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COMPARISON OF EFFECTS OF FENTANYL AND DEXMEDETOMIDINE ALONG WITH KETAMINE IN BOTH GROUPS ON HEMODYNAMIC PARAMETERS & RECOVERY IN PAEDIATRIC PATIENTS UNDERGOING MINOR CARDIAC PROCEDURES UNDER SEDATION IN CATH LAB SET UP.

Anaesthesiology

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ABSTRACT

Background: Management of children with congenital heart disease has been a great challenge for anesthesiologists especially during cardiac catheterization. **Material And Methods:** 60 children of either sex undergoing cardiac catheterisation were randomly assigned into two groups Dexmedetomidine-ketamine group (DK) and fentanyl-ketamine (FK) of 30 patients each. All patients were premedicated with glycopyrrolate and midazolam (0.05mg/kg) intravenously 5-10 min before anaesthetic induction. Group 'DK'received dexmedetomidine iv infusion 1 µg/kg over 10 min + ketamine 1mg/kg bolus, followed by iv infusion of dexmedetomidine 0.5µg/kg/hr and of ketamine1 mg/kg/hr. Group 'FK' received fentanyl 1 mcg/kg and ketamine 1mg/kg for induction followed by iv infusion of fentanyl 2mcg/kg/hr and ketamine 1 mg/kg/hr for maintenance. Haemodynamic parameters and recovery time was recorded postoperatively. **Statistical Analysis:** Independent sample t test ,Chi square test, Fischer exact test. **Results:** Heart rate in dexmedetomidine (DK) group was significantly lower during the initial 25 mins after induction compared to the fentanyl (FK) group. Recovery was prolonged in the DK group (41.39 ± 5.11) min versus (27.36 ± 5.67)min in FK group Even ketamine boluses consumption was higher in DK group. **Conclusion:** Although there was some delayed recovery with dexmedetomidine-ketamine grouo but combination is a safe alternative, without any hemodynamic or respiratory effects during the cardiac catheterization procedure.

KEYWORDS

Cardiac catheterization, children, dexmeditomidine, ketamine, fentanyl

INTRODUCTION:

Management of children with congenital heart disease always been a great challange for anesthesiologists especially in remote suite like cardiac cath lab, CT scan, MRI suite. Anaesthetic technique should be safe, easy to administer, provide adequate sedation, amnesia, immobility, cardiovascular stability, and fast recovery without residual complications. Although General anesthesia with positive pressure ventilation is a better alternative but can alter the intra-cardiac pressures as well as shunt fraction. So deep sedation with pain-free and spontaneously breathing patient on room air is preferred by the cardiac interventionist. A wide variety of anesthetic agents such as fentanyl ,propofol,[1,2] ketamine,[3,4] and dexmedetomidine, clonidine [5,6] are used for this purpose. The commonly performed cardiac catheterization laboratory procedures include diagnostic catheterization and Interventional procedures such as pulmonary artery angioplasty, aortic-coarctation angioplasty, patent ductus arteriosus occlusion or stenting, ventricular septal defect closure, atrial septostomy, atrial septal defect closure, and aortic/pulmonary/mitral valve dilation.[7,8] .We targeted pediatric population to compare the effects of dexmedetomidine-ketamine (DK) and fentanyl ketamine (FK) combinations on hemodynamic parameters and recovery time in pediatric patients undergoing minor cardiac procedures in cardiac catheterization laboratory.

MATERIALS & METHODS:

A prospective, randomized, controlled study was tertiary care hospital from January 2019 to January 2022. After obtaining Institutional Ethical Committee approval, informed written consent was taken from all the patients' guardians before the procedure. The patients were randomly assigned into two groups: DK and FK with 30 children in each group by using sealed envelope method. All children between the age group of 1 month to 10 years of either sex undergoing cardiac catheterization lab procedures were included in the study. Children with chromosomal abnormalities or other multiple congenital anomalies, drug allergy, patients requiring mechanical ventilation or inotropic support, and patients with hepatic or renal dysfunction were excluded from the study. According to hospital policy, all children were kept fasting for at least 6 h before procedure. The patients were premedicated with glycopyrrolate (10 µg/kg) and midazolam (50 µg/kg) intravenously (IV) 15 min before taking the child inside the catheterization laboratory where appropriate measures to prevent hypothermia to child were undertaken. Standard monitors including electrocardiogram and pulse-oximeter were attached. Group (DK) received: dexmedetomidine IV infusion 1 µg/kg over 10 min + ketamine 1 mg/kg IV bolus for induction and then maintenance by IV infusion of 0.5 µg/kg/h of dexmedetomidine and 1 mg/kg/h of ketamine. Group (FK) received fentanyl 1mcg/kg and ketamine 1 mg/kg IV for induction and then maintenance by IV infusion of 2 µg/kg/hr of fentanyl and 1 mg/kg/h of ketamine. Additional doses of ketamine 0.5 mg/kg IV bolus were administered when a child showed discomfort in both groups. Heart rate, mean blood pressure (BP), oxygen saturation (SpO2), and respiratory rate were recorded every 5 min during the procedure. Postoperatively, heart rate and SpO2 were recorded every 10 min. Recovery time was noted. Scores were assigned on admission to postanesthetic room where the routine vital signs were measured. Repeated scoring was performed every 10 min till the patient recovered up to score of 6 according to the Stewards Simplified Postanesthetic Recovery Score[9] [Table 1]. For statistical analysis, a sample size of 30 in each group was calculated with an alpha error of 5% (confidence interval 95%) and power of study of 80% and data analysis was done using statistical software version 21. This mean and standard deviation were used for continuous data such as age, weight, duration of surgery, heart rate, BP, respiratory rate, and recovery time. Independent sample t-test was used to compare the statistical significance of continuous variables of both the groups. Chi-square test was used for numerical data like gender. Fischer exact test was applied for nonparametric data like ketamine consumption.

