ORIGINAL RESEARCH PAPER
Volume - 13 | Issue - 10 | October - 2024 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF ANALGESIC EFFECTS BETWEEN THORACIC EPIDURAL AND INTRAVENOUS ANALGESIA IN TERMS OF MANAGEMENT OF POSTOPERATIVE PAIN RELIEF IN CONGENITAL CARDIAC SURGICAL PATIENT IN PAEDIATRIC POPULATION.

Anaesthesiology

Avijit Karmaker Senior Resident, DM –PDT.

Rimjim Chakma Senior Resident, DM –PDT.

Saptaki Majumder Senior Resident, DM –PDT.

Siddhi Banerjee Senior Resident, DM –PDT.

Sampa Dutta Gupta* Professor & Head Department of Cardiac Anaesthesiology, Nilratan Sircar Medical College, Kolkata. *Corresponding Author

ABSTRACT

Regional analgesia techniques are a safe and effective alternative than IV for post operative pain relief. Aim is to compare analgesic efficacy between thoracic epidural and intravenous analgesia in terms of management of postoperative pain relief in congenital cardiac surgical population. 60 CHD patients between 1 month to 12 years included in prospective observational study divided into Group TEA (n = 30); Group IVA (n = 30). Group TEA received continuous epidural with 0.1% bupivacaine + 0.0006% fentanyl @ 0.8 mL/hour +0.05 mL .Gr IVA received continuous intravenous fentanyl infusion at 1–2 mcg/kg/h.Intravenous paracetamol 15-30 mg/kg used as rescue analgesia. HR, SBP, DBP, MAP, Wong Baker FACES pain rating scale monitored and analysed. Age sex weight, height, and BMI, mean onset of pain after extubation were comparable. The SBP was significantly lower in Group TEA than Group IVA at 12 post extubation hours, 72 hours and 96 hours (p=0.044, 0.012 and 0.004 respectively. MAP was significantly lower in Group TEA than Group IVA at 96 hours (p=0.028). The Wong Baker FACES pain rating scale was significantly lower in Group TEA than Group IVA at 48 hours and 60 hours (p=0.012 and 0.033 respectively). Rescue analgesia needed in TEA group was 4 (13.3%), and in IVA group 11 (36.7%). and was statistically significant (0.037). Occurrence of nausea and somnolence was similar (p=0.640 and 0.228 respectively) incidence of vomiting was significantly higher in IVA (p=0.044). To conclude TEA provided better pain relief with significantly decreased requirement of postoperative analgesia.

KEYWORDS

Thoracic epidural, Intravenous, Post operative analgesia. CHD.

INTRODUCTION:

Post thoracotomy pain relief with epidural analgesia can be outstanding, better alternative to intravenous analgesia[1]. Perioperative TEA using fentanyl with bupivacaine provided optimal postoperative analgesia at rest and during coughing in patients following CABG[2]. Weber T et al concluded that thoracic epidural analgesia was superior to intravenous analgesia, in conjunction with greater well-being. for adolescents undergoing minimally invasive pectus excavatum repair, [3]. Hee Heo M and co-workers concluded that, epidural analgesia had a better analgesic effect than IV analgesia.[4] Rawal N stated that, epidural analgesia may no longer be considered the gold standard. as postoperative analgesia. [5] Aim is to compare between thoracic epidural and intravenous analgesia for postoperative pain relief in congenital cardiac surgical patients with an objectives to observe hemodynamic changes between two group in 24 hrs. postoperative period and to find out any side effects between the groups.

Methodology:

After obtaining IEC, informed consent from parents this prospective observational study was done on 60 paediatric CHD patients of ASA physical status III, aged between 2 months and 12 yrs posted for corrective cardiac surgeries under cardiopulmonary bypass were included . Child with known allergy to any of the study medications, multiple attempt of epidural puncture, psychiatric disorder, history of regular analgesic intake ,history of chronic pain, history of sleep apnoea, patients having no CNS disorder, renal insufficiency, or a history of bleeding diathesis, liver disease, and coagulopathy were excluded.

