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Original Article

Post-operative Outcome during Off-Pump Coronary Artery Bypass Surgery – A Comparison between Combined High Thoracic Epidural Anaesthesia with General Anaesthesia and General Anaesthesia Alone

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Key Words : *Epidural anaesthesia, Post - operative pain, CABG, Outcome, OPCAB.*

Abstract:

Background: *In the postoperative period inadequate analgesia may increase morbidity by causing adverse haemodynamic, metabolic, immunologic and haemostatic attentions and prolong mechanical ventilation with more ICU stay. This study has been undertaken to compare postoperative outcome in off-pump coronary artery bypass surgery (OPCAB) between high thoracic epidural anaesthesia (HTEA) as an adjunct to general anaesthesia (GA) vs. GA alone.*

Methods : *This prospective, randomized case control comparative study was carried out in sixty patients without having left main coronary artery disease, left ventricular ejection fraction <30% or contraindication of regional anaesthesia scheduled for OPCAB. They were divided into two groups, thirty in each group. Group A received GA alone and group B received high thoracic epidural anaesthesia with GA. Requirement of postoperative analgesics, pain score, sedation score, and post-operative complications were evaluated.*

Results: *Rescue analgesics was needed in 16 (53.3%) and 6 (20.0%) patients in group A and group B respectively ($p<0.05$). Post-operative pain score (VAS) during maintenance with ventilator with awareness at first fourth hour and after extubation during movement & cough were significantly different between two groups. Post-operative sedation score was significantly different between two groups except in 1st hour. No post-operative complication was observed in both groups.*

Conclusion: *High thoracic epidural anaesthesia with GA appeared to be most reliable postoperative pain reliever with better post-operative outcome in OPCAB surgery.*

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Introduction:

Studies examining the use of thoracic epidurals for cardiac surgery have documented superior pain relief when compared to all other modalities, including intrathecal opiate analgesia. It is important to use TEA to its maximum capacity to benefit from its full potential: outstanding analgesia, excellent protection against stress hormone surge after surgery, and better pulmonary recovery outcome. It seems imperative to begin its use before surgery starts, continue its infusion at a constant rate during surgery, and carry on for at least 2 days if possible. One study has shown that the maximum pain after surgery occurs within the first 48 hours, after which pain subsides significantly. In addition, use of TEA for longer than 3 days carries the risk of losing the control over its use and increase the likelihood of human error due to miscommunication. The safest duration of TEA in cardiac surgery is a maximum of 3 days; exceptionally longer use should be justified on a patient-by-patient basis. In the postoperative period inadequate analgesia may increase morbidity by causing adverse

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haemodynamic, metabolic, immunologic and haemostatic attentions.[1-4] This is often difficult to achieve better postoperative outcome without optimal pain relief. Aim of the study was to evaluate effect of HTEA on postoperative pain score, sedation score and post-operative outcome.

Methods:

patients are selected for off pump coronary artery by pass surgery included in this study except those have left main diseases , less then 35% ejection fraction, coagulopathy, bleeding disorder,recent anticoagulation medication, local or systemic infection and after obtaining informed consent, a total of 60 adult patients with coronary artery diseases were prospectively enrolled in this study. All patients underwent was randomly selected by lottery method using blind envelop. Group A patient received only general anaesthesia GA with propofol, Fentanyl and pancuronium bromide (PCB), O_2 with air and Group B received high thoracic epidural anaesthesia (HTEA) and general anaesthesia (GA) with the same.

All patients were premedicated Tab. Midazolam 7.5 mg received at bed time day before operation. In the group B (study group), with all aseptic precaution a side holed multiport epidural catheter was inserted through 18G Touhy needle at the level of T1-2 or T2-3 interspaces in the morning on the day of surgery under local anaesthesia using midline approach at lateral decubitus position with the loss of resistance or hanging drop technique. The catheter was directed cephalic and advance 3-4 cm into the epidural space. The initial bolus dose of 0.25% bupivacaine 10 ml 15 min before surgery was given through epidural catheter. Epidural infusion with 0.25% bupivacaine was maintained @ 4-5 ml/hr up to 48 hours. Sensory block was determined bilaterally using loss of warm- cold sensation as well pinprick discrimination.

