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Original Research Article

DOES INFILTRATION OF LOCAL ANESTHESIA IN THE POSTERIOR CAPSULE REDUCES PAIN IN TOTAL KNEE REPLACEMENT WHEN COMPARED WITH PLACEBO

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Abstract: *The current analysis aimed to determine the mean pain score after injecting long-acting local anesthesia in the posterior capsule after a total knee replacement by comparing it with the placebo group. This prospective cohort study was conducted in the orthopedic department of Aziz Bhatti shaheed teaching hospital Gujrat from 1st June to 31st December 2022. The mean pain score was assessed at the end of 24 hours after postoperative surgery and measured by a visual analog scale (VAS = 0-10) where 0 was taken as no pain and 10 as worst pain. We divided cases into groups A and B. Group A was given a drug, and Group B was given normal saline. The knee pain score was calculated at the end of 24 hours postoperatively. Out of 222 patients, (47.30%) were male and 117(52.70%) were female, with ages ranging from 40 to 70 years; in group A, the mean age was 58.29±6.84 years and 58.39 ±7.33 years in group B. The mean BMI was 30.55±2.46 kg/m2. In group A, 52 (46.85%) patients had DM, while 49 (44.14%) were in group B. The mean pain score in group A was 2.95±0.98 and 4.44±1.13 in group B with p-value =0.0001. Stratification of pain score was performed concerning age, gender BMI and DM. Statistically significant results were found among age and gender. This study concluded that there is less mean pain score after long-acting local anesthesia in posterior knee capsules compared with placebo in total knee replacement.*

Keywords: Total Knee Replacement, Local Anesthetic, Pain

Introduction

Total knee arthroplasty is a standard procedure for advanced osteoarthritis of knee joints. It is a technically demanding procedure requiring skills to correct deformity and marinate balanced knees. The alignment of components is a crucial step in the legibility of the procedure (Albrecht et al., 2016). Various modalities have been introduced to reduce to minimize stress related to surgical intervention, thereby enhancing recovery (Alijanipour et al., 2017). These include less invasive techniques, selected soft-tissue balancing, better instrumentation, and modern surgical implants with adequate patient counseling. Early and speedy recovery depends on adequate pain control (Badner et al., 1996).

Pain control after total knee arthroplasty is one of the crucial steps for the long-term outcome of surgical intervention. For adequate pain control after TKR, no clear guideline has been established. Various pain management methods have been adopted, including oral medications, peripheral nerve blocks, and epidural and parenteral analgesia. These may result in poor pain control and undesirable side effects like pulmonary embolism and deep vein thrombosis (Bramlett et al., 2012; Browne et al., 2004; Busch et al., 2006; Collis et al., 2016). Now, multimodal anesthesia has been employed to overcome this problem, and local infiltration is gaining popularity (Gibbs et al., 2012a). Studies showed that local analgesia infiltration provides adequate pain relief with decreased parenteral opioids. Some believe injecting in the posterior capsule gives satisfactory results regarding adequate pain control (Green et al., 2014; Kehlet and Andersen, 2011). It was noted that the mean pain score was significantly less after injecting in the posterior capsule compared to placebo in total knee replacement(3.9±2.7 versus 4.9±2.6) (Marino et al., 2009). As less literature is available locally on the effect of long acting analgesia in posterior capsule, we are conducting a study to compare the mean pain score after injection of long-acting local anesthesia in the posterior capsule after a total knee

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replacement compared to the placebo group.

Methodology

It was a prospective cohort study conducted in the orthopedic department of Aziz Bhatti shaheed teaching hospital Lahore from 1st June to 31st December 2022. The sample size was 222, with 111 cases in each group having a significance level of 5%. The power of the study was 80 % (Albrecht et al., 2016). Non-probability consecutive sampling technique was used. Inclusion criteria; all male and female patients undergoing total knee arthroplasty aged 40 to 70 years. We excluded patients having previous knee surgery and those with simultaneous bilateral TKR. Patients with prior history of chronic pain or drug abuse, with neurovascular compromise, and those with co-morbid conditions like CRF, chronic steroid use, and CLD.The mean pain score was assessed at the end of 24 hours postoperatively and measured by visual analog scale (VAS = 0-10) e=where 0 was taken as no pain, and 10 was taken as worst pain.

