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## Periarticular analgesia vs epidural analgesia in early post operative period of total knee arthroplasty

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### Abstract

Modern view of perioperative pain is to view it as an impediment to recovery and various methods are used to facilitate rapid return to normal functional activity. Post operative pain relief after knee surgeries, especially total knee replacement, is a major concern. It is severe in 60% of patients and moderate in 30%. It causes undue distress and hinders early intense physical therapy, considered one of the most important factors for optimal postoperative knee rehabilitation. The present study compares the efficacy between periarticular cocktail and epidural analgesia in early post operative pain management following TKA. A total of 78 patients were included in the study. By simple randomization patients were divided into Group A in which 48 patients received a periarticular cocktail and Group B in which 30 patients received Epidural top up dose. Group -A patients received an analgesic cocktail of 0.125% Bupivacaine (2mg/kg body weight), Ketorolac (30mg), Adrenaline. This analgesic cocktail of 20 cc was infiltrated in the posterior capsule, medial structure, lateral structures and the cut quadriceps tendon before placing the implant. Epidural topup of 8cc of 0.125% Bupivacaine was given 6 hours after surgery in Group B patients. No drain was placed in patients of Periarticular infiltration group. A straight leg raise test was done to assess the VAS score at 12h, 24h, 48h, 72h. Epidural analgesia provides effective pain control despite the disadvantages of its invasiveness, late return of motor functions and more systemic side effects. Local infiltrative periarticular analgesia methods should be considered due to its ease of use, lower rates of systemic side effects and the fact that it does not extend the motor block or require systemic application of LA, while providing comparable pain relief and equal range of movements and ambulation in the immediate postoperative period.

**Keywords:** epidural, periarticular cocktail, VAS

### Introduction

Clinicians have adopted a number of analgesic strategies to minimize pain after knee surgeries. Analgesic efficacy of these techniques, their influence on postoperative knee mobilization, length of hospital stay and long term functional recovery have been studied by few clinical trials. These studies have concluded that regional techniques provide superior pain relief and faster postoperative knee rehabilitation than systemic analgesia. Regional techniques were largely confined to spinal and epidural approaches until peripheral neural blockade were also shown to provide effective analgesia. Femoral nerve block provides excellent analgesia in the femoral nerve distribution. Investigators have reported the beneficial effects of femoral nerve block for patients undergoing total knee replacement, arthroscopy and other painful open knee procedures. They have reported a significant reduction in pain VAS scores for 48 hours, lower post operative opioid requirements, a reduced incidence of side effects and a shorter hospital stay. Single injection femoral nerve block provides analgesia typically for 12-24 hours but may last as long as 48 hours. In the recent times the advocacy of periarticular cocktail of local anaesthetic cocktail has increased. Intra operatively local anaesthetic cocktail is infused at various locations of the knee. Various studies have shown the efficacy of the cocktail infiltration with minimal complications.

### Materials and Methods

78 patients were involved in the study after taking prior consent from them and after approval from the ethics committee at Department of Orthopaedics, Kamineni Institute of Medical Sciences, Narketpally. The study was performed from October 2018 - September 2020. All

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patients qualifying for total knee arthroplasty were included in the study. Patients with deformity in the spine, hip and pathology were excluded. Patients were randomly divided in to 2 groups by simple randomization into Group A where 30 patients were given periarticular local infiltration and Group B where 48 patients received epidural analgesia.

Preoperatively, x rays of both knees (AP and lateral) were taken in standing position. All necessary blood and urine investigations were sent. Co-morbidities were optimized. After the blood, urine and throat swab cultures were negative, Pre anesthetic checkup was done and then the patients were taken up for the surgery. Intraoperatively, patients were in supine position with tourniquet in place. All patients were operated under spinal anesthesia. Epidural catheter was inserted only in Group-B patients. Group -A patients received an analgesic cocktail of 0.125% Bupivacaine (2mg/kg body weight), Ketorolac (30mg), Adrenaline. This analgesic cocktail of 20 cc was infiltrated in the posterior capsule, medial structure, lateral structures and the cut quadriceps tendon before placing the implant. No drain was placed in the patients involved in the study. The wound was closed in layers and then aseptic dressing was done. Postoperatively all patients received a rescue analgesia of Tramadol 50 mg intravenously for every 12 hours for the first two post op days. Group-B patients received a single dose of epidural top up of 8cc of 0.125%Bupivacaine was given 6hours after surgery. All patients were given Enaxoparin 40 mg subcutaneously for the first 3 post op days followed by oral Aspirin 75 mg twice daily for the next three weeks as prophylaxis for deep vein thrombosis. All patients were on intravenous antibiotics for first 6 post op days and on oral antibiotics for the next 5 days.