Table 1: Stewards Scoring System For Post-op Recovery

	Score
Consciousness	
Awake	2
Responding to stimuli	1
Not responding	0
Airway	
Coughing on command or crying	2
Maintaining good airway	1
Airway requires maintenance	0
Movement	
Moving limbs purposefully	2
Non-purposeful movements	1
Not moving	0

RESULTS:

There was no significant difference between the two groups with respect to patient characteristics, type and mean duration of surgery. The patient's age and weight were comparable in two groups .The mean age in DK group was 3.69 (±2.23) years and in FK group was 4.52 (±1.98) years with . The mean weight in DK group was 14.56 (±5.59) kg and in FK group was 15.43 (±4.78) kg. Mean age and weight between the two groups not statistically significant(p>0.05). Mean duration of surgery/procedure in group DK and group FK was 46.14 ± 9.57 min and 40.57 ± 10.67 min, and there was no significant difference in duration of procedure (P ≥ 0.05). The two groups were comparable with respect to type of procedure. Heart rate was significantly lower in DK group upto 20 min postinduction in

comparison to FK group. Later on, the heart rate continued to be lower in both the groups but it was not statistically significant .There was no significant difference between mean BP, mean SpO2, respiratory rate in group DK and group FK from baseline to 60th min .Recovery was significantly delayed in FK group (27.36 ± 5.67)min versus (41.39 ± 5.11) min in DK group (P ≤ 0.05) .Actual ketamine consumption was (1.85 mg/kg/h) in DK group, whereas in FK group, it was (1.15 mg/kg/h).

Table 2: Comparison Of Mean Recovery Time (mins) In Group DK And FK

Group	Number Of Patients	Recovery time (min)		P
		Mean	SD	
Group DK	30	41.39	5.11	<0.05
Group FK	30	27.36	5.67	

DISCUSSION:

Pediatric cardiac catheterization procedures are different from adults in several ways.We observed decrease in the heart rate after induction in both the groups, but the decrease was statistically significant in the dexmedetomidine-ketamine group in the first 25 min after induction. Later on, the decrease in heart rate was persistent in both the groups till the end of procedure but it was not statistically significant. Tosun et al[10] studied effects of dexmedetomidine-ketamine & fentanyl-kemine combinations on hemodynamics, sedation level, and the recovery period in pediatric patients undergoing cardiac catheterization were studied . The heart rate in Group DK was significantly lower than Group FK after induction and throughout the procedure. Systolic, diastolic, and mean BP were reduced after induction in both groups, but there was no statistically significant difference in the mean BP between the two groups during the procedure. In a similar study by Ali et al.[11] which compared DK and FK as anesthetic agents in pediatric cardiac catheterization, clinical outcome of both groups was similar but no significant difference in the recovery patterns and hemodynamic status. In our study, we had similar results in terms of BP, SpO2 and Respiratory rate between the two groups.

Hala M.S. El[12] Deen et al studied Ketamine–propofol(KP) versus ketamine fentanyl(KF)for anesthesia in pediatric patients undergoing cardiac catheterization& found statistical significant decreases in mean arterial blood pressure,systemic vascular resistance, pulmonary to systemic vascular resistance ratio in KP group. Additionally, Sao_2 and Pao_2 after anesthesia in KF group were statistically significant higher than the other group. Also there was significant prolongation of time to full recovery in KF group compared with KP group. Morray JP et al.[13] assessed the hemodynamic effects of ketamine in children with congenital heart disease. Pulmonary and systemic vascular responses to ketamine (2 mg/kg, intravenously) were studied during cardiac catheterization in 20 children with congenital heart lesions & concluded that the hemodynamic alterations after ketamine administration were small. Dexmedetomidine administration reduces anesthetic requirements, speeds postoperative recovery, and blunts the sympathetic nervous system response to surgical stimulation. Munro et al.[14] reported their experience using dexmedetomidine in 20 children aged 3 months to 10 years & they experienced dexmedetomidine, with or without the addition of propofol, may be a suitable alternative for sedation in spontaneously breathing patients undergoing cardiac catheterization. In our study Recovery was significantly delayed in FK group (27.36 ± 5.67) min versus 41.39 ± 5.11 min in DK group (P ≤ 0.05).

CONCLUSION:

This study which compared the dexmedetomidine and ketamine versus propofol and ketamine combinations on hemodynamic stability, respiratory variables, and recovery time in children undergoing minor cardiac procedures in cardiac catheterization laboratory concludes that the use of DK combination is a safe, practical alternative, without any hemodynamic or respiratory effects during the cardiac catheterization laboratory procedure but with some delayed recovery.

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