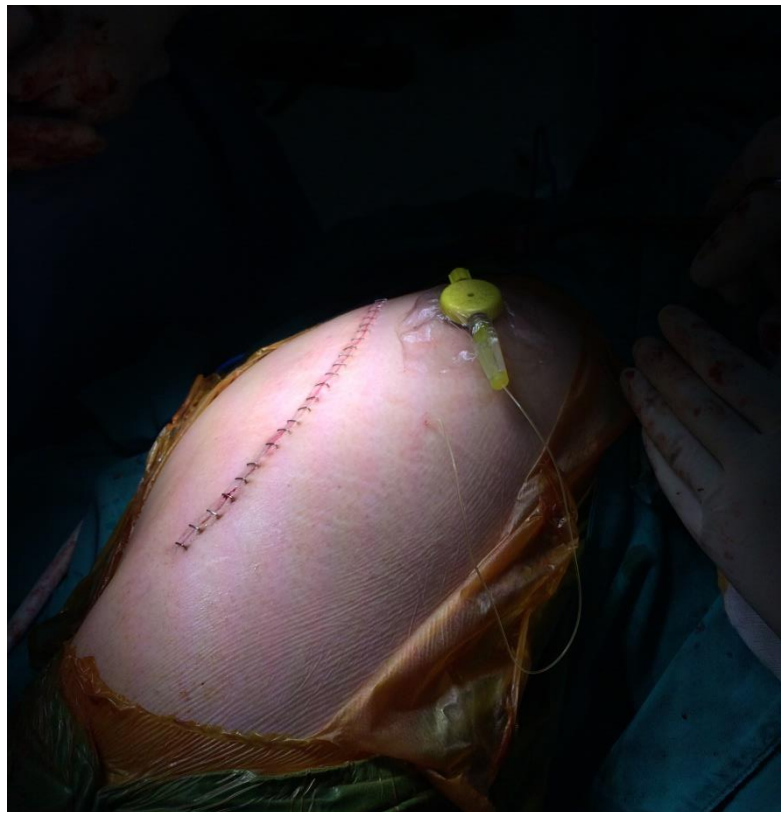

Fig.1: An epidural catheter was placed intra-articular.

Methods: The study took 3 years during October 2015 to October 2018. There were 50 patients underwent Total Knee Replacement (TKR) surgery and 50 patients underwent Total Hip Replacement (THR) surgery. All surgeries were done by one Orthopaedics surgeon, same surgical technique, same pre-operative management and same post-operative protocol. Patients who were candidate for elective total joint replacement surgery in Mahasarakham hospital during October 2015 to October 2018 were recruited into study. Those with inflammatory joint disease, post-traumatic arthritis, revision and History documented infected jiont were excluded from recruitment.

This research has been approved by the Research Esthic Committee,Mahasarackham Hospital.

As a preemptive medicine, meloxicam 7.5 mg would be routinely prescribed. Lorazepam 1 mg is also prescribed for better sleep of the patients on the night before operation would take placed. A half an hour before skin incision Cefazolin 2 gm is given intravenously as a prophylactic antibiotic. And just before skin incision, 750 mg of Transamin is given in the purpose of bleeding control and is also given 750 mg before wound closure.

AS for Total Knee Replacement (TKR), Medial parapatella skin incision and subvastus approach was done in all cases. PCL substituted and fixed bearing designed TKR prosthesis, were used.

For Total Hip Replacement (THR), Posterior approach is done with routinely repair of joint capsule, Piriformis tendon, Trochanteric bursa and fascial layer.Colarless, uncemented triple taper femoral stem was inserted by press-fit technique. Hemispherical acetabular metal cup was also inserted in press-fit technique without screw fixation. Epidural catheter was inserted into both the hip and knee joints through 18 gauge needle before begin would closure. Care was taken to ensure that the catheter was not caught in the joint mechanism and that it lay in a position such that the mixture solution could be delivered to all parts of the joints. A mixture of 0.5% Bupivacaine 20 cc, 40 cc of 0.9% NSS solution and 30 mg Ketorolac[6] was intra-articular and peri-articular injected before wound closure.

As a postoperative pain control protocol, 500 mg acetaminophen is given every 6 hour for 2 days. 50 mg Tramadol is given three times a day after meal. 300 mg Gabapentin is given before sleep time for 5 days. Parecoxib is injected 40 mg every 12 hours for 2 doses starting immediately when patients arrived at ward.

Pain is assessed every 4 hour by visual analogue score. If pain score is higher than 3 out of 10, Morphine is given intravenously. The amount of Morphine given is recorded and used for analyzing.

