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Comparison of Epidural Analgesia Vs I.V Analgesia in Post-Op Major Lower Limb Surgeries in Oprthopedic Patients

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1. Abstract

1.1. Introduction: Lower limb orthopedic surgery is associated with significant post-operative pain. There are multiple technique but the surgeon search for better technique for post-operative pain control.

1.2. Objectives: To compare the pain in the postoperative period after orthopedic major lower limb surgeries performed under epidural versus intravenous analgesia.

1.3. Material and Methods: This Randomized control trial Study was conducted Orthopedics department of Medical teaching instate Lady Reading Hospital, Peshawar Pakistan on 188 patients aged 20 to 80 years of both gender undergoing major lower limb orthopedic surgery was enrolled using Non-probability consecutive sampling technique after approval of hospital ethical committee and written informed of patients. Patients were divided in two groups of 94 patients in each group one group received epidural analgesia after surgery and the other group received intravenous analgesia after surgery. Post-operative pain was assessed using visual analogue pain score. Data was entered and analyzed using SPSS 23.

1.4. Results: In our study total 188 patients were enrolled, 94 patients in each group mean age was 44.6±15.6 years in group A and 46.14±15.27 years in group B, p-value 0.520. There were 68.1% male in group A and 56.4% in group B, p-value 0.098. Mean VAS score was significantly decreased in group A 1.6±0.82 and 3±0.9 after 24 hours of surgery, p-value <0.001

1.5. Conclusion: Epidural analgesia has better post-operative pain control in lower limb orthopedic surgery

2. Introduction

Postoperative pain is one of the most important problems in the postoperative period. Effective treatment of postoperative pain decreases surgical mortality and morbidity rates and has been shown to promote quicker healing. [1] Pain control in orthopedics is challenging. Intravenous agents used to anaesthetize patient for orthopaedic surgeries include propofol, ketamine, barbiturates and benzodiazepines. Drugs used for epidural anaesthesia include opioids (for example hydromorphone, morphine, fentanyl, sufentanil, pethidine) and local anaesthetics (for example lidocaine, mepivacaine, bupivacaine, ropivacaine, chloroprocaine) [2].

Epidural analgesia is an effective method of providing perioperative pain control. It is widely used for patients undergoing thoracic, abdominal and certain lower extremity orthopedic surgeries [2]. Epidural analgesia leads to statistically significant but possibly clinically less meaningful reductions in pain scores compared with intravenous analgesia. However there is debate regarding whether epidural analgesia leads to decreased complications and improved outcome [3]. Visual analog scale (VAS) is a commonly used scale to measure pain that rates pain on a scale of 1 to 10. Analgesic interventions that provide a change of 10 for the 100 mm pain visual analog scale signify a clinically important improvement or deterioration and a visual analog scale of 33 or less signifies acceptable pain control [4]. A study published in 2017 showed that visual analog scale (VAS) score 1 hour after surgery

in patients who received epidural analgesia was 2.98±2.47 while the visual analog scale (VAS) score 1 hour after surgery in patients who received intravenous analgesia was 4.23±2.87 (Visual analog scale was measured on a scale of 1 to 10) [10]. This study aims to compare the post-operative pain in patients who receive intravenous analgesia to the post-operative pain in patients who receive epidural analgesia in the local population of patients presenting to the orthopaedics unit of Medical Teaching Institute Lady Reading Hospital, Peshawar Pakistan.

2.1. Objectives

To compare the pain (assessed by mean visual analog scale) in the postoperative period after orthopedic major lower limb surgeries performed under epidural versus intravenous analgesia.

3. Material and Methods

This Randomized control trial Study was conducted Orthopedics department of Medical teaching instate Lady Reading Hospital, Peshawar Pakistan on 188 patients aged 20 to 80 years of both gender undergoing major lower limb orthopedic surgery was enrolled using Non-probability consecutive sampling technique after approval of hospital ethical committee and written informed of patients. Patients of polytrauma who had fractures of bones other than long bones of lower limb, Patients who have history of use of opiods abuse, Old fractures and Patients having hematological disorders were excluded from the study.