- Pain was assessed using visual analogue score in the first 24,36,48,72 hours of surgery.

- Straight leg raise test was performed to elicit pain at all intervals.
- Active ROM was recorded in the first 24,36,48,72 hours post operatively.
- Patients were ambulated as tolerated with the help of a walker.
- After discharge, patients were followed up for pain, ROM and other complaints at 3 weeks, 3 months and 6 months.

**Results and Discussion**

**Postoperative outcomes**

**Patient ambulation**

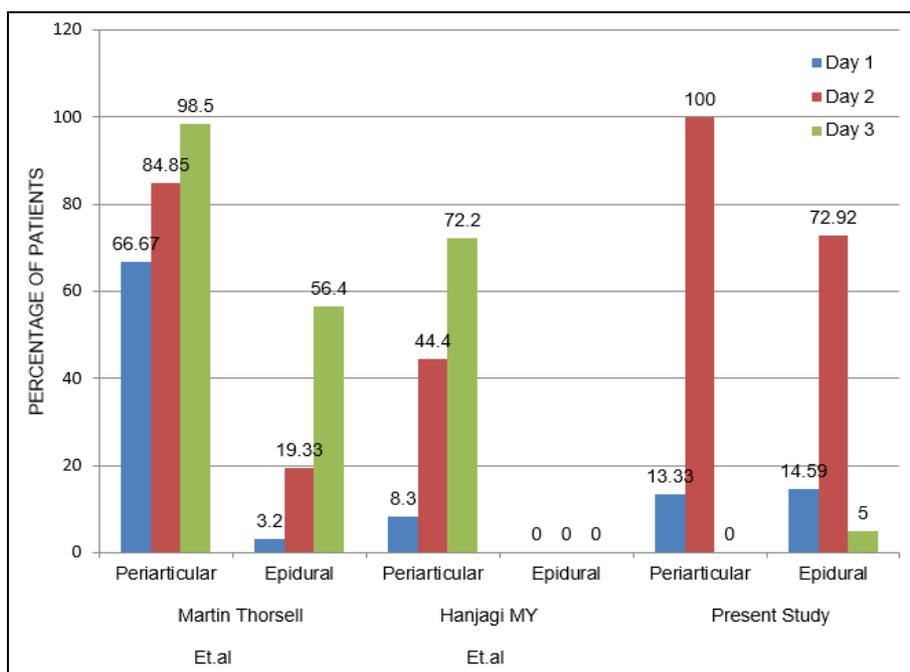
Majority of the patients (69.23%) were ambulated by the 2<sup>nd</sup> POD in both the groups. All 30 patients in periarticular group were ambulant by the 2<sup>nd</sup> day, whereas in epidural group, 13 out of 48 patients (27.08%) were ambulant only by POD-3. The patients with periarticular analgesia seemed to have a faster recovery to ambulence as compared to the epidural group, but this difference was found to be statistically insignificant with p value > 0.05.

Thorsell *et al.*, [1] in his comparative study in 2010 on total knee arthroplasty patients using local infiltration anaesthesia technique with Ropivacaine, Ketorolac and Adrenaline to epidural anaesthesia reported earlier mobilization in the group treated with local infiltration technique.

Manjunath Y. Hanjagi *et al.*, [2] in a 2017 study in Wayanad, Kerala concluded that Ambulation with support (knee brace and walker) was possible only in LIA group. Almost all the patients in LIA group were ambulated by 96 hrs. Ambulation was possible for 8.3%, 44.4%, 72.2%, 86.1% patients at 24 hrs., 48 hrs., 72 hrs. and 96 hrs. respectively. Ambulation in EA group was not possible till the end of 96 hrs. and was statistically significant.

