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Comparison Of Epidural Analgesia Vs Intraoperative Peri-Articular Injection For Pain Management Following Total Knee Arthroplasty

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Abstract

Objective: To compare epidural analgesia vs intraoperative peri-articular injection for pain management following Total Knee Arthroplasty.

Method: This randomized controlled trial was conducted on 54 patients undergoing Total Knee Arthroplasty and divided into two groups equally, group A received epidural analgesia while group B received peri-articular injection. Postoperative pain on VAS score after six hours and 24 hours and side effects on the first postoperative day were assessed between both groups. Independent samples T-test was used for comparison of variables keeping P value significant at 0.05.

Results: The mean age of the patients recorded was 58.85±5.93 years. Male were 46.3% while female patients were 53.7%. Postoperative pain assessed on VAS after 6 and 24 hours was significantly lower in group B (peri-articular injection) as compared to group A (epidural analgesia) (P = 0.009). The frequency of nausea and vomiting was significantly lower in group B (peri-articular injection) than in group A (epidural analgesia) (P = 0.004, P = 0.005).

Conclusion: Based on the findings of our study, we conclude that the utilization of intraoperative peri-articular injection for management of pain following Total Knee Arthroplasty yielded a significantly lower incidence of postoperative pain, as well as reduced occurrences of nausea and vomiting when compared to the use of epidural analgesia.

MeSH Keywords: Total Knee Arthroplasty, Analgesia, Articular injection, Epidural.

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1. Introduction

Total Knee Arthroplasty (TKA), commonly known as knee replacement surgery, is a transformative procedure that provides relief from debilitating knee pain and restores mobility for individuals suffering from advanced osteoarthritis or other degenerative joint conditions.[1] While the surgical aspect of TKA has seen significant advancements over the years, the effective management of postoperative pain remains a critical concern. In this era of patient-centred care, optimizing pain control after TKA is not only vital for patient comfort but also for facilitating early mobilization and accelerating the overall recovery process.[2, 3]

Epidural analgesia involves the administration of local anaesthetics and opioids into the epidural space, typically in the lumbar region of the spine.[4] This technique aims to provide comprehensive pain relief by blocking nerve signals from the operative site and reducing pain perception. Epidural analgesia is highly effective at controlling both postoperative pain and inflammation, allowing patients to achieve comfortable early mobilization and participate in physical therapy.[5] By delivering pain relief directly to the affected area, epidural analgesia reduces the reliance on systemic opioids, which can lead to side effects such as nausea, constipation, and respiratory depression.[6]

Intraoperative peri-articular injection is an alternative approach to pain management in TKA.[7] During the surgical procedure, a mixture of local anaesthetics, opioids, and other adjunctive medications is injected directly into the peri-articular tissues surrounding the knee joint.[8] Intraoperative peri-articular injection is relatively straightforward to perform during the surgery, requiring no additional procedures or equipment like epidural catheters. By targeting the specific area of surgical trauma, this approach provides localized pain relief, minimizing the need for systemic opioids and their associated side effects. Pain relief is achieved rapidly, often within the first few hours after surgery, promoting early postoperative ambulation and participation in physical therapy.[9-12]

Both Epidural Analgesia and Intraoperative Peri-articular Injection have their merits and considerations in the context of post-TKA pain management. The choice should be individualized to the patient's needs and the surgeon's preferences. Effective pain management is crucial for ensuring a smooth recovery and optimal patient outcomes following TKA.

Therefore, healthcare providers should weigh the benefits and drawbacks of each approach carefully, with a primary goal of maximizing patient comfort and satisfaction while minimizing potential complications. Ultimately, the selection of the most appropriate pain management strategy should be made through a collaborative decision-making process between the surgical team and the patient.

2. Materials & Methods

We conducted this randomized controlled trial on 54 patients from January 2021 to September 2021 at the Department of Orthopaedic Surgery, Benazir Bhutto Hospital, Rawalpindi Medical University, Rawalpindi. Participants in this clinical trial had to be over the age of 50 and in good enough health to have unilateral Total Knee Arthroplasty to be eligible. Patients who had contraindications for spinal anaesthesia and epidural analgesia, known allergies or intolerances to any of the research drugs, a history of consistent opioid use, renal insufficiency, or a prolonged QT interval on electrocardiograms were excluded from the study. Eligible patients gave written informed consent. Subsequently, each enrolled patient was assigned a randomized number.