In both groups general anaesthesia was induced with fentanyl 10 µg/kg IV and with propofol 1 mg/kg IV. Tracheal intubation was facilitated by pancuronium bromide 0.1 mg/kg. Total intravenous anaesthesia was maintained with propofol infusion @ 3-6 mg/kg/hr (50-100µg/kg/min) and fentanyl infusion @ 1-2 µg/kg/hr, neuromuscular booking agent pancuronium bromide 1/3rd dose of induction dose was given at one hour interval through IV route. The lungs were ventilated mechanically at normocapnia in an air and Oxygen mixture.

The parameters including heart rate (HR), arterial blood pressure (ABP), ECG, SPO_2, CVP, ABG analysis, urine output were monitored during operation. Ephedrine 5-10 mg IV bolus was given if hypotension associated with epidural anaesthesia.

On the arrival at ICU from Operation Theater the patient, ventilation was maintained by mechanical ventilator and gradually become extubated with all accepted extubation criteria. Postoperative analgesia was performed by the epidural infusion 0.25% bupivacaine in patients group B and both groups of the patients were received injection ketorolac 30 mg IV 8 hourly.

Pain exceeding a visual analog score (VAS 0-100) of 50 or whenever were requested by the patients or deemed necessary by the nurse in case the patients are not fully awake and able to respond sufficiently, the hourly epidural rate was increased by 1 ml and intravenous Ketorolac 30 mg was administered simultaneously for instant pain relief. Morphine 1-2 mg IV as needed was used if ketorolac were insufficient. These rescue analgesics need were recorded. The epidural catheter was removed after 48 hours of post-operative period with normal coagulation profile.

After awareness postoperative pain scores were assessed and recorded of all patients at rest, exercise (e.g. movement, coughing and so on) using a 100-mm visual analog scale, with ends marked as 0 (no pain) and 100 mm (worst imaginable pain) every four hour interval for 48 hours postoperatively. Sedation score was assessed and recorded by using a 3- point scale (1, completely awake and open eyes; 2, asleep but responds to verbal commands and/or touch; 3, does not respond) every hourly for first six hour of postoperative period.[5] Following post-operative complications were recorded in this study.

- Pneumothorax: Evidenced on chest x-ray for consecutive post-operative 3 days.
- Prolong mechanical ventilation: Tracheal intubation for more than 24 hours, tracheal reintubation after initial extubation.

- Neurologic complication: Assessed with sensory, motor or reflex abnormalities any time after surgery; global abnormalities within two days operation.
- Acute confusion: Patients were defined as confused when, after extubation they were unable either to cooperate or communicate with the nurses and were disoriented in time and place for 8 hours or more.
- Epidural haematoma: Suspected if patients had radicular pain on the back, sensory, motor deficits, and urinary retention diagnosed was confirm with immediate MRI.

All demographic and postoperative data were recorded on data collection form. The data were compiled and analyzed by using statistical software SPSS (version 12.0) and significance test performed by unpaired t test and Chi square test. p value <0.05 was considered as statistically significant.

Results:

The mean (±SD) age of the study patients were 49.9±7.1 years in group A and 49.3± 7.2 years in group B. The mean (±SD) weight of the study patients were 62.3±7.4 kg in group A and 62.1±9.9 kg in group B. The mean (±SD) height of the study patients were 151.4±5.5 cm in group A and 148.9±15.7 cm in group B. The mean (±SD) body surface area (BSA) of the study patients were 1.6±0.11 m^2 in group A and 1.7±0.15 m^2 in group B. No significant mean age, weight, height and body surface area (BSA) differences were found between two groups in unpaired t-test (Table I)

Table-I

Demographic characteristic of the study patients (n=60).

	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
Age (years)	49.9±7.1	49.3±7.2	0.789 NS
Weight (kg)	62.3±7.4	62.1±9.9	0.934 NS
Height (cm)	151.4±5.5	148.9±15.7	0.490 NS
BSA (m^2)	1.6±0.11	1.7±0.15	0.410 NS

Only one female patient was in group A, however no female patients was in group B and the difference was not statistically significant (p>0.05) in chi square test (Table II).

Table-II

Sex distribution of the patient (n=60).