**Table 1:** Post-operative patient ambulation in various studies

Patient ambulation (In %)	Periarticular			Epidural		
	Day 1	Day 2	Day 3	Day 1	Day 2	Day 3
Martin Thorsell [1] (2010) (n=85)	66.67	84.85	98.5	3.2	19.33	56.4
Hanjagi MY [2] (2017) (n=72)	8.3	44.4	72.2	0	0	0
Present Study (n=78)	13.33	100	0	14.59	72.92	100



**Graph 1:** Post-operative patient ambulation in various studies

### Post operative pain scores

Post-operative Pain scores were documented using Visual analogue scales and compared with other studies. In the present study, VAS scores were lower in the periarticular group as compared to Epidural group for the first 24 hours in postoperative period. However, after 24 hours, the effect seems to be wearing off and equal pain scores were noted in both groups at 48 hours and 72 hours.

This is largely in tandem with other studies which have shown similar results. In most of these published studies and present study, the difference in postoperative analgesia was found to be statistically insignificant. ( $p > 0.05$ )

Arun Mullaji *et al.*,<sup>[3]</sup> in 2010 reviewed the effectiveness of a mixture of opioid, corticosteroid and a local anesthetic for periarticular injection in patients undergoing bilateral TKR. They injected one of the two knees with the drug cocktail. They reported significantly lower pain scores and better quadriceps recovery on the side that had periarticular injection of the anesthetic cocktail, as compared to the side that did not have the injection.

Nattapol Tammachote *et al.*,<sup>[4]</sup> in 2013 compared the pain control effect of intrathecal morphine and multimodal drug injections in patients undergoing total knee arthroplasty. They found that though initially there was no difference between the two modalities, 12 – 16 hrs postoperatively, the intrathecal group consumed significantly more Ketorolac and that the side effects of nausea and vomiting was also more in this group compared to the group treated with multimodal drug injections.

Ageliki Pandazi *et al.*,<sup>[5]</sup> (2013) derived from his study the following results. VAS scores at rest at 6, 12 and 24 h postoperatively and at movement at 6 and 12 h postoperatively were lower in the infiltration group as compared to the Patient controlled analgesia group ( $p < 0.05$ ). VAS scores were comparable between the infiltration and epidural groups at all time points

In Binici Bedir E *et al.*,<sup>[6]</sup> study (2014), 30 patients who underwent TKR were divided randomly into 2 groups of 15 each and Group 1 was administered epidural analgesia, while Group 2 received local infiltrative analgesia. No statistically significant difference was determined between the mean VAS scores at 30 minutes, 8 hours and 12 hours ( $p > 0.05$ ) in both groups. Mean VAS scores at 60 minutes and 2 hours were statistically significantly higher in Group 2 than in Group 1 ( $p < 0.05$ ). At postoperative 24 hours, VAS scores of all cases were 0.

In a German study by J. A. Klasen *et al.*,<sup>[7]</sup>, Thirty-seven patients, scheduled for total knee arthroplasty, were randomly

assigned to three treatment groups: in group 1 (EPI) patients received bolus doses of morphine via an epidural catheter; in group 2 (IA) an intraarticular bolus of 1 mg of morphine was applied at the end of the operation with subsequent use of a patient-controlled analgesia (PCA) pump; group 3 (Control), in which only PCA was provided, served as control for both analgesic procedures. Visual analogue scale for pain intensity ratings were preoperatively less than 3/10. In all three groups, highest pain scores were observed between 4 h and 8 h. After that, values declined below 4/10 in all three groups. There were no statistically significant differences between the EPI and Control groups.