Two groups participated in the study's interventions: group A received an epidural analgesic (Bupivacaine was used for epidural analgesia). Group B received peri-articular injection and this peri-articular cocktail of injections consisted of Bupivacaine (0.5%) 20ml, Tranexamic acid 15mg/kg and Ketorolac 30mg. All patients underwent the same perioperative procedures, such as spinal anaesthetic, surgical methods, knee prostheses, prophylactic antibiotics, and thromboprophylaxis. Following surgery, each participant followed the same rehabilitation schedule. A senior surgeon with more than ten years of expertise performed the operations. Both groups' postoperative pain levels were compared after 6 hours and after 24 hours. Both groups were assessed for symptoms such as nausea and vomiting on the first postoperative day.

All the data was analyzed by SPSS 24. We used independent samples T-test and Chi-Square test for comparison between various variables keeping the p value significant at < 0.05.

3. Results

This trial was conducted on 54 patients who underwent Total Knee Arthroplasty, mean age recorded in the patients was 58.85±5.93 years. Regarding gender, we observed that 46.3% were male while 53.7% were female patients. Patients were divided into two groups, 27 patients in each group. Group A patients had epidural analgesics while group B patients had peri-articular injections. The mean surgery duration and hospital stay are presented in Table 1.

Table 1: Descriptive statistics

Descriptive statistics	Groups	N	Mean	Std. Deviation	P value
Duration of Surgery (Mins)	Group A (Epidural analgesia)	27	59.00	9.373	0.27
	Group B (Peri-articular injection)	27	61.89	9.827	
Hospital Stay (Days)	Group A (Epidural analgesia)	27	3.37	1.149	0.32
	Group B (Peri-articular injection)	27	3.67	1.038	

Table 2: Comparison of postoperative pain on VAS after six hours between both groups

		Pain on VAS after 6 hours				Total	P value
		No pain	Mild	Moderate	Severe		
Groups	Group A (Epidural analgesia)	7	7	8	5	27	0.009
		25.9%	25.9%	29.6%	18.5%	100.0%	
	Group B (Peri-articular injection)	15	10	1	1	27	
		55.6%	37.0%	3.7%	3.7%	100.0%	
Total		22	17	9	6	54	
		40.7%	31.5%	16.7%	11.1%	100.0%	

Table 3: Comparison of postoperative pain on VAS after 24 hours between both groups

		Pain on VAS after 24 hours				Total	P value
		No pain	Mild	Moderate	Severe		
Groups	Group A (Epidural analgesia)	8	9	7	3	27	0.01
		29.6%	33.3%	25.9%	11.1%	100.0%	
	Group B (Peri-articular injection)	18	8	1	0	27	
		66.7%	29.6%	3.7%	0.0%	100.0%	
Total		26	17	8	3	54	
		48.1%	31.5%	14.8%	5.6%	100.0%	

Table 4: Comparison of side effects between both groups

Side effects		Groups				P value
		Group A (Epidural analgesia)		Group B (Peri-articular injection)		
		N	%	N	%	
Nausea at postoperative 1st day	Yes	11	40.7%	2	7.4%	0.004
	No	16	59.3%	25	92.6%	
Vomiting at postoperative 1st day	Yes	9	33.3%	1	3.7%	0.005
	No	18	66.7%	26	96.3%	

We observed that the postoperative pain after 6 and 24 hours in the peri-articular group was significantly lower than in the epidural analgesia group, 55.6% of patients in the peri-articular group reported no pain while 25.9% in the epidural analgesia group reported no pain. Severe pain was reported by 18.5% of patients in the epidural group while 3.7% of patients in peri-articular injection (P = 0.0009). Table 2 shows a comparison on the VAS scale at 6 hours. Table 3 presents the postoperative pain comparison on the VAS scale after 24 hours, which was significantly lower in group B (P = 0.01). Table 4 represents the comparison of postoperative side effects on the first day in terms of nausea and vomiting between both groups, group B showed a significantly lower frequency of side effects as compared to group A (P = 0.004, P = 0.005).

