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Efficacy of local infiltration analgesia in the early postoperative period after total knee replacement

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Abstract

Background: Total knee replacement (TKR) is a commonly performed surgical procedure, all across the world. TKR may be associated with severe postoperative pain, usually requiring prolonged hospital stay and relative immobilization of the patient, may cause unwanted medical problems like nosocomial infections, DVT and poor surgical outcome. Local infiltration analgesia (LIA) is becoming more commonly used owing to the excellent pain relief, the low frequency of complications, and the anti-inflammatory effect. The injection usually contains a mixture of an anesthetic drug and a NSAID, to which epinephrine or a corticosteroid can be added. LIA is easy to use, relatively cheap, and many authors concluded that it reduces pain and opioid consumption.

Objectives:

1. To assess the pain relief postoperatively using visual analogue score (VAS).
2. To assess the knee range of movements (knee flexion and extensor lag) postoperatively.

Methods and Methodology: This study is an observational clinical study, centered at a private hospital between March 2019 to October 2020. Data was collected from 42 patients undergoing total knee replacement with local infiltration analgesia between the periods from March 2019 to 2020 October. Written and informed consent was taken. Patients with allergy to any of the study drugs, uncontrolled diabetes and hypertension were excluded from the study. A local infiltration injection of a mixture (cocktail) of drugs ropivacaine, ketorolac, adrenaline and normal saline was given using spinal needle. Quality of analgesia was estimated by using visual analogue score of 0 to 10 at 6 hr, 24hr, 48 hr, and 72hr after surgery during the rest and movement and knee range of movements was assessed postoperatively using goniometer. Data was collected and entered in excel sheet and was analyzed using paired t test. Software SPSS 20 was used for the statistical analysis. A P value of <0.001% was considered significant.

Results: A total of 42 patients with Osteoarthritis knee undergoing TKR with LIA were included in the study. A local infiltration injection of a mixture (cocktail) of drugs listed above was given before and after the implantation of the components. VAS, KF and EL was measured postoperatively at 6hrs, 24hrs, 48 hrs, 72 hrs respectively. Our results showed that postoperative VAS was significantly better till 48 hours postoperatively. KF improved significantly postoperatively. There was improvement in the extensor lag from postoperative day three.

Keywords: Total knee replacement (TKR), osteoarthritis, postoperative pain, local infiltration of analgesics (LIA), analgesics, pain relief

Introduction

Background: Total knee replacement (TKR) is a commonly performed surgical procedure, all across the world (fig1). TKR may be associated with severe postoperative pain, usually requiring prolonged hospital stay and relative immobilization of the patient, may cause unwanted medical problems like nosocomial infections, DVT and poor surgical outcome [1]. Total knee arthroplasty (TKA) may provoke intense early postoperative pain affecting the patients satisfaction for surgery. Local infiltration analgesia (LIA) is becoming more commonly used owing to the excellent pain relief, the low frequency of complications, and the anti-inflammatory effect [2]. LIA constitutes an additional form of analgesia, in which an analgesic is administered locally in to the surgical wound. The injection usually contains a mixture of an anesthetic drug and a NSAID, to which epinephrine or a corticosteroid can be added. LIA is easy to use, relatively cheap, and many authors concluded that it reduces pain and opioid consumption [3].