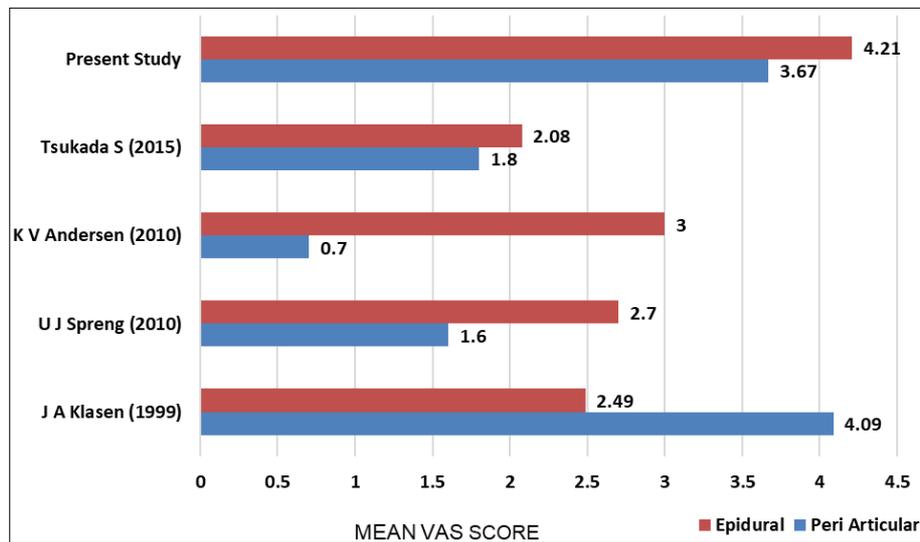
Tsukada S *et al.*,<sup>[8]</sup> (2015) conducted a randomized controlled trial of 71 patients scheduled for simultaneous bilateral total knee arthroplasty. The periarticular injection group had a significantly lower area under the VAS curve at four to twenty-four hours postoperatively compared with the epidural analgesia group ( $174.9 \pm 181.5$  mm day compared with  $360.4 \pm 360.6$  mm day;  $p = 0.0073$ ), while no difference in the area under the curve was noted at twenty-four to seventy-two hours ( $1388.1 \pm 727.2$  mm 2 days compared with  $1467.3 \pm 810.1$  mm 2 days;  $p = 0.67$ )

In Karen V Anderson *et al.*,<sup>[9]</sup> study (2010) comparing a peri- and intraarticular technique with continuous epidural infusion combined with intravenous ketorolac treatment, Visual analog pain scores at rest and during mobilization were significantly lower in intra articular group during the whole study period, with the exception of pain scores during mobilization at 24–48 h after surgery ( $p = 0.05$ ). Peri- and intraarticular analgesia provided superior pain relief compared with continuous epidural infusion.

U J Spreng *et al.*,<sup>[10]</sup> in a 2010 study of 102 TKR patients reported that patients randomized to the LIA group had significantly lower pain scores (VAS) at rest compared with the EDA group on days 1, 2, and 3 after surgery. The mean reduction in VAS at rest for the LIA group compared with the EDA group from discharge PACU until 72 h after surgery was 7.52, 95% CI: 2.49–12.5,  $P=0.004$ . VAS during active knee flexion was significantly higher in the EDA group 72 h after surgery compared with patients in the LIA group. The mean reduction in VAS during knee flexion for the LIA group compared with the EDA group from discharge PACU until 72 h after surgery was 4.35, 95% CI: –3.03 to 11.7,  $P=0.25$ . In conclusion, epidural anaesthesia provided better pain relief in the immediate postoperative period, whereas local infiltration anaesthesia provided better pain relief after the initial 24 hours.

