

Comparison of Felodipine and Propranolol in the Treatment of Hypertension

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ABSTRACT

Objective: To compare the efficacy of felodipine and propranolol in the treatment of essential hypertension.

Study Design: Randomized controlled study

Place and Duration of Study: This study was conducted at Accident and Emergency Department, Bahawal Victoria Hospital Bahawalpur and Ansari Private Clinic Model Town B, Bahawalpur from March 2013 to May 2013.

Materials and Methods: Total 90 patients of mild to moderate essential hypertension both male and female between the ages of 30 to 55 years were enrolled to this study, for 90 days patients were randomly divided into three groups Group I, II and III. Efficiency of felodipine, propranolol and placebo tablets in the treatment essential hypertension was compared.

Results: Felodipine and propranolol both reduces the systolic blood pressure was highly significant ($P < 0.001$) between day 0-15, day 0-30, day 0-45, day 0-60, day 0-75 and day 0-90. The placebo exhibited a non-significant effect on systolic blood pressure.

In case of diastolic blood pressure patients treated with felodipine and propranolol the decrease of blood pressure was also significantly ($P < 0.001$) for all time intervals. In placebo administered group the effect of diastolic blood pressure was non-significant at all-time intervals

Conclusion: Result of this study showing that both felodipine and propranolol significantly reduces blood pressure at all time of intervals. In addition felodipine has got an edge on propranolol that it is administered once daily.

Key Words: Essential Hypertension, Felodipine, Propranolol, Placebo

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INTRODUCTION

Felodipine is the member of second generation dihydropyridine class of calcium channel antagonists (calcium channel blockers) and is insoluble in water^{1,2}. Felodipine possesses pronounced arteriolar dilating capacity and free from negative inotropic activity³. This drug suggested to exert its vasodilating effect in part by interaction with intracellular calcium. Unlike other calcium antagonist (e.g. Verapamil and Nifedipine) felodipine has been shown to have more pronounced selectivity for vascular smooth muscle than the heart muscle^{4,5,6}. The mean systolic and diastolic blood pressure is decrease significantly by felodipine^{7,8}. Moreover, felodipine rendered the blood pressure to normal levels in most patients who were not controlled on standard triple therapy⁹.

Propranolol, a non-selective beta blocker^{10,11} is the most widely used beta blocker in the management of cardiovascular disorders including hypertension, ischemic heart disease and certain arrhythmias¹² and

bronchio-constriction¹³. The mechanism by which blood pressure is lowered by propranolol is the primary reduction in the cardiac output resulting from negative inotropic and chronotropic action of the drug^{14,15,16}. It is reported that propranolol was most likely to produce fall in blood pressure in the patients with high plasma renin activity then in the patients with normal or low plasma renin activity¹⁷. Propranolol a non-selective beta blocker without ISA was the first and still most widely used in the treatment of hypertension. They further indicate that propranolol significantly reduced the systolic and diastolic blood pressure¹⁸. Various studies have been carried out to demonstrate the effects of these two types of drugs individually, but these have not been compared. Thus, the present study was undertaken to compare the effects of felodipine and propranolol in the patients of essential hypertension.

MATERIALS AND METHODS

Ninety patients of mild to moderate essential hypertension were selected. Their systolic blood pressure reached from 160-200 mmHg and the diastolic blood pressure was in range of 95-114 mmHg¹⁹. The patients were of either sex (male and female) between the ages of 30 to 55 years. These patients

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were then divided randomly into three groups each comprising of thirty (30) patients.

Group I was given felodipine 5mg tablets once daily Group II was given propranolol 40mg tablets twice a day and Group III was given placebo tablets once daily. All patients are withheld from any hypertensive medication for at least two weeks prior to their inclusion in the study. Blood pressure, both systolic and diastolic was recorded on the day of registration (day 0) and then on biweekly basis for three months. Blood pressure was recorded three times, the mean of three values was calculated and taken as blood pressure through standard sphygmomanometer²⁰.

The values of blood pressure are given as mean $\pm$ SEM, and the values within the same group at different time intervals were compared with paired 't' test. Group comparison was done by applying student's t test.

RESULTS

Table 1 shows the variation in the levels of systolic blood pressure for the patients treated with felodipine, propranolol and placebo at day 0, 15, 30, 45, 60, 75 and 90.

Felodipine and propranolol both reduces the systolic and diastolic blood pressure the differences (as mean + S.E.M.) is the systolic blood pressure at different time intervals effected by the drugs are shown in the table 2. For felodipine and propranolol the decrease was highly significant ($P < 0.001$) between day 0-15, day 0-30, day 0-45, day 0-60, day 0-75 and day 0-90. The placebo exhibited a non-significant effect on systolic blood pressure.