Sample size calculation done as $n = (2\alpha + 2\beta)(S^2+S^2)/ (\text{mean1-mean}^2)^2$, assuming 10% non-response rate, the revised SS(20) was 20+10% of 20 =22, considering the conventionally accepted lowest sample size, 30 participants of each group was included.

60 patients (N) divided into 2 groups as Group TEA (n = 30) ; Group IVA (n = 30); Group TEA received thoracic epidural analgesia with placement of epidural catheter between T3–T8. ECG, NIBP,SPO_2% attached, arterial line inserted. Patients were premedicated with inj. midazolam 0.02 mg/kg and inj. fentanyl 0.5 ug/kg. Patients were induced with inj. fentanyl 20 mcg and inj. thiopentone sodium 3-5 mg / kg and inj. vecuronium *0.08 - 0.1mg/kg B.W.* After induction and intubation, central venous catheter was put in left internal jugular vein and patient was turned into lateral position for institution of epidural catheter in Gr.TEA. Anesthesia was maintained with isoflurane (1.5%), oxygen, and air (50:50) along with intermittent bolus doses of vecuronium and fentanyl . A continuous epidural infusion consisting of 0.1% bupivacaine combined with 0.0006% fentanyl with a rate according to the modified Bromage formula (0.8 mL/hour +0.05 mL for every 5 cm of height above 150 cm for every spinal segment) was started. Group IVA received continuous intravenous fentanyl infusion of 1–2 mcg/kg/h at rates of 1.5–0.5 mcg/kg/h, Rescue analgesic used iv.paracetamol 15-30 mg/kg dose whenever the patients demanded or pain score reached 2 after minimum 6 hours after initiation of treatment.

Age, sex, BMI, type & duration congenital heart disease, hemodynamics, type of post-op analgesia, pain score, adverse effects. were monitored and noted. Parameters measured were Wong Baker FACES pain rating scale, Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP). Complication if any, like nausea, vomiting, drowsiness, pain or chest tightness and dizziness were noted.

Statistical analysis done after data entered into a Microsoft excel spreadsheet and then analyzed by SPSS 24.0. and Graph Pad Prism version 5. Data was summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests, Chi-square test ($\chi 2$ test) was applied. and p-value ≤ 0.05 considered statistically significant.

RESULTS:

Demographic profile in terms of age , sex, weight, height, and BMI were comparable.

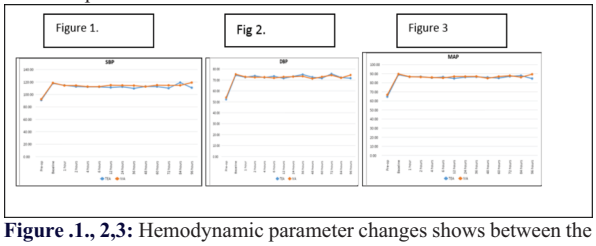

Figure .1., 2,3: Hemodynamic parameter changes shows between the groups

The HR did not show much fluctuations throughout the time and it was similar in the groups with no statistically significant difference. The SBP, DBP did not show much fluctuations throughout the time but it was significantly lower in Group TEA than Group IVA at 12 hours, 72 hours and 96 hours (p=0.044, 0.012 and 0.004 respectively. The MAP did not show much fluctuations throughout the time but it was significantly lower in Group TEA than Group IVA at 96 hours (p=0.028). The Wong Baker FACES pain rating scale significantly reduced in both the groups over time but it was significantly lower in Group TEA than Group IVA at 48 hours and 60 hours (p=0.012 and 0.033 respectively).