**Table 2:** Comparison of vas scores at 24 hours in various studies

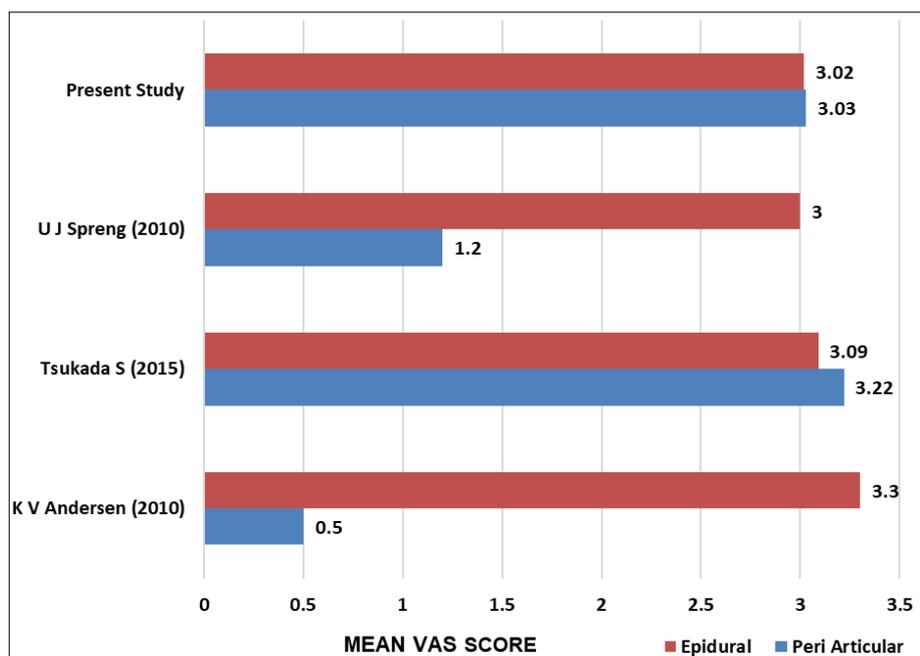
Vas Score AT 24 Hours	Peri Articular Group	Epidural Group
J. A. Klasen (1999) <sup>[7]</sup> (n=37)	4.09	2.49
Karen V Andersen (2010) <sup>[9]</sup> (n=40)	0.7	3
Tsukada S (2015) <sup>[8]</sup> (n=111)	1.8	2.08
U J Spreng (2010) <sup>[10]</sup> (n=102)	1.6	2.7
Present Study (n=78)	3.67	4.21



**Graph 2:** Comparison of vas scores at 24 hours in various studies

**Table 3:** Comparison of vas scores at 48 hours in various studies

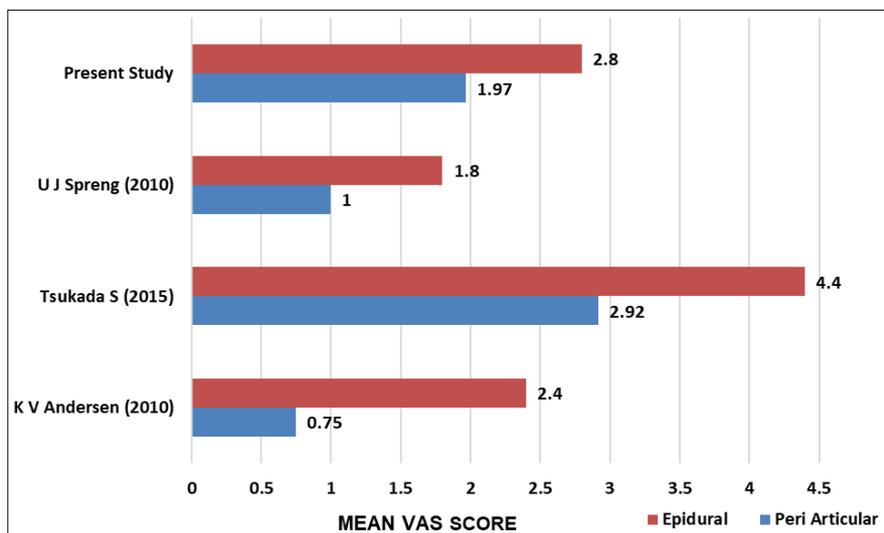
VAS SCORE AT 48 Hours	Peri Articular Group	Epidural group
Karen V Andersen (2010) <sup>[9]</sup> (n=40)	0.5	3.3
Tsukada S (2015) <sup>[8]</sup> (n=111)	3.22	3.09
U J Spreng (2010) <sup>[10]</sup> (n=102)	1.2	3
Present Study (n=78)	3.03	3.02



**Graph 3:** Comparison of vas scores at 48 hours in various studies

**Table 4:** Comparison of vas scores at 72 hours in various studies

VAS SCORE AT 72 Hours	Peri Articular Group	Epidural Group
Karen V Andersen (2010) <sup>[9]</sup> (n=40)	0.75	2.3
Tsukada S (2015) <sup>[8]</sup> (n=111)	2.92	3.75
U J Spreng (2010) <sup>[10]</sup> (n=102)	1	2.1
Present Study (n=78)	1.97	1.94



Graph 4: Comparison of vas scores at 72 hours in various studies

**Postoperative range of movements**

In our study, there was no significant difference of values noted in the degree of post-operative range of motion of the operated knee joint as 12, 24, 36, 48 and 72 hours. This is in agreement with the existing literature which shows no statistical difference between these two forms of analgesia in terms of postoperative range of movements.