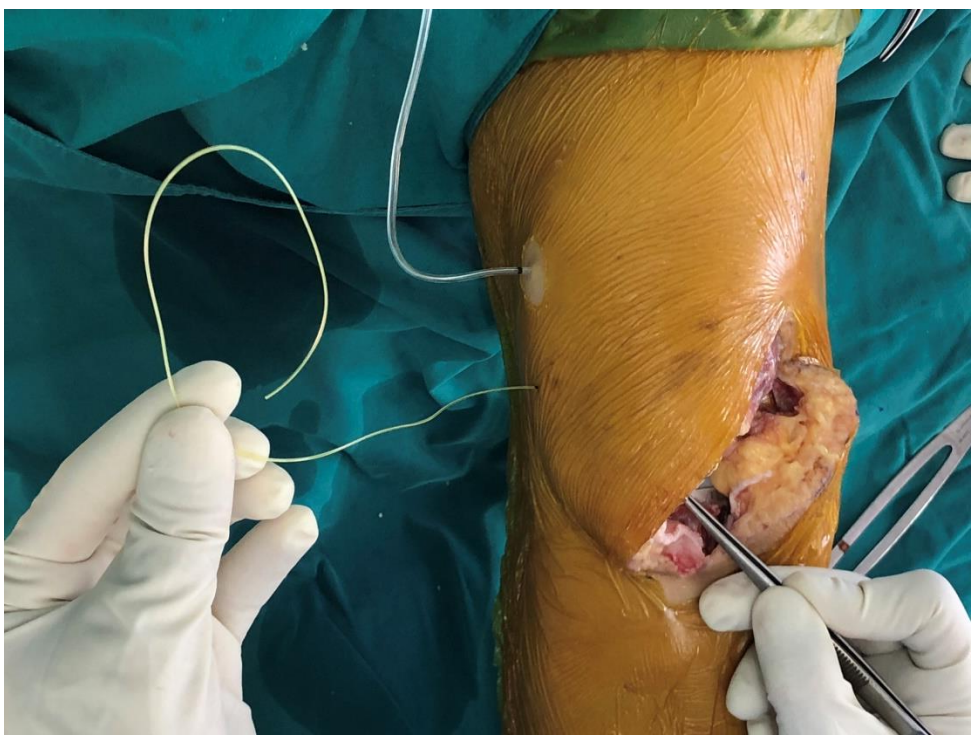

Fig 2 : An epidural catheter was inserted to knee joint before wound closure.

The mixture of 30 mg Ketorolac and 0.5% Bupivacaine 20 ml is injected to the operated joint in the morning for 2 days and the catheter is removed after the second day injection. The Radivac drain was clamped during injection of the solution through the epidural catheter then continue for 10 minutes to prevent the solution leakage.

The Radivac drain is removed when drainage fluid is less than 50cc per 8 hour and would never be placed for longer than 4 days. As for postoperative rehabilitation protocol, patients are encouraged to move their operated extremities as soon as possible. Begin with ankle-foot pump exercise and leg raise exercise and begin full weight bearing ambulation the first day after operation.

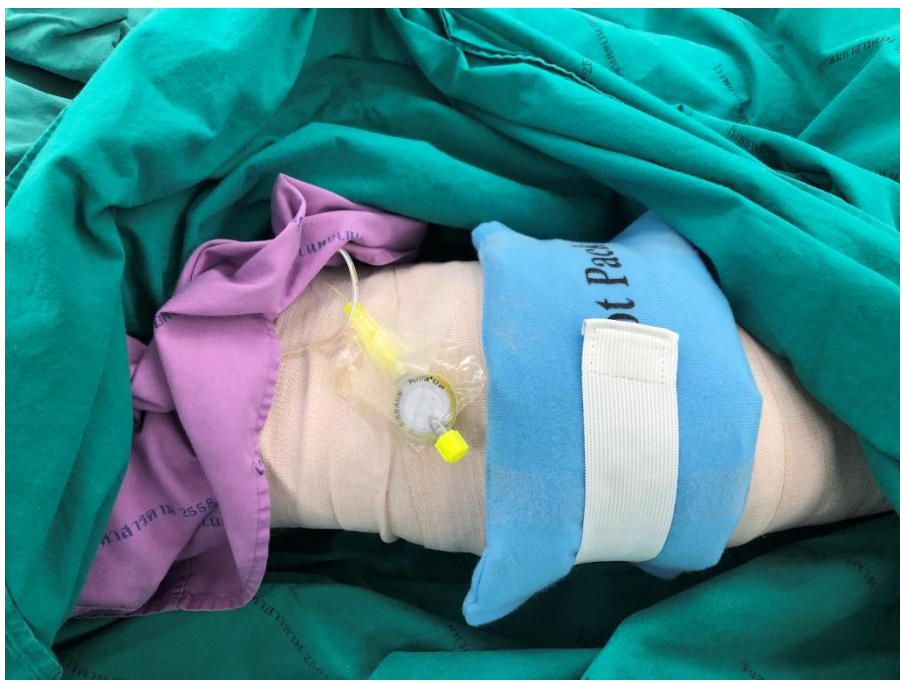

Fig 3 : Tip of epidural catheter is inserted to catheter connector and then connected to a filter.

