



Original Research

Experimental Study to evaluate Protective Efficacy of Arjuna Kshira Paka on Induced Myocardial Infarction

* Vinod A Rasala, **Gurdip Singh and ***Ravishankar B

*Medical Officer, ESI Dispensary Bapunagar Ahmadabad

**Director, PG & Ph D Studies, S. D. M. College of Ayurveda Thanniruhalla, Hassan-573201, Karnataka

***Director Research, SDM College of Ayurveda Udupi

Corresponding Author: Dr. Vinod A Rasala Mobile No. 9426349965

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Abstract:

The protective effects of bark powder of Arjuna (*Terminalia arjuna*) was assessed against L-ISO Protornol HCL induced myocardial infarction in rats and the effects were assessed on biochemical parameters and histopathological and ECG findings. The ECG findings showed that the drug significantly checked the rise of heart rate in comparison to control group and there were less appearance of number of Q wave, ST segment elevation and T wave inversions as well as decrease in QRS complex voltage in comparison to control group. Histo-pathological findings indicate that the drug provided moderate protection to rats against L-ISO Protornol HCL induced MI. On the basis of ECG and histopathological findings, it is concluded that Arjuna Ksheera Paaka showed pro cardio protective effect in comparison to control group against the L-ISO Protornol HCL induced myocardial infarction.

Keywords: L-ISO Protornol HCL induced myocardial infarction, Arjuna, *Terminalia arjuna*, myocardial infarction

INTRODUCTION:

Arjuna (*Terminalia arjuna*) is Hridya and very commonly used by Ayurveda physicians for treating the heart diseases. Recent studies have also shown its beneficial effects for the heart ailments. Tiwari (1987) reported that powder of bark of Arjuna significantly reduces serum total cholesterol, lipoprotein and triglyceride; and elevates HDL cholesterol (Tiwari, 1990). Radhakrishana (1993) showed that its chloroform, petroleum ether and ethanol extracts reduces heart rate which was maximum in case of ethanol extract. Divedi (1994) reported that Arjuna lowers the diastolic blood pressure.

Chakradatta pioneer in popularizing Arjuna for the treatment of heart diseases advises use of Arjuna in form of its Kshirpaka. Therefore Arjuna Kshira-Paka was selected for this study

AIMS AND OBJECTS:

To evaluate the role of Arjuna Kshira-Paka in protecting L Iso Protornol HCL induced myocardial infarction in Albino Rats on the basis of biochemical, histological and ECG Parameters.

MATERIALS AND METHODS

Charles foster strain albino rats weighing 200 to 235 gm of either sex were used. Myocardial necrosis was produced by injecting L Iso Protornol HCL in dose of 400mg/Kg (sc) for two consecutive days and myocardial necrosis was confirmed after 48 hours of last injection by estimating serum enzymes and histopathological examination. Other details of the two groups maintained for the study were as follow:

Control Group: The rats of this group were given tap water in the volume corresponding to the test drug dose

once daily for 11 days and thereafter two injection of L Iso Protornol HCL were given in dose of 400mg/Kg at the interval of 24 hours. Then after 48 hours animals were sacrificed and blood was collected for enzymes and biochemical studies, liver was collected for glycogen estimation and heart for histo-pathological studies.

Arjuna Kshira Paka Group: The animals of this group were first given Arjuna Kshira Paka orally in the dose of 5mg/Kg body weight with help of gastric catheter for 11 days. Thereafter the injections and other procedures were carried out as mentioned above in control group.

Arjuna Ksheera Paaka was prepared by adding eight parts of milk and 32 parts of water to one part of bark powder of Arjuna. It was heated on slow fire till whole water was evaporated and only eight parts of milk remained. The filtrate thus obtained was used as Arjuna Kshira Paaka.