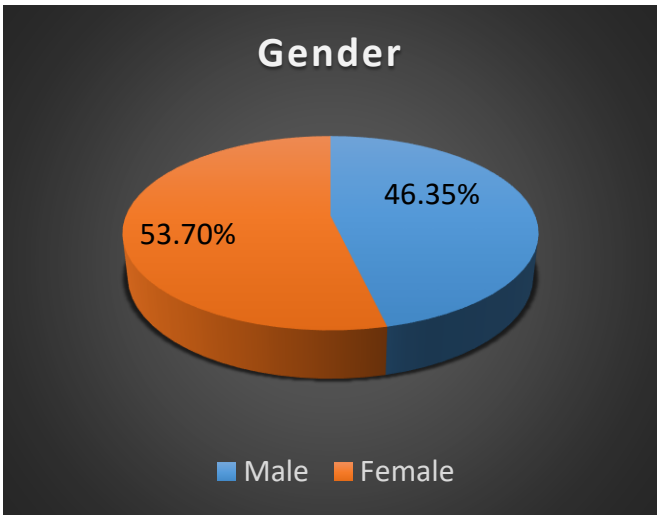

Figure 1: Gender distribution of patients

4. Discussion

The effective management of postoperative pain following Total Knee Arthroplasty is of paramount concern for both patients and surgeons.[13] One approach commonly employed for postoperative pain relief is epidural analgesia, which involves the use of a combination of anaesthetic agents and opioids. However, it is essential to have a balance between the benefits of epidural analgesia and the prevalence of associated adverse effects. Mostly these side effects are not limited to symptoms such as pruritus, nausea, hypotension, urinary retention, compromised muscle control, and delayed patient mobilization but sometimes, potentially serious complications like anticoagulant-induced spinal hematoma can be seen.[14]

The efficacy of a single-administration peri-articular injection given during surgery has been well-understood by recent investigations. With few negative effects, these trials have shown a considerable decrease in postoperative pain levels. For instance, when a peri-articular injection containing ropivacaine, epinephrine and ketorolac was given, one research saw a decrease in patient-controlled morphine use with few negative effects.[15] Another study found that patients who had a peri-articular injection comprising morphine, bupivacaine, and betamethasone consumed less postoperative morphine and experienced noticeably less postoperative nausea.[16]

For Total Knee Arthroplasty, the effectiveness of peri-articular injection and epidural analgesia has been

directly compared in two randomized controlled trials.[16, 17] One of these trials compared intraoperative peri-articular injection with ropivacaine, ketorolac, and epinephrine to intraarticular infusion with ropivacaine and ketorolac as well as epidural analgesia combined with intravenous ketorolac delivery. The latter strategy was judged to be superior in this comparison. In a different trial, postoperative pain levels at rest were not significantly different between peri-articular injection and epidural analgesia combined with femoral nerve blocking. However, changes in the pain management procedures linked to both peri-articular injection and epidural analgesia may have had an impact on the comparative results in these trials.[18]

Our study aimed to evaluate the effectiveness of epidural analgesia and peri-articular injection for pain control after Total Knee Arthroplasty. Notably, we observed that the peri-articular injection group exhibited significantly lower postoperative pain levels at the six-hour and 24 hours compared to the epidural analgesia group ($p = 0.009$). Furthermore, on postoperative day 1, the incidence of nausea and vomiting was significantly higher in the epidural analgesia group when compared to the peri-articular injection group. These findings strongly suggest that, at least for patients resembling those in our study cohort, peri-articular injection may be the preferred approach over epidural analgesia.

While epidural analgesia, involving opioids and local anaesthesia, has traditionally been considered the gold standard for postoperative pain control, a meta-analysis corroborates its superior efficacy in pain relief across various surgical scenarios.[18] However, it is important to acknowledge that epidural analgesia is associated with a notable incidence of nausea and vomiting. In contrast, while prior reports have associated peri-articular injection with a lower rate of nausea, no study has definitively established whether the overall complication rate following peri-articular injection is lower than that associated with epidural analgesia.[19] Nevertheless, our trial provides compelling evidence that peri-articular injection is indeed linked to a lower occurrence of nausea and vomiting when compared to epidural analgesia.

5. Conclusion

Our study leads us to conclude that the use of intraoperative peri-articular injection for pain management following Total Knee Arthroplasty resulted in a significantly lower incidence of postoperative pain, as well as a reduced occurrence of nausea and vomiting when compared to the administration of epidural analgesia.

INSTITUTIONAL REVIEW BOARD

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R.R.A, R.A - Conception of study
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R.R.A, W.A, H.W - Analysis/Interpretation/Discussion
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