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Objectives

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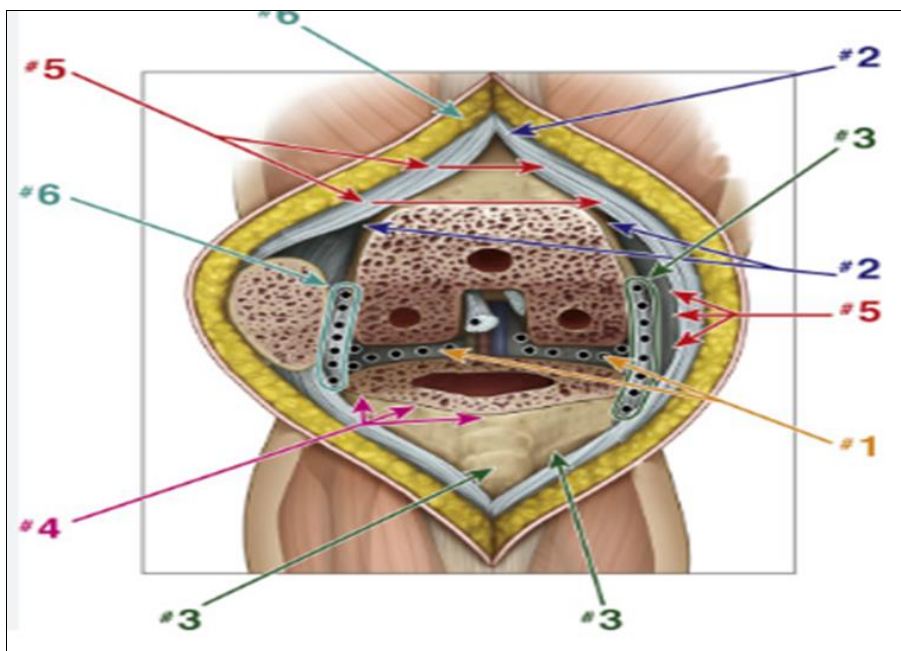
Methods and Methodology

The proposed study is an observational clinical study, centered at a private hospital between March 2019 to October 2020. Data was collected from 42 patients undergoing total knee replacement with local infiltration analgesia between the periods from March 2019 to 2020 October. Written and informed consent was taken from each patient enrolled in the study. Patients were evaluated clinically and radio logically at the time of the presentation. Patients with allergy to any of the study drugs, uncontrolled diabetes and hypertension were excluded from the study. A local infiltration injection of a

mixture (cocktail) of drugs ropivacaine, ketorolac, adrenaline and normal saline was given using spinal needle (fig2). Concentration of drugs given was as shown in table 1. Into the knee joint, injections were given at different sites as shown in figure 3, 4, 5, 6, 7. TKR was conducted under femoral nerve block. Quality of analgesia was estimated by using visual analogue score of 0 to 10 at 6 hr, 24hr, 48 hr, and 72hr after surgery during the rest and movement and knee range of movements was assessed postoperatively using goniometer. Post operatively pain management was done using IV and epidural analgesia. Data was collected and entered in excel sheet and was analyzed using paired t test. This was applied to check the presence of a significant difference in outcome variable between the two groups. Software SPSS 20 was used for the statistical analysis. A P value of <0.001% was considered significant.



Fig 1: Total knee replacement



- Syringe 1: Posterior capsule 8-10 sticks medial and 8-10 sticks lateral.
- Syringe 2: Femur - medial and lateral periosteum, posterior periosteum, suprapatellar quadriceps tendon.
- Syringe 3: Tibia- fat pad (5 sticks) Pesanserinus, medial collateral ligament and gutter (15 sticks)
- Syringe 4: Circumferential periosteum
- After cementation
- Syringe 5: Midline quadriceps tendon (10 sticks) Retinaculum, medial gutter, femoral to tibia (10 sticks)
- Syringe 6: Lateral gutter, femoral to tibia (10 sticks) Subcutaneous/closure (10 sticks)

Fig 2: Prior to cementation

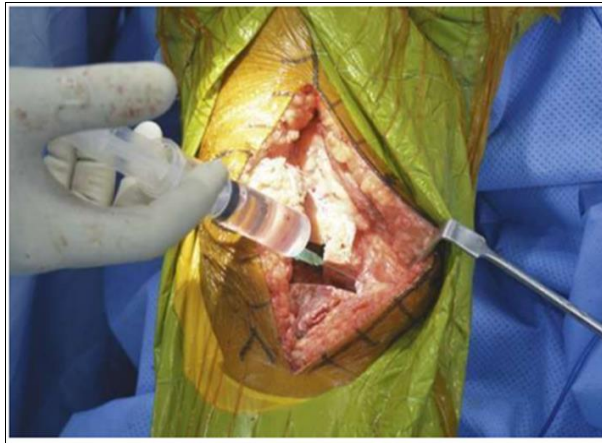


Fig 3: Injection of cocktail to medial collateral ligament and medial meniscus capsular attachment