The mean values of corresponding differences in systolic blood pressure at different time intervals in the three groups are compared in table 3.

The comparison of felodipine with propranolol showed a significant difference only for day 0-30 and a non-significant difference at other time intervals i.e. (day 0-15, day 0-45, day 0-60, day 0-75 and day 0-90). When felodipine was compared with placebo the difference was highly significant ($P < 0.001$) for all time interval. Similarly comparison of propranolol with placebo, also showed a highly significant differences, ($P < 0.001$) for all three intervals.

Diastolic Blood Pressure: Table 4 shows the variation in the levels of diastolic blood pressure for the patients treated with felodipine, propranolol and placebo at 0, 15, 30, 45, 60, 75 and 90. A significant reduction was noticed in the diastolic blood pressure in patients treated with felodipine as well as with propranolol.

The comparative effects of the drugs at different time intervals are shown as difference (mean $\pm$ S.E.M) in the diastolic blood pressure in table 5. For felodipine the decrease was highly significant ($P < 0.001$) for day 0-15, day 0-30, day 0-45, day 0-60, day 0-75 and day 0-90. In propranolol treated group, the decrease was also highly significant ($P < 0.001$) for all time intervals.

In placebo administered group, the effect on diastolic blood pressure was non-significant at all-time intervals. The mean values of corresponding differences in diastolic blood pressure at different time interval in the three groups are compared in table 6.

The comparison of felodipine with propranolol showed a non-significant difference for all three interval when felodipine was compared with placebo, the difference was highly significant ($P < 0.001$) for all time intervals. Similarly comparison of propranolol with placebo, also showed a highly significant difference ($P < 0.001$) for all time intervals.

Table No.1: Variation in systolic blood pressure before and during treatment Mean $\pm$ S.E.M.

Systolic Blood pressure in mmHg							
Drugs	Before treatment	During treatment					
	Day 0	Day 15	Day 30	Day 45	Day 60	Day 75	Day 90
Felodipine(n=30)	161.06 $\pm$ 2.45	135.86 $\pm$ 1.50	130.98 $\pm$ 1.30	127.26 $\pm$ 1.25	124.86 $\pm$ 1.32	123.13 $\pm$ 1.22	123.06 $\pm$ 1.27
Propranolol (n=30)	163.06 $\pm$ 2.03	138.20 $\pm$ 1.70	127.13 $\pm$ 1.37	123.60 $\pm$ 1.24	124.06 $\pm$ 1.26	124.13 $\pm$ 1.47	123.53 $\pm$ 1.36
Placebo (n=30)	159.46 $\pm$ 1.71	159.13 $\pm$ 1.82	159.20 $\pm$ 1.65	159.40 $\pm$ 1.60	159.06 $\pm$ 1.75	158.86 $\pm$ 1.51	159.00 $\pm$ 1.66
S.E.M: Standard Error of Mean				n: number of patients			

Table No.2: Effect of Felodipine and Placebo on systolic blood pressure before at different time intervals

Drugs	Day 0-15	Day 0-30	Day 0-45	Day 0-60	Day 0-75	Day 0-90
Felodipine	***-25.20 $\pm$ 1.73	***-30.13 $\pm$ 2.11	***-33.80 $\pm$ 2.34	***-36.20 $\pm$ 2.18	***-37.93 $\pm$ 2.41	***-38.06 $\pm$ 2.32
Propranolol	***-24.86 $\pm$ 1.56	***-34.93 $\pm$ 1.86	***-39.46 $\pm$ 1.82	***-39.00 $\pm$ 1.85	***-38.93 $\pm$ 1.78	***-39.53 $\pm$ 1.80
Placebo	-0.40 $\pm$ 0.68	-0.26 $\pm$ 0.61	-0.33 $\pm$ 0.61	-0.40 $\pm$ 0.61	-0.60 $\pm$ 0.87	-0.46 $\pm$ 0.67
S.E.M: Standard Error of Mean			***=P<0.001			

Table No.3: Levels of significance of systolic blood pressure on conversion of drugs at different time intervals

Drugs	Day 0-15	Day 0-30	Day 0-45	Day 0-60	Day 0-75	Day 0-90
Felodipine vs Propranolol	N.S	P<0.05	N.S	N.S	N.S	N.S
Propranolol vs Placebo	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001
Felodipine vs Placebo	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001

Table No.4: Variation in Diastolic blood pressure before and during treatment Mean $\pm$ S.E.M