Fig 4 : The mixture solution of Bupivacaine and Ketorolac is injected for 2 days after operation.

Result : After recruitment patients who were candidate to enroll in this study. Patients who meet the exclusion criteria were excluded from enrollment. Exclusion criteria were revision surgery, infection or suspect infection, post traumatic arthritis and inflammatory disease.

There were 50 patients underwent Total Hip Replacement (THR) and 50 patients underwent Total Knee Replacement (TKR). Demographic data of enrolled participants are shown in table 1 as below.

Table 1 : Demographic data of patients underwent total joint replacement.

Operation	n	Age(average)	Sex (M/F)
Total hip replacement	50	58	28/22
Total knee replacement	50	66	18/32

All operations were done by same surgeon, same pre-operative care, surgical technique and postoperative care protocol. Pain score were recorded by ward nurses by visual analogue pain score. Pain score 1 to3 was considered as minimal pain. Pain score 4-10 was considered as significant pain and Morphine would be given. Number of patients who had significant pain or pain score was more than 3 were recorded and used for analyze. Numbers of patients who had significant pain (PS>3) and were given strong analgesic (Morphine) throughout 48 hour after operation until removal of catheter from hip and knee joints are shown below.

Table 2; pain score recorded on postoperative day 0 at 4 hour after time zero, postoperative day1 approximately 24 hour after time zero, and postoperative day 2 approximately 48 hour after time zero for each operation category.

	4 hour		24 hour				48 hour			
	Rest		Rest		Walking		Rest		Walking	
Score	n	%	n	%	n	%	n	%	n	%
Total hip replacement (n=50)										
0	0	0	0	0	0	0	0	0	0	0
1	2	4	4	8	0	0	6	12	0	0
2	10	20	22	44	16	32	26	52	21	42
3	37	74	22	44	34	68	18	36	29	58
>3	1	2	2	4	0	0	0	0	0	0
Total knee replacement (n=50)										
0	0	0	0	0	0	0	0	0	0	0
1	0	0	1	2	0	0	0	0	0	0
2	6	12	13	26	15	30	21	42	11	22
3	41	82	36	72	33	66	29	58	39	78
>3	3	6	0	0	2	4	0	0	0	0

As shown in table 2, number of patients underwent both total hip and total knee replacement with Local infiltration analgesia (LIA) pain control technique that had severe pain and required Morphine were only 6 and 10 percent respectively.

Table 3; Morphine usage over the first 48 hour postoperative by operation category.

	Total hip replacement	Total knee replacement
	N=50	N=50
No Morphine	47	45
Morphine	3	5
Morphine after 24 hour	0	0

Summary numbers of patients who received and did not receive Morphine are shown in table 3

Total joint replacement surgery usually cause significant pain. And as shown in our study, postoperative pain usually is more intense on the first 24 hour after operation. There was no patients had pain score more than 3 after 24 hour.

There were none serious complications such as deep surgical wound infection. But there were some minor complication such as prolonged wound drainage [7] in both group of patients but the incidence percentage of this complications in our series was not exceed incidence in general population undergoing total joint replacement surgery. In 2013, the first International ConsensusMeeting (ICM) on PJI defined prolonged wound drainage as >2 x 2 cm of drainage in the wound dressing beyond 72 hours after index surgery.[7]

Table 4; Number and percent of patients with complication by operation category.

	Total hip replacement	Total knee replacement
	N=50	N=50
Deep surgical wound infection (percent)	0(0)	0(0)
Prolonged wound oozing (percent)	4(8)	7(14)

Number and percent of patients who had complications are shown in table 4

Conclusion : Local Infiltration Analgesia (LIA) pain control technique is simple, practical, effective and doesn't require any special skill or instruments to do.

Less than 10 percent of patients underwent total joint replacement surgery has significant pain and most of them were satisfied with this simple pain control technique.

This novel pain control technique does not mean to replace any other method of analgesia technique but to enhance and adjunct other method's efficacy for better postoperative pain alleviation and thus facilitate faster ambulation and recovery.

There was no serious complication but some minor complications such as prolonged wound oozing in the study group of patients.

Limitations in this study were this is not a Randomized controlled trial (RCT) study and number of patients enrolled in the study were not large and there was not blind in the study.

Further randomized controlled trial study may be conducted in the future to further clarify the accuracy and reliability of this analgesia technique.

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