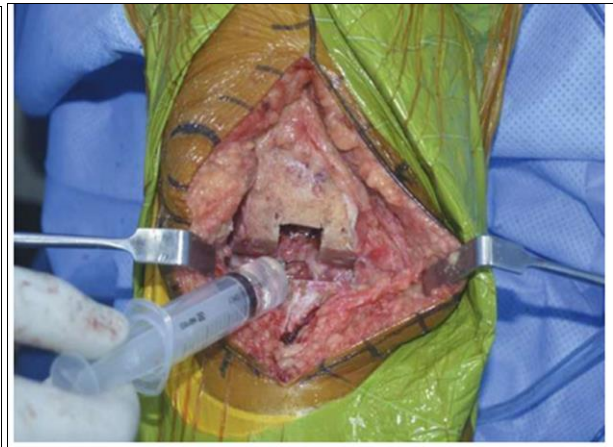


Fig 4: Injection of cocktail to lateral collateral ligament and lateral meniscus capsular attachment

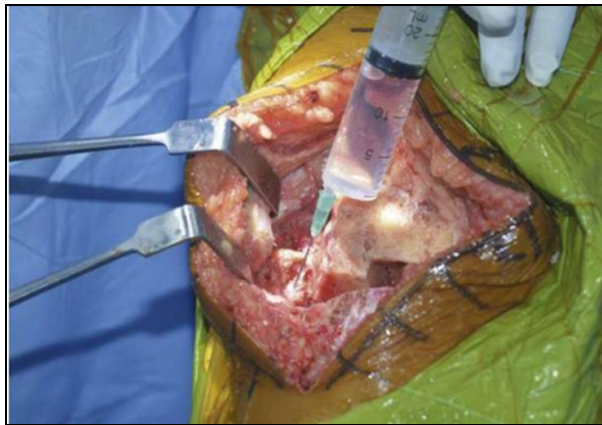


Fig 5: Injection of cocktail to posterior capsule of knee

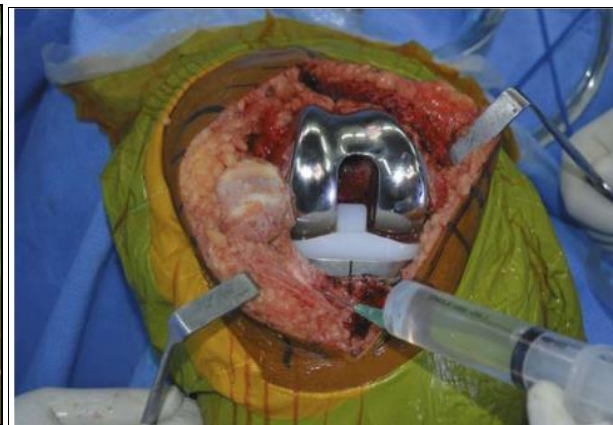


Fig 6: Injection of cocktail to patellar tendon and patellar fat pad