CRITERIA OF ASSESSMENT:

Enzymes:CPK NAC and CPK MB creatine kinase

Biochemical investigations: Serum cholesterol, HDL cholesterol, serum triglyceride, serum total protein

Liver tissue glycogen

Histopathological examination of the infarcted heart

ECG

RESULTS

The effect of Arjuna Kshira Paka on the biochemical parameters of L ISO Protornol treated rats is shown in Table-1 and on enzymes in Table-2. The ECG was done and the results obtained on the various parameters of ECG are shown in Table-2 to 9. The heart tissue was examined histopathologically and the findings are depicted in Plate-1

Table-1
Effect of Arjuna Kshira-Paka on Biochemical Parameters of L ISO Protrenol Treated Rats

Investigation	Group		Arjuna in comparison to control	
	Control	Arjuna Ksirapaka	% age	Statistical Significance
Serum cholesterol	46.19±2.67	44.77±1.44	3.07% decreased	Insignificant
HDL Cholesterol	12.16±1.5	10.82±3.5	11.02% decreased	Insignificant
LDL Cholesterol	17.48±3.86	20.20±4.16	15.56% increased	Insignificant
Triglyceride	82.50±10.57	66.89±25.79	18.92% decreased	Insignificant
Total protein	4.38±0.39	05.34±0.13	21.91% increased	Insignificant
Liver glycogen	432.0±182.6	945.2±340.0	118. 8% increased	Insignificant
LDH Activity (U/L)	3300.0±504.0	4400.0±350.0	33.33% increased	Insignificant

Table-2
Effect of Arjuna Kshira-Paka on enzymes of L ISO Protrenol Treated Rats

Investigation	Group		Arjuna in comparison to control	
	Control	Arjuna Ksirapaka	% change	Statistical Significance
CPK NAC	628.59± 92.0	1127.0± 162.0	79.29% more	Insignificant
CPK MB	227.6± 68.95	215.0± 67.15	05.54% less	Insignificant

Table-3
Effect of Arjuna Kshira-Paka on Percentage Increase in Heart Rate (ECG) of L ISO Protrenol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			% change	Statistical Significance
5 minutes	41.14±10.26	20.02±4.36	51.34% less	Insignificant
30 minutes	67.11±13.05	16.32±7.11*	75.68% less	*Significant (P<0.05)
60 minutes	72.46±3.06	20.63±7.23***	71.53% less	***Significant (P<0.001)

Table-4
Effect of Arjuna Kshira-Paka on QRS Complex (ECG) of L ISO Protrenol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			% change	Statistical P value
Before MI	0.32±0.10	0.37±0.11	15.63% increase	Insignificant
After 5 minutes	0.27±0.09	0.24±0.07	11.11% decrease	Insignificant
After 30 minutes	0.46±0.16	0.32±0.08	30.43% decrease	Insignificant
After 60 minutes	0.66±0.21	0.13±0.005	80.30% decrease	Insignificant

Table-5
Effect of Arjuna Kshira-Paka on PR Interval (ECG) of L ISO Protrenol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			% change	Statistical Significance
Before MI	52.6±7.6	50.0±0.00	4.94% decrease	Insignificant
After 5 minutes	56.6±6.6	46.60±3.40	17.67% decrease	Insignificant
After 30 minutes	45.0±9.6	41.6±4.4	7.56% decrease	Insignificant
After 60 minutes	45.6±4.8	45.0±0.00	1.32% decrease	Insignificant

Table-6
Effect of Arjuna Kshira-Paka on QT Interval (ECG) of L ISO Protrenol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			% change	Statistical Significance
Before MI	92.4±48.00	94.0±24.00	1.73% increase	Insignificant
After 5 minutes	61.6±10.2	60.0±2.8	2.60% decrease	Insignificant
After 30 minutes	65.0±6.40	64.2±2.8	1.23% decrease	Insignificant
After 60 minutes	70.0±10.0	61.6±4.4	12.0% decrease	Insignificant

Table-7
Effect of Arjuna Kshira-Paka on Q wave (ECG) of L ISO Protornol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			Change	Statistical Significance
After 5 minutes	2.0±0.71	1.0±0.33	50.0% decrease	Insignificant
After 30 minutes	2.25±0.48	1.25±0.67	44.44 decrease	Insignificant
After 60 minutes	2.0±0.58	0.33±0.33	83.5% decrease	Insignificant

Table-8
Effect of Arjuna Kshira-Paka on T Wave Depression (ECG) of L ISO Protornol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			Change	Statistical Significance
After 5 minutes	2.0±0.41	1.33±0.88	33.5% decrease	Insignificant
After 30 minutes	2.25±0.65	1.67±0.36	25.78% decrease	Insignificant
After 60 minutes	2.33±0.88	0.67±0.67	71.24 % decrease	Insignificant

Table-9
Effect of Arjuna Kshira-Paka on ST Depression (ECG) of L ISO Protornol Treated Rats