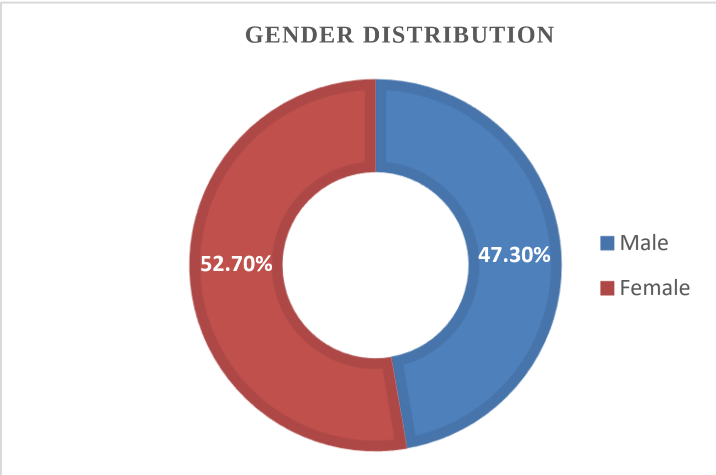
Informed written consent was taken from patients who fulfilled our criteria. We divided cases into groups A and B. Group A was given a drug, and Group B was given normal saline. The same surgeon performed all procedures with at least 5 years of experience. The knee pain score was calculated at the end of 24 hours postoperatively. Data was entered in SPSS version 20.0. Age BMI and knee pain score calculated in mean and standard deviation. Frequency and percentage were recorded for gender and diabetes mellitus. An Independent t-test was used to compare mean pain, and ≤.0.05 was taken as significant.

Results

A total of 222 patients were included in this study, males were 47.30%, and females were 52.70% (Figure 1); age ranged from 40 to 70 years with a mean of 58.33±7.40 years. In Group A, the mean age was 58.29±6.84 years, and in Group B was 58.39 ±7.33 years (Table 1). We found a mean BMI of 30.55±2.46 kg/m2 (Table 1). In group A, 52(46.85%) patients were diagnosed with DM, while 49 (44.14%) in group B with a total number of patients was 101(45.50) (Table 1).In group A, the Mean pain score was 2.95±0.98; in group B, it was 4.44±1.13 with p=0.0001 (Figure 2). Stratification of pain score was performed concerning age, gender, BMI, and DM (Table 2). Statistically significant results were found among age and gender.

Table 1: Distribution of age, BMI, and DM for both groups (n=222)

Age years)	Group A (n=111)		Group B (n=111)	
	No	%	No.	%
40-55	39	35.14	36	32.43
56-70	72	64.86	75	67.57
Mean±SD	58.29±6.84		58.39±7.33	
BMI (kg/m2)				
≤30	46	41.44	46	41.46
≥30	65	58.56	65	58.56
Mean±SD	30.52±2.48		30.56±2.45	
DM				
Yes	52	46.85	49	44.14
No	59	53.15	62	55.86



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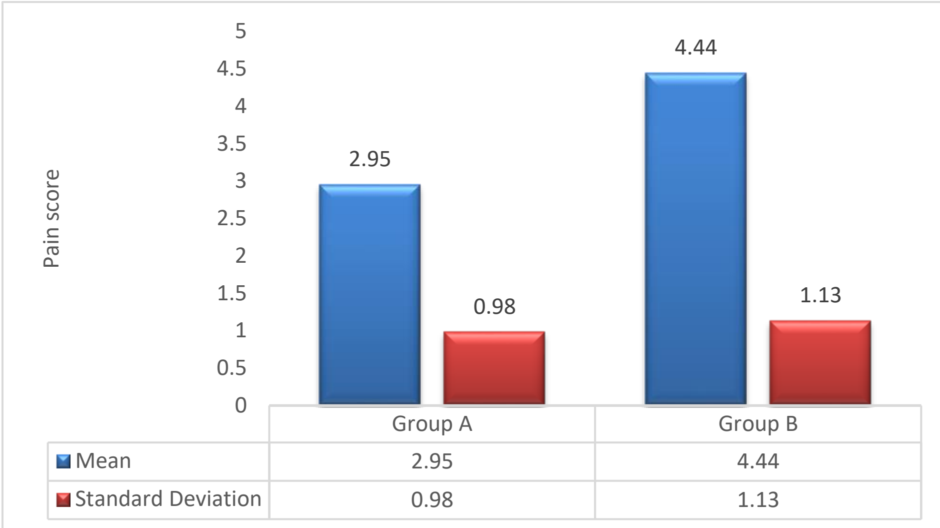

Figure II: Mean pain score in both groups. The P-value is 0.0001, which is statistically significant.