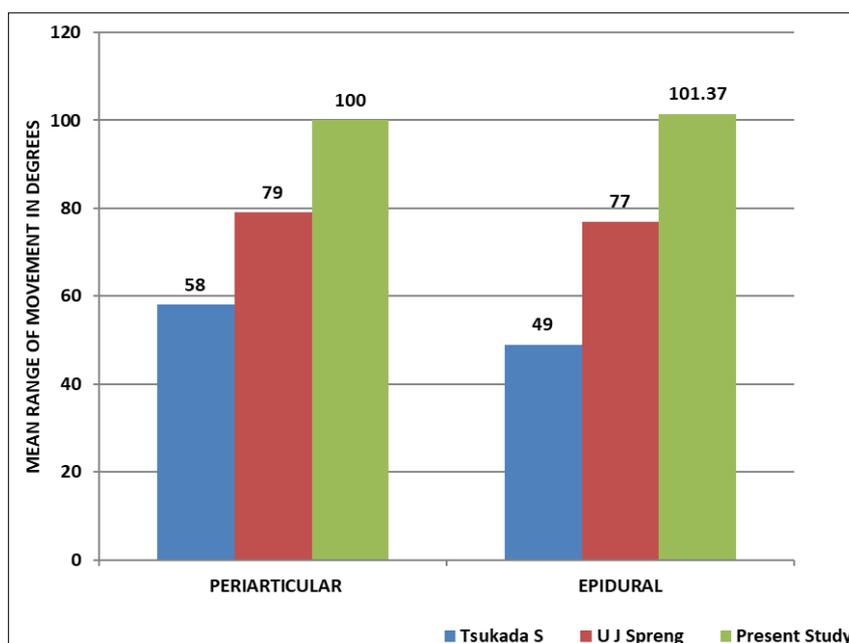
Meta-analysis results of two other studies, Tsukada S *et al.*,<sup>[8]</sup> and U J Spreng *et al.*,<sup>[10]</sup> indicated that intra articular group was associated with an increase of the range of motion than epidural at 24 hours (WMD = 5.44, 95% CI 0.29, 10.79, *P*=0.039) and 48 hours (WMD = 5.21, 95% CI 1.01, 9.42, *P*=0.015). The pooled results indicated that there was no significant difference between both the groups in terms of range of motion at 72 hours. (WMD = -1.25, 95% CI -2.54, 0.05, *P* = 0.060)

With respect to the range of motion of the knee, they found that intra articular analgesia was superior than epidural in the early period after TKA. These may not be an indicator of favourable pain control in the intra articular analgesia group. It is more likely attributed to the absence of motor block. As a result, early functional recovery will be strengthened by functional quadriceps. Although the difference was marginal between the 2 groups, patients managed by intra articular analgesia also showed a tendency towards improved long-term ROM (1.5 – 6 months).

In general, the intra articular technique is beneficial to the early functional recovery following total knee replacement. Besides the analgesic technique, many factors affect the length of stay after knee replacement. For this reason, the result regarding length of stay is not conclusive and considered to be of less clinical significance.

Table 5: Comparison of mean range of movements at 24 hrs in various studies

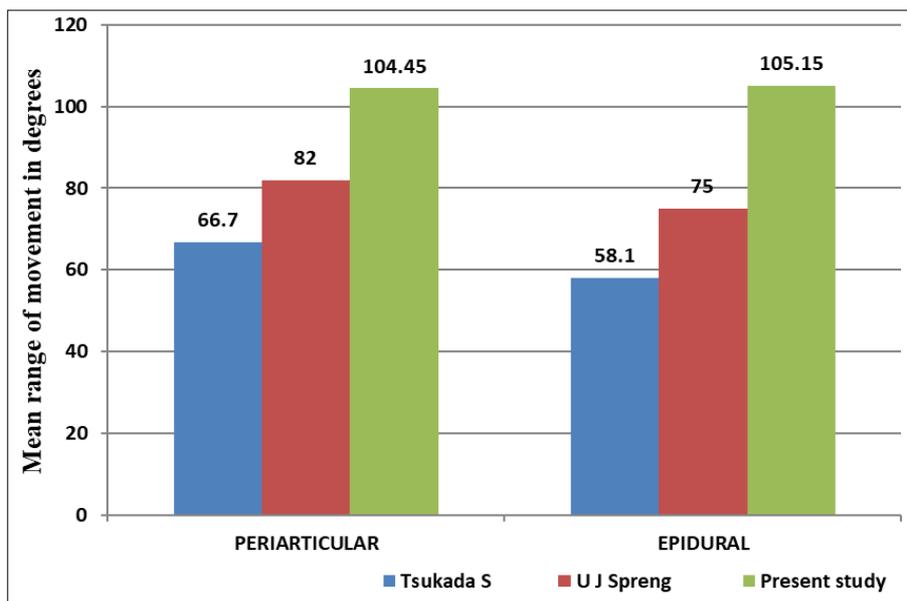
Range of Movements At 24 Hours in degrees	Periarticular Group	Epidural Group
Tsukada S (2015) <sup>[8]</sup> (n=111)	58.3	49
U J Spreng (2010) <sup>[10]</sup> (n=102)	79	77
Present Study(n=78)	100	101.37



