International Journal of Advanced Biotechnology and Research (IJBR)
ISSN 0976-2612, Online ISSN 2278–599X,
Vol-8, Issue-4, 2017, pp1961-1964
http://www.bipublication.com

Research Article

Analysis of different concentrations of morphine after coronary perfusion for the myocardial protection in Pakistani hospitals

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Source(s) of support in the form of grants, equipment, drugs, or all of the above: None.

ABSTRACT

Introduction: Cardiogenic shock is defined as a systolic blood pressure of less than 90 mmHg for at least 30 minutes, which is secondary to myocardial dysfunction. It is associated with clinical signs of hypo perfusion, which include decreased urine output, altered mental status and peripheral vasoconstriction. **Objectives of the study:** Our main objective is to find the role of morphine as a drug for pain relief in heart patients.
Methodology: Forty five patients undergoing heart valves replacement were selected between the ages of 30 and 70. The study was conducted THQ hospital Yazamn by the approval of concerned department. **Results:** The patients in three groups aging 33-66, mean age 49.78±8.53; men account for 46.67 percent, women account for 53.33 percent; weight 36-67kg, mean weight 51.78±7.31kg; NYHA classification II account for 51.11 percent, III 48.89 percent. There was no statistically significant difference ($P<0.05$) between the patients of their age, gender, weight, NYHA in the three groups. **Conclusion:** To sum up, 2 or 4μmol/L morphine after coronary perfusion has the effect of myocardial protection in patients undergoing cardiac valve replacement with cardiopulmonary bypass. 4μmol/L morphine after coronary perfusion has more ideal myocardial protection.

Keywords: morphine; coronary perfusion; myocardial protection

INTRODUCTION

Myocardial ischemia reperfusion injury is the enhanced myocardial cell metabolic disturbance and structural damage when ischemic hearts restore blood flow. Morphine,the agonists of δ and κ opioid receptors ,having both early and late preconditioning effects playing an significant role in cardioprotection.[1] In the model of ischemic preconditioning ,using morphine can reduce the reperfusion injury. This study is focused on the cardio protection under different concentration of morphine preconditioning in the aspect of hemodynamics, cardiac arrhythmia, myocardial enzyme, cTn I and the histological changes of cardio myocytes.Cardiogenic shock is defined as a systolic blood pressure of less than 90 mmHg for at least 30 minutes, which is secondary to myocardial dysfunction. It is associated with clinical signs of hypo perfusion, which include decreased urine output, altered mental status and peripheral vasoconstriction. It is usually unresponsive to fluids, an important differentiating quality from other types of shock.

However, it frequently responds to inotropes. The cardiac index (CI) and the pulmonary capillary wedge pressure (PCWP) are usually less than 2.2 l/min/m^2 and greater than 15 mmHg respectively.[2]

OBJECTIVE OF THE STUDY

Our main objective is to find the role of morphine as a drug for pain relief in heart patients.

MATERIALS AND METHODS

Forty five patients undergoing heart valves replacement were selected between the ages of 30 and 70. The study was conducted THQ hospital Yazamn by the approval of concerned department. The patients were randomly divided into three groups- morphine 1 group, morphine 2 group, and control group named A, B, C respectively. Each group had 15 patients.All patients were given cardiac diuresis and potassium supply therapy. Anesthesia was induced with midazolam, fentanyl and vecuronium bromide. Generalanesthesia maintained with fentanyl intravenous injection and sevoflurane inhalation. All the patients underwent open heart surgery with extracorporeal membrane oxygenator (Sarns8000). Cardioplegic solution having 2umol/L morphine were prepared to St-Thomas II cold crystalloid. Group A had underwent aortic cross clamp initiated 20ml/kg morphine perfution.

Statistical treatment of data

Statistical analysis was handled by SPSS 17.0 software. All values are expressed as mean±std means analyzed and compared by ANOVA.

RESULTS

The patients in three groups aging 33-66, mean age 49.78±8.53; men account for 46.67 percent, women account for 53.33 percent; weight 36-67kg, mean weight 51.78±7.31kg; NYHA classification II account for 51.11 percent, III 48.89 percent. There was no statistically significant difference (P<0.05) between the patients of their age, gender, weight, NYHA in the three groups.

Hemodynamic parameters

The patients' hemodynamic parameters were listed in Table 1. The values of MAP were lower at T2, T3, T4 than T1. But HR and CVP were higher. However, there were no significant differences between the groups (P>0.05).

Table 1 Changes of Hemodynamic Parameters ($\bar{x}$±S)

Parameter	group	Cases	T1	T2	T3	T4
HR (b/min)	A	15	95.07±15.69	101.53±14.89	106.33±8.30	100.53±6.63
	B	15	92.73±17.97	95.33±11.29	98.80±10.69	96.73±5.48
	C	15	93.93±19.34	101.20±18.19	105.73±12.67	101.60±7.61
MAP （mmHg)	A	15	83.67±8.30	68.73±8.38	69.27±6.34	79.53±8.96
	B	15	88.13±6.53	72.20±6.90	70.00±7.24	74.40±6.15
	C	15	81.87±9.92	74.20±9.36	72.60±4.17	74.00±6.91
CVP (cmH_2O)	A	15	9.13±3.02	9.47±2.00	10.73±2.25	10.53±2.50
	B	15	8.87±2.20	9.13±1.64	9.47±1.46	8.93±1.28
	C	15	9.40±2.75	9.47±2.23	10.47±2.36	10.20±2.40

There were no significant differences in operative data between the groups (P>0.05); CPB transit time, aortic cross-clamp time, defibrillation time, duration of ventilation and ICU and hospital stay. Incidence rates were lower in group A, B than those in group C. However, There were no significant differences (P>0.05) between groups.