The patients meeting the inclusion criteria in the orthopaedics unit of Lady Reading Hospital, Peshawar were recruited in the study after taking written informed consent. The patients undergoing any of the major orthopedic lower limb surgeries mentioned in the operational definitions above were included as subjects. The purpose of the study and what this study entails was explained to all the recruited patients at the start of the study before enrolling them. These patients were randomly divided into two groups; one group received epidural analgesia after surgery and the other group received intravenous analgesia after surgery. Computer generated table of random numbers were used to randomly allocate patients to these two groups. These patients had their weight measured using a digital electronic balance and height measured using a stadiometer. Body mass index was calculated from the height and weight using the formula BMI = Weight in kilograms/Square of height in meters. Demographic data including age and gender of the patient was noted. History was taken from the patient to find out the duration since the time of injury leading to fracture. The pain experienced by these patients was assessed 24 hours after the surgery by using visual analog scale (VAS) which is attached as an annexure. All the data was recorded on a predesigned proforma for subsequent analysis. The data was analyzed using SPSS version 23. Student's t-test was used to compare the mean visual analog scale at 24 hours after surgery in the two groups and a p-value of $\leq$ 0.05 was taken as significant. The mean visual analog scale in both groups was stratified according to different age groups, gender, type of surgery, height, weight, BMI and duration since the time of injury leading to fracture.

4. Results

In our study total 188 patients were enrolled, 90 patients in each group mean age was 44.6±15.6 years in group A and 46.14±15.27 years in group B, p-value 0.520 (Table 1).

There were 68.1% male in group A and 56.4% in group B, p-value 0.098 (Table 2).

Most common indication of surgery was total knee replacement 22.3% in group A and 21.3% in group B, p-value 0.957 (Table 3).

Height, weight and BMI was comparable in both groups, p-value 0.413, 0.304, and 0.614 respectively (Table 4).

Duration of injury was 2.47±1.1 weeks in group A and 2.62±1.06, p-value 0.632 (Table 5).

Mean VAS score was significantly decreased in group A 1.6±0.82 and 3±0.9 after 24 hours of surgery, p-value <0.001 (Table 6).

Data stratification was done for age groups, gender, type of surgery, height, weight, BMI and duration of injury (Table 7-13).

Table 1: Age of sampled population (n=188)

	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
Age	Group A (Epidural analgesia)	94	44.64	15.64	1.61	0.520 not significant
	Group B (Intravenous analgesia)	94	46.14	15.27	1.57	

Table 2: Gender of sampled population (n=188)

			Gender		Total
			Male	Female	
Group	Group A (Epidural analgesia)	Count	64	30	94
		% within Group	68.10%	31.90%	100.00%
	Group B (Intravenous analgesia)	Count	53	41	94
		% within Group	56.40%	43.60%	100.00%

p-value 0.098 not significant

Table 3: Type of surgery (n=188)

			Type of surgery						Total
			Intertrochanteric fracture	Femur diaphyseal fracture	Tibial plateau fracture	Femur/Tibia shaft fracture	Total hip replacement	Total knee replacement	
Group	Group A (Epidural analgesia)	Count	14	16	8	18	17	21	94
		%	14.90%	17.00%	8.50%	19.10%	18.10%	22.30%	100.00%
	Group B (Intravenous analgesia)	Count	14	16	6	16	22	20	94
		%	14.90%	17.00%	6.40%	17.00%	23.40%	21.30%	100.00%

p-value 0.957 not significant

Table 4: Physical parameters of sampled population (n=188)

Group		Height (cm)	Weight (kg)	BMI (kg/m2)
Group A (Epidural analgesia)	Mean	154.58	72.78	30.1933
	Std. Deviation	14.225	11.798	5.89928
	Std. Error of Mean	1.499	1.244	0.62184
Group B (Intravenous analgesia)	Mean	156.11	72.62	29.6956
	Std. Deviation	13.962	11.577	5.75539
	Std. Error of Mean	1.472	1.22	0.60667
p-value		0.413	0.304	0.614

Table 5: Duration of injury (n=188)

	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
Duration of injury (weeks)	Group A (Epidural analgesia)	94	2.47	1.15	0.6	0.632 not significant
	Group B (Intravenous analgesia)	94	2.62	1.06	0.5	

Table 6: Mean VAS after 24 hours of surgery (n=188)

	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
Pain after 24 hours of surgery	Group A (Epidural analgesia)	94	1.6667	0.82107	0.08655	<0.001
	Group B (Intravenous analgesia)	94	3.0889	0.91975	0.09695	

Table 7: Data stratification for age groups and VAS in both groups (n=188)