	Group A (n=30)		Group B (n=30)		p value
	n	%	n	%	
Male	29	96.7	30	100.0	0.500 NS
Female	1	3.3	0	0.0	

Preoperative clinical characteristic which were mean pulse rate, systolic blood pressure, diastolic blood pressure SPO_2, EF%, prothrombin time and platelet were not statistically significant (p>0.05) in unpaired t-test (Table III) .

Table-III

Preoperative clinical characteristic of the patient (n=60).

	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
Pulse (beat/min)	81.4±9.6	76.1±11.3	0.086NS
Systolic BP (mmHg)	126.8±24.6	124.8±21.5	0.740NS
Diastolic BP (mmHg)	78.7±20.9	78.3±7.9	0.921NS
SPO_2(%)	97.3±1.2	97.6±0.8	0.325NS
Ejection fraction (EF%)	57.4±7.0	57.0±9.8	0.886NS
Prothrombin time(sec)	14.4±1.2	13.2±4.8	0.317NS
Platelet count (nL^{-1})	$2.1x10^5$ $\pm0.5x10^5$	$2.0X10^5$ $\pm0.4x10^5$	0.609NS

Most (96.7%) of the patients had involved LCX lesion followed by 28(93.3%) LAD and 21(70.0%) RCA in group A, however in group B patients LAD involved in 29(96.7%) patients, 27(90.0%) LCX and 25(83.3%) RCA. OM1/OM2/OM3 and D1/D2 were less in both groups. No statistical significant (p>0.05) difference were found between two groups (Table IV).

Table-IV

Types of lesion involved of the study patients (n=60).

	Group A (n=30)		Group B (n=30)		p value
	n	%	n	%	
LAD	28	93.3	29	96.7	0.500 NS
RCA	21	70.0	25	83.3	0.359 NS
LCX	29	96.7	27	90.0	0.305 NS
D1/D2	2	6.7	1	3.3	0.500 NS
OM1/ OM2/ OM3	2	6.7	1	3.3	0.500 NS

Sixteen (53.3%) patients of Group A and 6 (20.0%) patients of Group B needed rescue analgesia in ($p<0.05$) (Table V).No post-operative complication was observed in any of the groups (Table V).

Table-V

Status of rescue analgesics received by the study patients (n=60).

Rescue analgesics	Group A (n=30)		Group B (n=30)		p value
	n	%	n	%	
Received	16	53.3	6	20.0	0.015
Not received	14	46.7	24	80.0	

Regarding the pain score (VAS) during maintenance with ventilator with awareness at first fourth hour was different ($p<0.05$) between two groups (Table VI). Post-operative pain score (VAS) after extubation at rest, at movement, during coughing at different time intervals were found significantly different ($p<0.05$) between two groups in all follow-up times (Table VII). Post-operative pain score (VAS) after extubation at movement in different time interval and found significant ($p<0.05$) change between two groups in all follow-up times (TableVIII).

Post-operative pain score (VAS) after extubation during coughing at different time intervals were significantly different ($p<0.05$) change between two groups (Table IX). The mean distribution of post-operative sedation score at first six hour (hourly) was found significantly different ($p<0.05$) between two groups except 1st hour. (Table X).

Table-VI

Post-operative pain score (VAS) during maintenance with ventilator with awareness at different times of the study patients (n=60)

	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
1st fourth hour	53.4±9.4	26.0±8.7	0.001

Table-VII

Post-operative pain score (VAS) after extubation at rest in different time interval of the study patients (n=60).

Four hours time interval	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
8th hour	47.5±9.6	23.3±5.0	0.001
12th hour	47.5±8.8	23.3±5.8	0.001
16th hour	45.3±5.1	22.3±5.3	0.001
20th hour	42.1±6.1	21.9±5.3	0.001
24th hour	42.5±6.2	21.5±4.3	0.001
28th hour	41.7±5.9	21.5±4.3	0.001
32NSd hour	40.5±4.6	21.5±4.3	0.001
36th hour	40.7±4.7	21.5±4.3	0.001
40th hour	40.2±5.7	21.2±4.2	0.001
44th hour	39.5±5.1	21.5±5.2	0.001
48th hour	37.8±4.6	21.3±4.3	0.001

Table-VIII

Post-operative pain score (VAS) after extubation at movement in different time interval of the study patients (n=60).