Graph 5: Comparison of mean range of movements at 24 hrs in various studies

**Table 6:** Comparison of mean range of movements at 48 hrs in various studies

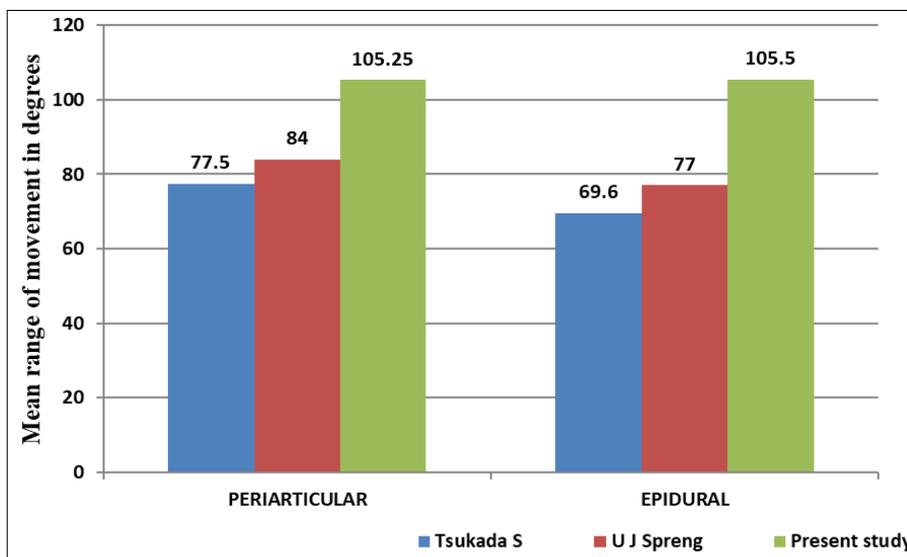
Range of movements at 48 Hours in degrees	Periarticular Group	Epidural Group
Tsukada S (2015) <sup>[8]</sup> (n=111)	66.7	58.1
U J Spreng (2010) <sup>[10]</sup> (n=102)	82	75
Present Study (n=78)	104.45	105.15



**Graph 6:** Comparison of mean range of movements at 48 hrs in various studies

**Table 7:** Comparison of mean range of movements at 24 hrs in various studies

Range of movements at 72 Hours in degrees	Periarticular Group	Epidural Group
Tsukada S (2015) <sup>[8]</sup> (n=111)	77.5	69.6
U J Spreng (2010) <sup>[10]</sup> (n=102)	84	77
Present Study (n=78)	105.25	105.5



**Graph 7:** Comparison of mean range of movements at 24 hrs in various studies

**Conclusion**

Epidural analgesia provides effective pain control despite the disadvantages of its invasiveness, late return of motor functions and more systemic side effects. Local infiltrative periarticular analgesia methods should be considered due to its ease of use, lower rates of systemic side effects and the fact that it does not extend the motor block or require systemic application of LA, while providing comparable pain relief and equal range of movements and ambulation in the immediate postoperative period.

From the present study it can be concluded that Epidural analgesia was superior in providing a better early knee range of movement and that it has given a similar analgesic effect when compared to intra operative periarticular infiltration.

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