Table 2 Basic Situations of Operative Procedure

group	CPB transit time (min)	aortic cross-clamp time (min)	Duratio-n of ventil-ation（h）	Dura-tion of ICU（h）	Defibr-illation time	Hosp-ital stay （d）	ventricular arrhythmia	
							n（%）	n（%）
A(n=15)	97.60±22.12	64.47±20.10	21.20±2.68	30.40±10.99	0.80±0.94	9.80±1.61	2(13.33)	2(13.33)
B(n=15)	92.73±19.41	58.73±16.16	20.60±2.38	30.40±10.99	0.53±0.92	9.53±1.30	1(6.67)	1(6.67)
C(n=15)	96.13±23.92	63.53±20.07	22.53±2.77	35.20±12.39	0.73±0.70	9.53±1.36	4(26.67)	4(26.67)

Table 3 Compare of Myocardial Enzymes and cTnI

Indexe	Gro-ups	cases	T2	T5	T6
CK	A	15	51.73±36.18	542.53±278.32	721.00±236.64
	B	15	39.07±12.99	339.40±125.12	563.87±179.79
	C	15	50.80±24.62	521.60±286.30	665.40±246.76
LDH	A	15	225.67±63.12	418.60±110.52	522.93±124.05
	B	15	226.53±56.76	383.40±383.40	471.93±143.62
	C	15	236.00±42.25	429.80±97.07	556.67±140.49
α-HBDH	A	15	155.93±36.78	353.93±142.39	445.73±167.49
	B	15	167.00±41.50	292.33±81.12	381.20±83.68
	C	15	157.20±31.32	278.07±65.84	380.07±94.84
CK-MB	A	15	12.80±2.86	66.93±25.01	43.00±15.80
	B	15	11.27±3.75	65.47±19.63	34.73±10.63[a]
	C	15	11.67±4.39	60.60±18.63	47.73±12.45
cTnI	A	15	112.10±20.40	355.31±47.25[b]	446.71±33.86[b]
	B	15	114.89±25.40	348.89±40.07[b]	411.08±36.49[bc]
	C	15	122.37±30.33	391.29±51.62	506.84±26.95

NOTE. Data are means±SD. Compared with C, [a]P＜0.05, [b]P＜0.05; Compared with A, [c]P＜0.05.

DISCUSSION

Commonly used clinical drug morphine has broad application prospects at cardioprotection at present. Morphine ,a non-selective opioid receptor agonist[4], mainly agigate μ-opioid receptor can also agigate δ- and -κ receptors simultaneously, was broadly used in anesthetization, analgesia, myocardial infarction and acute left-sided heart failure cures. Several investigators had demonstrated that morphine precondition has ceiling effect.

Morphine has improved protective precondition effects at the concentration of 0.5-10μmol /L. But at the concentration of 10μmol/L or higher, morphine precondition effect didn't improved. YAN Xuebin[5]found that morphine at concentration 2 μmol /L had a better effect than 1 μmol /L in cardioprotection in clinical practice. Now that these studies had demonstrated that morphine at low concentration had cardioprotection, we speculated that morphine at a higher concentration had a better cardioprotection effect.[6]

This study determined to investigate whether the different concentrations of morphine precondition after coronary perfusion has myocardial protection. We increased the concentration of morphine, selected haemodynamics, cardiac arrhythmia, myocardial enzyme, cTnI and the histological changs of cardiomyocytes as examination indicators. There are many influencing factors on haemodynamics. In the similar indicators such as blood flow, the degree of anesthesia, use of vasoactive agent, haemodynamics can reflect the change of cardiac function.[7] Cardiac arrhythmia reflects the change of electronical activity of myocardial cell. Myocardial cells are abundant in CK,CK-MB,LDH .These enzymes let out and make enzyme activity elevated when myocardial cells were injured, which can reflect the degree of myocardial cells injured. cTnI is a subuit of cardiac troponin and a biomarker of cardiac damage.[8]

The research of our study shows that the levels of cTnl at T5 and T6 in group A and group B were significantly lower than those in group C(P<0.05),and at T6 in group B were lower than those in group A(P<0.05).[9]

These demonstrated that cardiomyocytes injuries were lower in morphine groups, and 4μmol/L morphine had a better effect. The results of electron microscop showed that myocardial damage was lower in group A and group B than that in group C, and group B was better than group A, which indicated that morphine 4μmol/L cardioplegic solution played an important role in maintaining the structures of cardiomyocyesin the process of IP.[10-11]

CONCLUSION

To sum up, 2 or 4μmol/L morphine after coronary perfusion has the effect of myocardial protection in patients undergoing cardiac valve replacement with cardiopulmonary bypass. 4μmol/L morphine after coronary perfusion has more ideal myocardial protection.

CONFLICT OF INTEREST

There is no conflict of interest.

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