After the injection	Control group	Arjuna group	Arjuna in comparison to control	
			Change	Statistical Significance
After 5 minutes	3.75±0.48	3.67±0.46	2.13% decrease	Insignificant
After 30 minutes	4.0±0.41	1.67±0.88	58.25% decrease	Insignificant
After 60 minutes	3.33±0.20	1.33±0.67	60.06% decrease	Insignificant

DISCUSSION

In this study the protective effect of bark powder of Arjuna (*Terminalia arjuna*) administered orally in the form of Ksheera Paak (boiled in mixture of milk and water) was evaluated against myocardial infarction induced by L ISO Protornol. Its effects on the various parameters adopted in the study were as follow:

Effect on ECG Parameters: the drug significantly checked the rise of pulse rate by about 75% n comparison to control group (Table-3). This can be taken as one of the reliable indicators of cardio protective effect of Arjuna Kshira Paaka. The probable mechanism may be antagonizing the L-ISO Protornol HCL included increase in the slope of slow diastolic depolarization of the cell in SA node.

The number of Q wave appearances (Table-7), ST segment elevation (Table-9) and T wave inversions

(Table-8) were much less in Arjuna Kshira-Paka group in comparison to control group.

The other effects observed were decrease of about 80% in QRS complex voltage in Arjuna-Kshira-Paaka (AK) group (Table-4) in comparison to control group.

The changes in PR interval (Table-5) and QT interval (Table-6) were about the similar in both the groups.

On the whole as evident from the above mentioned ECG findings, it can be concluded that Arjuna Kshira Paka showed pro-cardio protective effect in comparison to control group against L-ISO Protornol HCL induced myocardial infarction in rats.

Histological Changes: Both longitudinal and transverse microtone sections of the ventricle were prepared for each rat of each group.

Histological Changes in Control Group: In the control group rats, transmural necrotic changes were observed from epicardial to endocardial region in 3 out of 5 rats. In 2 out of 5 rats there was severe subendocardial necrosis with the extensive necrotic area. There was extensive degeneration and disintegration of sarcoplasm with nuclear fragmentation. Nuclei were with interstitial edema and fatty degenerative changes were also noticed. There was also leukocyte infiltration and vascular degenerative changes.

Histological Changes in Arjuna Kshirapaka Group: In Arjuna Kshira-Paka group in one rat infarct like lesion was observed with necrotic changes and marked cell infiltration. In one other rat diffused necrosis, vacuolization and cell infiltration of moderate intensity and interstitial edema were observed. In other two rats there was fragmentation of muscular bundles with mild diffused necrosis (Plate-1).

As histological study provides direct evidence, therefore on the basis of the foregoing findings it can be said that powder of bark of Arjuna (*Terminalia arjuna*) administered in the form of Kshira-Paka (boiled in mixture of milk and water) provided moderate protection to rats against L-ISO Protornol HCL induced myocardial infarction.

Effect on Biochemical Parameters: The drug showed no statistical significant effect on the values of biochemical and enzyme parameters as shown in Table-1 and table-2. The reason may be the time of collection of blood samples.

On the basis of careful analysis of the results based on histo-pathological and ECG changes showed that Arjuna Kshira-Paka possesses moderate cardio-protective effect against L-ISO Protornol HCL induced myocardial infarction.

CONCLUSIONS

- As evident by ECG findings, bark powder of Arjuna (*Terminalia arjuna*) administered in form of Kshira-Paka significantly checked the rise of heart rate of the L-ISO Protornol HCL induced myocardial infarction.
- In Arjuna Kshira-Paka group the number of Q wave appearances, ST segment elevation, T wave inversions and decrease in QRS complex voltage were much less in comparison to control group.
- Thus ECG findings suggested that Arjuna Kshira Paka possesses pro cardio protective effect.
- Findings of the histological study provided direct evidence that powder of bark of Arjuna (*Terminalia arjuna*) administered in the form of Kshira-Paka (boiled in mixture of milk and water) provided moderate protection to rats against L-ISO Protornol HCL induced myocardial infarction.
- On the whole as evident from the above mentioned ECG findings and histo-pathological evidences, it can be concluded that Arjuna Kshira Paka showed moderate pro cardio protective effect in comparison to control group against L-ISO Protornol HCL induced myocardial infarction in rats.

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