Time	Group	N	Mean	SD	P value
Wong Baker FACES pain rating scale Baseline	TEA	30	6.30	1.49	.935
	IVA	30	6.27	1.64	
Wong Baker FACES pain rating scale 1 Hrs	TEA	30	6.33	0.99	.053
	IVA	30	6.90	1.21	
Wong Baker FACES pain rating scale 2 Hrs	TEA	30	5.83	1.56	.752
	IVA	30	5.97	1.69	
Wong Baker FACES pain rating scale 4 Hrs	TEA	30	5.70	1.49	.384
	IVA	30	6.07	1.74	
Wong Baker FACES pain rating scale 6 Hrs	TEA	30	5.00	1.95	.463
	IVA	30	5.40	2.24	
Wong Baker FACES pain rating scale 12 Hrs	TEA	30	3.53	1.70	.276
	IVA	30	4.13	2.46	
Wong Baker FACES pain rating scale 24 Hrs	TEA	30	3.07	1.89	.617
	IVA	30	3.37	2.66	
Wong Baker FACES pain rating scale 36 Hrs	TEA	30	2.87	2.39	.088
	IVA	30	4.07	2.95	
Wong Baker FACES pain rating scale 48 Hrs	TEA	30	2.27	1.96	.012
	IVA	30	3.67	2.28	
Wong Baker FACES pain rating scale 60 Hrs	TEA	30	2.00	1.51	.033
	IVA	30	3.10	2.31	
Wong Baker FACES pain rating scale 72 Hrs	TEA	30	2.57	1.52	.169
	IVA	30	3.20	1.97	
Wong Baker FACES pain rating scale 84 Hrs	TEA	30	1.97	1.19	.080
	IVA	30	2.70	1.91	
Wong Baker FACES pain rating scale 96 Hrs	TEA	30	1.30	1.99	.309
	IVA	30	1.87	2.29	

Figure 4. Pain Score As Wong Baker FACES Pain Rating Scale

Table 1. Comparison of rescue analgesic between the two groups.

Rescue analgesic	Group		P value
	TEA	IVA	
No	26 (86.7%)	19 (63.3%)	0.037
Yes	4 (13.3%)	11 (36.7%)	

Table 1. rescue analgesic requirement was significantly higher in Group IVA than Group TEA (p=0.037).

Table 2. Comparison Of Complications Between The Two Groups.

Complications	TEA	IVA	P value
Nausea	2 (6.67%)	3 (10.00%)	0.640
Vomiting	(3.33%)	6 (20.00%)	0.044
Drowsiness	0.00%	0.00%	-
Constipation	0.00%	0.00%	-
Chest Pain & Tightness	0.00%	0.00%	-
Blurred Vision	0.00%	0.00%	-
Tremors	0.00%	0.00%	-
Dizziness	0.00%	0.00%	-
Somnolence	2 (6.67%)	5 (16.67%)	0.228

Table 2 shows , occurrence of Nausea and Somnolence was similar in the groups with no statistically significant difference (p=0.640 and 0.228 respectively) but vomiting was found significantly more in Group IVA than Group TEA (p=0.044).

DISCUSSION:

Anaesthetic goal mainly based on maintenance of systemic arterial blood pressure minimizing PVR; and avoiding sudden increase in systemic oxygen demand in postoperative period. Fast-track recovery protocols postulates that thoracic epidural anesthesia (TEA) in cardiac surgery contributes in improving postoperative outcomes.