Table 2: Stratification of pain score; group A and group B with respect to age, gender, BMI, and DM

Age (years)	Group A (n=111)		Group B (n=111)		P value
	Pain score		Pain Score		
	Mean	SD	Mean	SD	
20-30	3.26	1.12	4.47	1.06	**0.0001**
31-40	2.79	0.86	4.43	1.16	**0.0001**
BMI					
(<30)	3.12	0.97	4.31	1.23	**0.0001**
(>30)	2.82	0.97	4.55	1.04	**0.0001**
DM					
Yes	2.79	0.80	4.24	1.11	**0.0001**
No	3.10	1.09	4.60	1.12	**0.0001**

Discussion

Adequate management of postoperative pain is crucial to overcome decreased mobility resulting in complications like PE and DVT causing prolonged hospital stays. Improvement in peri-operative anesthesia has revealed an increased satisfaction level of patient improvement in early rehabilitation.(Green et al., 2014; Marino et al., 2009). Kerr and Kohan have reported the application of local anesthesia with promising results in reducing postoperative pain. 14 Various studies have shown the same results in pain control by injecting local anesthesia in the wound and surrounding tissues (Yin et al., 2014).

Local analgesia application has become increasingly popular, with acceptable results in reducing postoperative pain. Gibbs et al. provide sufficient evidence to support the local application of the drug (Gibbs et al., 2012b). Marques et al. favor local infiltrations as a part of multimodal anesthesia in reducing pain and decreasing hospital stay in TKR and THR.(Marques et al., 2014) Yin et al. support infiltrations in the early stages of recovery from surgery, but it does not affect the late stage of recovery (Yin et al., 2014). Also, there is no high-quality research design and reporting of favorable results, thus creating a bias. On the other hand, previous systematic reviews for the efficacy of local administration of drugs have certain limitations that decrease high-quality RCTs with the variability of design and quality of studies (Kehlet and Andersen, 2011; McCarthy and Iohom, 2012).

No significant difference was found in pain score and opioid consumption in the first 24 hours after infiltrations of local anesthesia in many studies.(Browne et al., 2004; Ritter et al., 1999) However, Badner et al. reported reduced opioids use in the first 24 hours without a pain score difference (Badner et al., 1996).

Tanaka et al. demonstrated both decreases in both pain score and opioids consumption in the first 24 hours and a decrease in opioids requirement afterward (Tanaka et al., 2001).

A prospective masked randomized controlled trial by Bush et al. (Busch et al., 2006) in 64 patients undergoing unilateral knee replacement. In this trial patient either receives no drug or infiltrations of multimodal drugs (bupivacaine, ketorolac, apomorphine, and adrenaline). Patient-controlled analgesia was significantly reduced in the first 24 hours, but no difference in length of hospital stay was noted.

Schroer et al. (Schroer et al., 2015) and Alijanipour et al. (Alijanipour et al., 2017) studied the effect of liposomal bupivacaine and bupivacaine HCL in TKR. They found no significant difference in pain control after local infiltration. Bramlett et al. (Bramlett et al., 2012) further added by measuring the plasma concentration of bupivacaine in blood samples of the patients in addition to pain score. They concluded a significant difference in mean pain score between liposomal bupivacaine with a high dose of 532mg versus bupivacaine HCl 150mg in TKR. No significant difference was noted in low-dose liposomal bupivacaine (133mg, 266 mg, and 399mg) compared to bupivacaine HCL 150mg.

Collis et al. (Collis et al., 2016) conducted a study by comparing lysosomal bupivacaine injection with multimodal analgesia (ropivacaine, epinephrine, ketorolac, and clonidine). They demonstrated no difference in pain scores and narcotic use with both groups. Schwarzkopf et al. (Schwarzkopf et al., 2016) found no difference in daily narcotic use by comparing liposomal bupivacaine with the combination of multimodal drugs (ropivacaine, clonidine, toradol, and epinephrine) and saline.

Conclusion

This study concluded that there is less mean pain score after long-acting local anesthesia in posterior knee capsules compared with placebo in total knee replacement. This promotes early recovery, decreases hospital stay, and enhances rehabilitation without documented adverse effects. Hence we recommend regular use of this drug during surgery.

Conflict of interest

The authors declared the absence of a conflict of interest.

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