Diastolic Blood pressure in mmHg							
Drugs	Before treatment	During treatment					
	Day 0	Day 15	Day 30	Day 45	Day 60	Day 75	Day 90
Felodipine (n=30)	103.40 $\pm$ 0.84	91.26 $\pm$ 1.15	86.46 $\pm$ 0.67	86.13 $\pm$ 0.68	85.40 $\pm$ 0.62	85.40 $\pm$ 0.67	84.66 $\pm$ 0.61
Propranolol (n=30)	103.46 $\pm$ 0.67	92.33 $\pm$ 0.80	85.53 $\pm$ 0.75	84.93 $\pm$ 0.67	84.33 $\pm$ 0.68	85.40 $\pm$ 0.60	84.13 $\pm$ 0.62
Placebo (n=30)	103.26 $\pm$ 0.59	102.13 $\pm$ 0.69	102.33 $\pm$ 0.84	102.53 $\pm$ 0.59	102.06 $\pm$ 0.63	102.26 $\pm$ 0.61	102.86 $\pm$ 0.54
S.E.M: Standard Error of Mean n: number of patients							

Table No.5: Effect of felodipine, propranolol and placebo on diastolic blood pressure at different time intervals.

Drugs	Day 0-15	Day 0-30	Day 0-45	Day 0-60	Day 0-75	Day 0-90
Felodipine	***-12.13 $\pm$ 0.77	***-16.93 $\pm$ 0.72	***-17.13 $\pm$ 0.72	***-17.93 $\pm$ 0.72	***-17.86 $\pm$ 0.58	***-18.60 $\pm$ 0.63
Propranolol	***-11.13 $\pm$ 0.55	***-17.93 $\pm$ 0.69	***-18.53 $\pm$ 0.69	***-19.13 $\pm$ 0.83	***-18.00 $\pm$ 0.62	***-19.26 $\pm$ 0.76
Placebo	-1.13 $\pm$ 0.76	-0.93 $\pm$ 0.62	-0.73 $\pm$ 0.41	-1.20 $\pm$ 0.61	-1.00 $\pm$ 0.54	-0.26 $\pm$ 0.48
S.E.M: Standard Error of Mean				***=P<0.001		

Table No.6: Levels of significance of diastolic blood pressure on conversion of drugs at different time intervals

Drugs	Day 0-15	Day 0-30	Day 0-45	Day 0-60	Day 0-75	Day 0-90
Felodipine vs Propranolol	N.S	N.S	N.S	N.S	N.S	N.S
Propranolol vs Placebo	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001
Felodipine vs Placebo	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001	P<0.001
N.S: Non-significant						

DISCUSSION

This study signifies that significant changes occurred in blood pressure both systolic and diastolic, as a result of three months regimen of the administration of felodipine and propranolol.

Felodipine lowers the blood pressure by having pronounced selectivity on vascular smooth muscle than the heart muscle⁵. Frohlich et al., (1968)²¹ has reported that propranolol lowered the blood pressure by primary reduction in cardiac output resulting negative inotropic and chronotropic action of the drug.

Present study revealed that felodipine and propranolol significantly reduced both systolic and diastolic blood pressure. Propranolol reduced the level of systolic blood pressure by 15% in the initial 15 days, by another 7% in the next 15 days and by further 2% by the 45th day while in case of felodipine the reduction was 16% in the initial 15 days, by another 3% in the next 15 days, by another 2% in the next 15 days, by another 2% in the next 15 days and by another

1% by 75th day and there was no further reduction in blood pressure even though the treatment was being continued. Similar finding for both drugs were noticed on the diastolic blood pressure but up to 45th day of treatment only.

The results of the present study match with the study of Collste and colleagues (1985)⁹ and Liul Zhangy (2005)²² in which the mean systolic and diastolic blood pressure were decrease significantly with felodipine. The statement of (Wahl et al. 1985)¹⁸ accords with present study that propranolol significantly reducing sitting blood pressure, the reduction in blood pressure was noted after 2 weeks of treatment and was maintained throughout the study of 24 weeks.

Propranolol introduced 25 years ago is still widely used drug and is effective in patients of essential hypertension¹³. The present study concludes that like propranolol, felodipine is also an effective antihypertensive and is well tolerated. It is therefore, recommended that felodipine can be used as a monotherapy in patients suffering from mild to moderate essential hypertension.

CONCLUSION

Result of our study are showing that felodipine is as effective as an antihypertensive as propranolol in treatment of essential hypertension. In addition felodipine has got an edge over propranolol that it is administered once daily and is not contraindicated in diabetic and asthmatic subjects.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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