Fig 7: Injection of cocktail to cut ends of quadriceps tendon

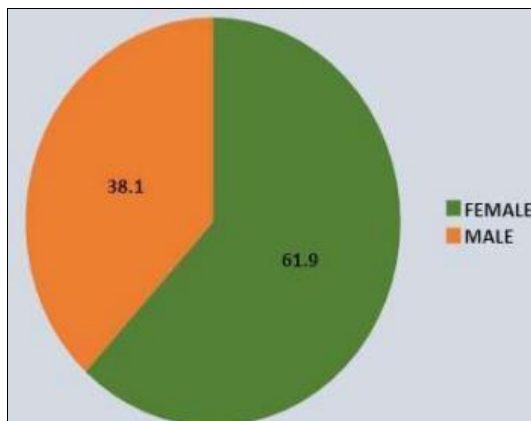


Fig 8: Age distribution of patients underwent TKR

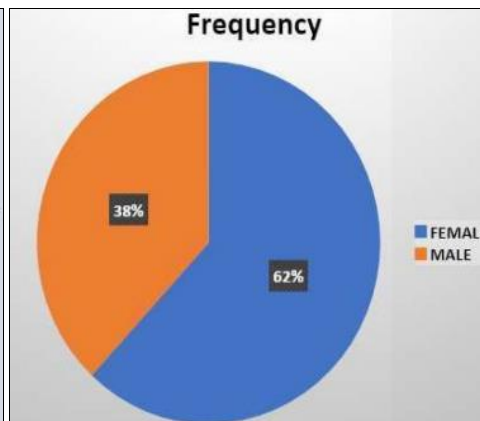


Fig 9: Gender distribution of patients underwent tkr

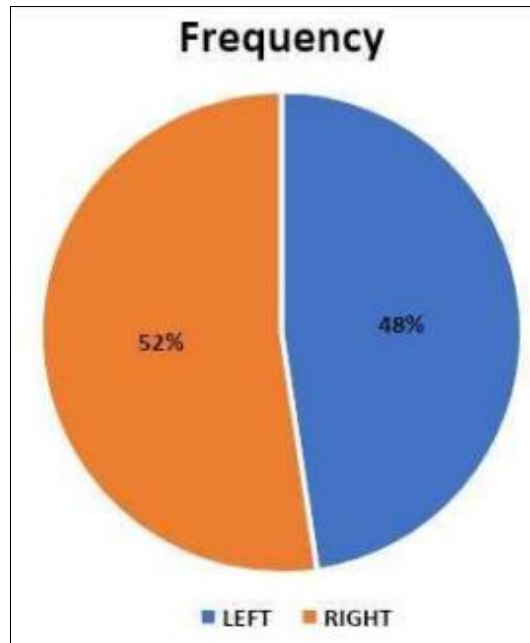


Fig 10: Frequency of right and left knee involved in the study

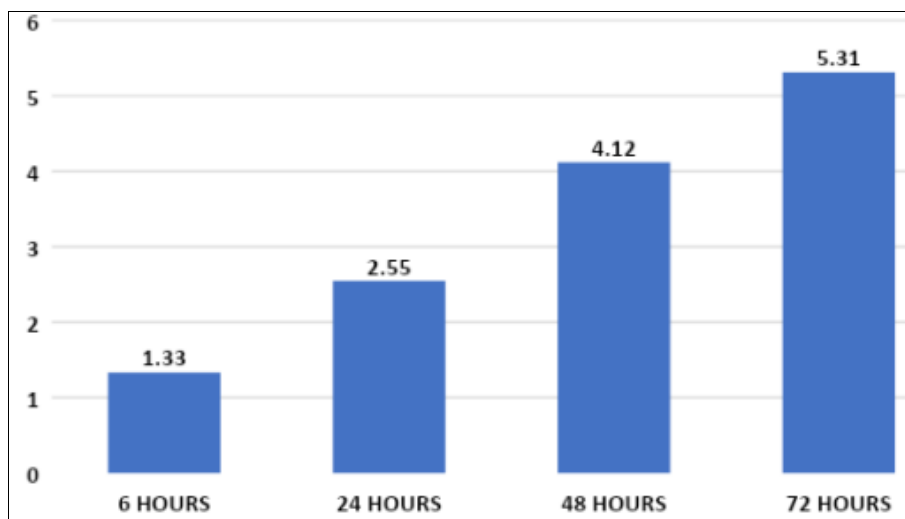