Sarica F, and coworkers concluded that, TEA revealed better analgesia than traditional iv analgesia in paediatric cardiac post surgical patients [1]. Sen A C and coworkers concluded also that, perioperative TEA using fentanyl with bupivacaine provided optimal postoperative analgesia at rest and during coughing compared to post operative iv analgesia[2]. Moreover Weber T. et al. studied on adolescents population those underwent minimally invasive surgery and found that, TEA was superior to iv intravenous patient-controlled analgesia for postoperative analgesia, resulting with greater well-being. [3]. Also Hee Heo M et al. concluded that, ,epidural analgesia had a better analgesic effect than IV analgesia.[4] Rawal N stated that, routine postoperative analgesia, epidural analgesia may no longer be considered the gold standard. in post operative analgesia. [5] Present study states that, HR did not show much fluctuations throughout the postoperative period in TEA group which favor diminished requirement of oxygen. The SBP, DBP did not show much fluctuations throughout the time but it was significantly lower in Group TEA than Group IVA at 12 hours, 72 hours and 96 hours (p=0.044, 0.012 and 0.004 respectively. The MAP did not show much fluctuations throughout the time but it was significantly lower in Group TEA than Group IVA at 96 hours (p=0.028). The Wong Baker FACES pain rating scale significantly reduced in both the groups over time but it was significantly lower in Group TEA than Group IVA at 48 hours and 60 hours (p=0.012 and 0.033 respectively). Moreover , requirement of rescue analgesic was significantly higher in Group IVA than Group TEA (p=0.037). We used noradrenaline to increase SVR and keep high pulmonary blood flow to maintain oxygen level. To optimize the risk-benefit balance of TEA, safe time intervals regarding the use of concomitant anticoagulants and consideration of reduced renal function impairing their elimination was meticulously monitored and maintained. Thoracic epidural anaesthesia (TEA) reduces cardiac and splanchnic sympathetic activity and thereby influences perioperative function of vital organ systems. Beyond its analgesic properties, TEA's effects on the postoperative neurohumoural stress response, cardiovascular pathophysiology, and intestinal dysfunction have been in the focus of both clinical and experimental investigations for years. Post operative stress increase catecholamine levels, increase left ventricular afterload, heart rate, and raise corticotropin-releasing hormone levels reduce cardiac NO release and increase endothelin production. Better pain relief with concomitant reduction in the postoperative stress response and systemic sympathetic activity may contribute to alleviate these effects. TEA improved diastolic function in patients with compromised coronary perfusion, moreover TEA reverse impaired intraoperative intestinal oxygenation during major surgery and protect intestinal barrier function and improved mucosal capillary perfusion therefore enhance faster resolution of postoperative illeus with reduced opioid consumption. Early extubation is preferred to prevent further reduction in pulmonary blood flow due to positive pressure ventilation. Adequate postoperative analgesia is essential as pain increases pulmonary vascular resistance and sudden increase in oxygen demand. intra-operative and postoperative epidural analgesia is associated with a significant reduction in time to extubation and intestinal transit time in major neonatal surgery. But its use in paediatric congenital corrective surgeries is less documented.

CONCLUSION:

With the recognized limitations, thoracic epidural analgesia. provided more effective pain relief with significantly decreased requirement of postoperative analgesia. Future studies are needed to determine its analgesic efficacy of thoracic epidural infusion compared to intravenous opioids infusion postoperative analgesia in CHD children.

REFERENCES:

1. Sarica F, Erturk E, Kutanis D, Akdogan A, Senel AC. Comparison of Thoracic Epidural Analgesia and Traditional Intravenous Analgesia With Respect to Postoperative Respiratory Effects in Cardiac Surgery. Journal of Cardiothoracic and Vascular Anesthesia. 2021 Jun 1;35(6):1800-5.
2. Sen AC, Rajan S, Balachandran R, Kumar L, Nair SG. Comparison of perioperative thoracic epidural fentanyl with bupivacaine and intravenous fentanyl for analgesia in patients undergoing coronary artery bypass grafting surgery. Anesthesia, Essays and Researches. 2017 Jan;11(1):105.
3. Weber T, Mätzl J, Rokitansky A, Klimscha W, Neumann K, Deusch E, Society MR. Superior postoperative pain relief with thoracic epidural analgesia versus intravenous patient-controlled analgesia after minimally invasive pectus excavatum repair . The Journal of Thoracic and Cardiovascular Surgery. 2007 Oct 1;134 (4) :865-70.
4. Heo MH, Kim JY, Kim JH, Kim KW, Lee SI, Kim KT, Park JS, Choe WJ, Kim JH. Epidural analgesia versus intravenous analgesia after minimally invasive repair of pectus excavatum in pediatric patients: a systematic review and meta- analysis. Korean journal of anesthesiology. 2021 Oct 1;74(5):449-58.
5. Rawal N. Epidural technique for postoperative pain: gold standard no more? Reg Anesth Pain Med. 2012 ; 37:310–7