Age groups	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
20-40 years	Group A (Epidural analgesia)	1.5556	0.77254	0.12876	0.012 significant
	Group B (Intravenous analgesia)	3.087	0.9387	0.1384	
	Total	2.4146	1.15418	0.12746	
41-80 years	Group A (Epidural analgesia)	1.7407	0.85086	0.11579	0.023 significant
	Group B (Intravenous analgesia)	3.0909	0.91036	0.13724	
	Total	2.3469	1.1039	0.11151	

Table 8: Data stratification for gender and VAS in both groups (n=188)

Gender	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
Male	Group A (Epidural analgesia)	1.7333	0.82064	0.10594	0.41 significant
	Group B (Intravenous analgesia)	3.32	0.74066	0.10474	
	Total	2.4545	1.11402	0.10622	
Female	Group A (Epidural analgesia)	1.5333	0.81931	0.14958	0.032 significant
	Group B (Intravenous analgesia)	2.8	1.04268	0.16486	
	Total	2.2571	1.13809	0.13603	

Table 9: Data stratification for type of surgery and VAS in both groups (n=188)

Type of surgery	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
Intertrochanteric fracture	Group A (Epidural analgesia)	1.8571	0.86444	0.23103	0.011 significant
	Group B (Intravenous analgesia)	2.7143	1.06904	0.28571	
	Total	2.2857	1.04906	0.19825	
Femur diaphyseal fracture	Group A (Epidural analgesia)	1.125	0.34157	0.08539	0.032 significant
	Group B (Intravenous analgesia)	3.375	0.7188	0.1797	
	Total	2.25	1.27	0.22451	
Tibial plateau fracture	Group A (Epidural analgesia)	2	0.89443	0.36515	0.033significant
	Group B (Intravenous analgesia)	4	0	0	
	Total	3	1.20605	0.34816	
Femur/Tibia shaft fracture	Group A (Epidural analgesia)	1.7778	0.80845	0.19055	0.042 significant
	Group B (Intravenous analgesia)	3	0.96077	0.25678	
	Total	2.3125	1.06066	0.1875	
Total hip replacement	Group A (Epidural analgesia)	1.875	0.95743	0.23936	0.050 significant
	Group B (Intravenous analgesia)	3.2	0.76777	0.17168	
	Total	2.6111	1.07644	0.17941	
Total knee replacement	Group A (Epidural analgesia)	1.6	0.82078	0.18353	0.011 significant
	Group B (Intravenous analgesia)	2.8	1.00525	0.22478	
	Total	2.2	1.09075	0.17246	

Table 10: Data stratification for height and VAS in both groups (n=188)

Height group	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
Equal to or less than 160cm	Group A (Epidural analgesia)	1.667	0.837	0.10806	0.031 significant
	Group B (Intravenous analgesia)	3.071	0.93141	0.12447	
	Total	2.345	1.12755	0.10469	
More than 160cm	Group A (Epidural analgesia)	1.667	0.8023	0.14648	0.042 significant
	Group B (Intravenous analgesia)	3.118	0.91336	0.15664	
	Total	2.438	1.12511	0.14064	

Table 11: Data stratification for weight groups and VAS in both groups (n=188)

Weight group	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
Equal to or less than 70kg	Group A (Epidural analgesia)	1.8	0.88289	0.1396	0.020 significant
	Group B (Intravenous analgesia)	3.143	0.9518	0.14687	
	Total	2.488	1.13577	0.12542	
More than 70kg	Group A (Epidural analgesia)	1.56	0.76024	0.10751	0.031 significant
	Group B (Intravenous analgesia)	3.042	0.89819	0.12964	
	Total	2.286	1.11226	0.11235	

Table 12: Data stratification for BMI and VAS in both groups (n=188)

BMI2	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
BMI <30	Group A (Epidural analgesia)	1.8095	0.86216	0.13303	0.022 significant
	Group B (Intravenous analgesia)	3.1	0.95542	0.15106	
	Total	2.439	1.11219	0.12282	
BMI > 30	Group A (Epidural analgesia)	1.5417	0.7707	0.11124	0.038 significant
	Group B (Intravenous analgesia)	3.08	0.89989	0.12726	
	Total	2.3265	1.13769	0.11492	

Table 13: Data stratification for duration of injury and VAS in both groups (n=188)