Fig 11: VAS comparison

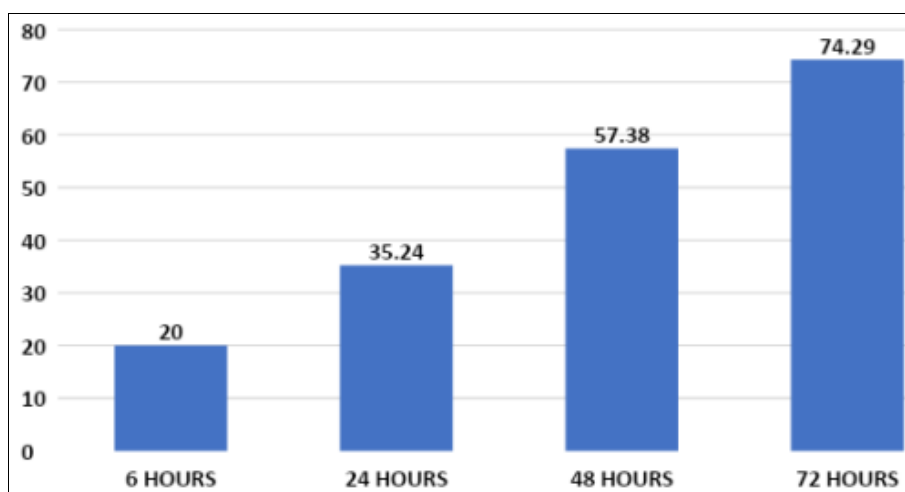


Fig 12: KF Comparison

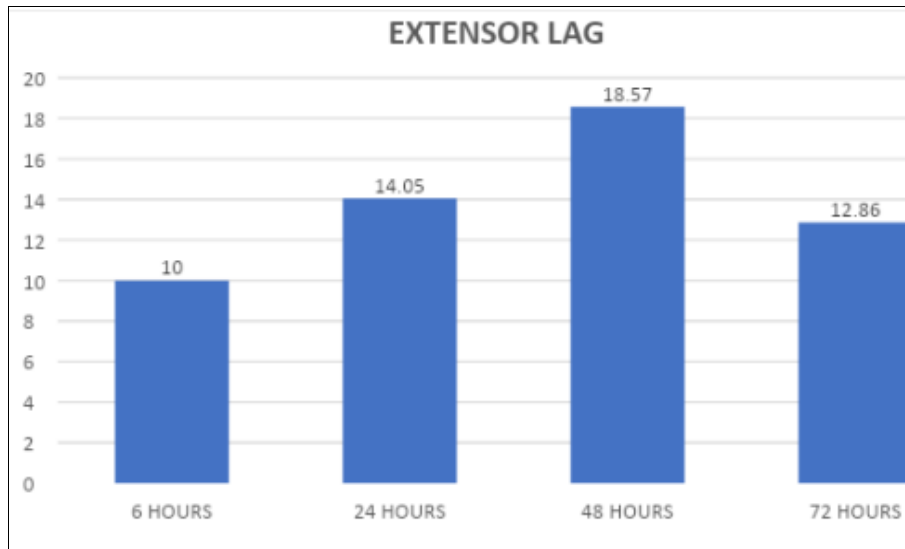


Fig 13: EL Comparison

Table 1: Local infiltration drugs

Sl. No	Drug	Dose(CONCN)	Volume (ML)
1.	Ropivacaine	0.25%	25 ml
2.	Ketorolac	30 mg	1 ml
3.	Adrenaline	1 mg (1:1000)	1 ml
4.	Normal saline	0.9%	73 ml
		Total	100 ml