Four hours time interval	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
8th hour	51.2±7.5	25.0±6.1	0.001
12th hour	52.5±8.6	24.8±6.9	0.001
16th hour	48.5±4.8	23.8±5.8	0.001
20th hour	47.1±5.1	22.9±5.5	0.001
24th hour	47.0±9.5	22.9±5.7	0.001
28th hour	44.2±5.7	22.3±6.2	0.001
32NSd hour	41.7±4.9	22.5±5.3	0.001
36th hour	43.0±4.7	22.3±4.4	0.001
40th hour	43.5±5.4	22.5±6.4	0.001
44th hour	41.7±6.5	21.7±4.3	0.001
48th hour	40.6±4.8	21.7±5.3	0.001

Table-IX

Post-operative pain score (VAS) after extubation at during coughing in different time interval of the study patients (n=60).

Four hours time interval	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	pvalue
8th hour	53.7±7.5	28.3±8.3	0.001
12th hour	56.7±8.2	28.7±9.5	0.001
16th hour	50.8±6.1	25.8±7.5	0.001
20th hour	50.2±7.2	24.6±6.6	0.001
24th hour	48.5±9.3	23.7±6.6	0.001
28th hour	45.7±5.4	22.9±6.4	0.001
32NSd hour	45.0±4.3	23.1±5.5	0.001
36th hour	45.2±6.8	22.9±4.6	0.001
40th hour	45.0±5.4	23.1±7.6	0.001
44th hour	43.2±6.5	21.7±4.3	0.001
48th hour	42.8±3.5	22.4±5.6	0.001

Table-X

Mean distribution of post-operative sedation score at first six hour (hourly) of the study patients (n=60).

One hour interval	Group A (n=30) Mean±SD	Group B (n=30) Mean±SD	p value
1st hour	2.9±0.3	2.8±0.5	0.352 NS
2nd hour	2.8±0.5	2.1±0.6	0.001
3rd hour	2.4±0.7	1.4±0.5	0.001
4th hour	2.1±0.5	1.1±0.3	0.001
5th hour	1.4±0.5	1.0±0.0	-
6th hour	1.15±0.4	1.0±0.0	-

Discussion:

This prospective, randomized observational comparative study was carried out with on aim to compare, which one is more efficient for post-operative analgesia with better outcome during off pump coronary artery bypass surgery (OPCAB) between combined High Thoracic Epidural anaesthesia (HTEA) with General anaesthesia (GA) and general anaesthesia (GA) alone.

A total of 60 patients undergo elective CABG on off pump having American Society of Anesthesiologist classification (ASA class) I, II, III & IV and heart failure with NYHA class I, II & III were included and excluded patents having left main diseases, less than 35% ejection fraction, heart failure with NYHA class IV, coagulopathy, bleeding disorder, recent anticoagulation medication, local or systemic infection in the study at the National Institute of Cardiovascular Diseases and Hospital, She-r-e Bangla nagar, Dhaka and they were randomly allocated by lottery methods in two groups; group A: using GA alone and group B: using HTEA+ GA.

During maintenance with ventilator and awareness at first fourth hour the mean pain score was significantly ($p<0.05$) higher in Group A (53.4±9.4) vs. Group B (26.0±8.7).[5] have assessed the VAS (0-100mm) at rest were subsequently higher in group A than group B at all times after surgery, always reaching significance level except at 48 hours. Similarly assessed the VAS (0-10 mm) for the first 24 hour period were 0.9 at rest and 1.7 during coughing in each patients the VAS score always less than <2, which indicating that the post-operative pain relief was excellent in their study patients (group B).[6] In the present study it was found that post-operative pain score VAS (0-100mm) was >40 in group A and <30 in group B after extubation at rest, movement and during coughing which were significantly ($p<0.05$) higher in group A at all the different follow-up times.[5] The results obtained in the present study are comparable with the above studies. In the current series it was observed that the status of rescues analgesics need 53.3% in group A and 20.0% group B and the difference was statistically significant ($p<0.05$). No post-operative complications was observed.

Conclusion:

Based on the present study results, all anesthetic techniques were equally safe. However, general anaesthesia with high thoracic epidural anaesthesia appeared to be most comprehensive, allowing for good and reliable postoperative pain relief with better outcome.

Conflict of Interest - None.

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