Duration of injury	Group	Mean	Std. Deviation	Std. Error of Mean	p-value
Equal to or less than 2 weeks	Group A (Epidural analgesia)	1.6774	0.78457	0.09964	0.016 significant
	Group B (Intravenous analgesia)	3.1212	0.88605	0.10907	
	Total	2.4219	1.10553	0.09772	
More than 2 weeks	Group A (Epidural analgesia)	1.6429	0.91142	0.17224	0.041 significant
	Group B (Intravenous analgesia)	3	1.02151	0.20851	
	Total	2.2692	1.17349	0.16273	

5. Discussion

In our study total 188 patients were enrolled, 94 patients in each group mean age was 44.6±15.6 years in group A and 46.14±15.27 years in group B, p-value 0.520. There were 68.1% male in group A and 56.4% in group B, p-value 0.098. Most common indication of surgery was total knee replacement 22.3% in group A and 21.3% in group B, p-value 0.957. Height, weight and BMI was comparable in both groups, p-value 0.413, 0.304, and 0.614 respectively. Duration of injury was 2.47±1.1 weeks in group A and 2.62±1.06, p-value 0.632. Mean VAS score was significantly decreased in group A 1.6±0.82 and 3±0.9 after 24 hours of surgery, p-value <0.001.

Our results were comparable with other studies. A study published in 2017 showed that visual analog scale (VAS) score 1 hour after surgery in patients who received epidural analgesia was 2.98±2.47 while the visual analog scale (VAS) score 1 hour after surgery in patients who received intravenous analgesia was 4.23±2.87 (Visual analog scale was measured on a scale of 1 to 10) [5]. Epidural analgesia is associated with decreased pain and improved outcomes as reported by meta-analysis [11]. A total of 125 trials (9044 patients, 4525 received epidural analgesia) were eligible. In 10 trials (2201 patients; 87 deaths), reporting on mortality as a primary or secondary endpoint, the risk of death was decreased with epidural analgesia (3.1% vs 4.9%; odds ratio, 0.60; 95% confidence interval, 0.39– 0.93). Epidural analgesia significantly decreased the risk of atrial fibrillation, supraventricular tachycardia, deep vein thrombosis, respiratory depression, atelectasis, pneumonia, ileus, and postoperative nausea and vomiting, and also improved recovery of bowel function, but significantly increased the risk of arterial hypotension, pruritus, urinary retention, and motor blockade. Technical failures occurred in 6.1% of patients [12].

In another meta-analysis potential academic articles were identified from the Cochrane Library, Medline (1966–2015.5), Pub Med (1966–2015.5), Em base (1980–2015.5) and Science Direct (1966–2015.5). Gray studies were identified from the references of the included literature. Randomized controlled trials (RCTs) involving PCEA and PCIA after spinal fusion were included. Two independent reviewers performed independent data abstraction. I2 statistic was used to assess heterogeneity. Fixed or random effects model was used for meta-analysis. Eight RCTs met the inclusion criteria. There was a better analgesic effect in patients with PCEA for postoperative VAS on the first day (P=0.0005) and second day (P=0.006). The patients with PCEA had a higher incidence of pruritus (P=0.02) and paresthesia (P=0.03) after surgery than those with PCIA. There was no statistically significant difference in postoperative VAS on the third day (P=0.15), nausea (P=0.74) or emesis (P=0.37) between the two groups [13].

A study done in India enrolled 50 patients (ASA I and II) planned for elective surgery of lower limb in orthopedics and were divided at random into two groups of 25 each. Patients in group I received intravenous analgesia while patients in group II received epidural analgesia. The relief of pain and perioperative sequelae were compared. Groups were compared with respect to quality of epidural anaesthesia and pain relief as felt by the patient. The pain cntrol was found adequate in 80% cases of group 2 and 76% cases of group 1. Pain relief was 20% excellent and 76% good in group 2 and 12% excellent and 68% good in group 1. In group I the mean duration of pain relief was 363.91±180.94 min and in group II was 582.63±182.03 min. These values differ markedly and are statistically highly significant (p<0.001) [14]. All these studies validate results of our study.

6. Conclusion

To control post operative pain there are multiple procedure but the easiest way is give parental analgesia in the form of patient controlled analgesia which is not as effective as epidural. So, it is concluded that Epidural analgesia is better than intravenous analgesia in controlling post-operative pain after lower limb orthopedic surgery.

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