Table 2: Age distribution of patients underwent TKR

	Frequency	Percent
Female	26	61.9
Male	16	38.1
Total	42	100.0

Table 3: Gender distribution of patients underwent TKR

	Frequency	Percent
Female	26	61.9
Male	16	38.1
Total	42	100.0

Table 4: Frequency of right and left knee involved in the study

	Frequency	Percent
Left	20	47.6
Right	22	52.4
Total	42	100.0

Results

A total of 42 patients with Osteoarthritis knee undergoing TKR with LIA were included in the study. Among the 42 patients, the age of the patients ranged from 60 to 73 years with the mean age of the patients being 68 years (fig 8 table 2). Among the 42 patients, 26 were female and 16 were male (fig 9 table 3). Among the 42 patients 20 patients underwent right knee TKR and 22 patients underwent left knee TKR (fig 10 table 4). A local infiltration injection of a mixture (cocktail) of drugs listed above was given before and after the implantation of the components. VAS, KF and EL was measured postoperatively at 6 hrs, 24 hrs, 48 hrs, 72 hrs respectively. Our results showed that postoperative VAS was significantly better till 48 hours postoperatively (fig 11). KF improved significantly postoperatively. (Fig. 12). There was improvement in the extensor lag from postoperative day three (fig 13).

Discussion

Total knee replacements (TKRs) are known to be very successful procedures they are often associated with lengthy and painful recoveries. Great strides have been made in the last several years in minimizing patient discomfort and enhancing their recovery. Less invasive surgical approaches, more selective soft tissue balancing, improved patient education, and perhaps instrument and implant design have all contributed to an overall easier recovery for a patient undergoing TKR. However, improvements in pain control deserve the greatest credit for the more rapid recoveries that are now being seen [5]. Arthrofibrosis and diminished range of movements are closely related to degree of post-operative pain [6]. Hence, pain control after total knee arthroplasty (TKA) is of prime importance in the immediate postoperative period for early rehabilitation. LIA is a Technique for management of acute phase of postoperative pain, particularly after knee and hip surgery [7, 8]. It was developed by Dr. Dennis Kerr and Dr. Lawrence Kohan in Sydney. Technique is based on the systematic infiltration of long-acting local anesthetic, a direct acting anti-inflammatory drug and sometimes other drugs (steroids, clonidine) [9, 10]. The intention is to target all elements involved in generation of pain signals at the site of the injury, including nociceptors, nerve endings, nerves responsible for inflammatory response to injury. LIA is the element designed to manage the acute postoperative pain phase lasting about 36 hours post operation.¹¹ Key enabling technique promoting rapid return to normal activities of daily living and facilitating discharge from the hospital. The focus of efforts should not be only on pain control, but rather to improve overall rate and quality of recovery from surgery and anesthesia. Rapid, high quality recovery makes it possible to avoid, reduce, or rapidly terminate all invasive measure and to have people return to normal activity. With dramatic improvement in the incidence of infection and venous thromboembolism, consequently, any assessment of this technique in comparison to their techniques for pain control must include measures of postoperative quality of recovery. In our study a local infiltration injection of a mixture (cocktail) of drugs listed above was given before and after the implantation of the components. VAS, KF and EL was measured postoperatively at 6hrs, 24hrs, 48hrs, 72hrs respectively. Our results showed that postoperative VAS was significantly better till 48 hours postoperatively (fig 11 table4). KF improved significantly postoperatively (fig 12

table 5). There was improvement in the extensor lag from postoperative day three (fig 13 table 6).

Conclusion

The intraoperative periarticular injection with ropivacaine, ketorolac and adrenaline showed better early postoperative pain relief up to 72 hours postoperatively. There was improvement in the knee flexion postoperatively and also there was improvement in extensor lag from postoperative day three. More study is needed to determine if additional medications or changes in the medication concentrations in the injection could provide added benefit or longterm functional improvements beyond the perioperative period. LIA can be compared with other modalities of postoperative pain relief like FNB, EDA to show that LIA is better than other modalities for early postoperative pain management after TKR [12].

Conflict of interest

There is no conflict of interest in this article.

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