

Formulation and Evaluation of Immediate Release Tablet of Lercanidipine HCL

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Abstract:

The aim of the present research work was to develop and formulate Immediate release tablet of Lercanidipine. Lercanidipine is an antihypertensive agent. Solid dispersion of Lercanidipine was prepared by spray drying method with different polymer for improvement of solubility resulting in improved bioavailability. Immediate release tablet containing solid dispersion of Lercanidipine was compressed by direct compression method. The Immediate release properties of the tablets were achieved by the use of natural superdisintegrants for fast disintegration. The formulations were evaluated for various physical parameters, hardness, disintegration, dissolution studies and drug released mechanisms. Experimental batch number F6 formulation showed minimum disintegration time (30 sec) and maximum drug release duration of Lercanidipine spread over 1 hour.

Keywords

Immediate release drug delivery, Lercanidipine, solid dispersion, In-vitro study, analytical method development.

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I. Introduction:

In the present study and research novel drug delivery systems are developed for expanding markets/indications, extending product life cycles and generating opportunities. Immediate release tablets are those which disintegrate rapidly and get dissolved to release the medicaments. Immediate release may be provided for by way of an appropriate pharmaceutically acceptable diluent or carrier, which diluent or carrier does not prolong, to an appreciable extent, the rate of drug release and/or absorption.

Material :

Lercanidipine HCl was a gift sample from Cipla Limited, Mumbai. Polyvinyl pyrrolidone (PVP K30), directly compressible lactose (DCL), Ac-Di-Sol (crosscarmellose sodium), sodium starch glycolate (SSG), crospovidone, talc, magnesium stearate, and sodium lauryl sulphate (SLS) were obtained as gift samples from Lupin Research Park, Pune, India.

Formulation Development:

For preparing FPRTs of lercanidipine HCl, initially the immediate release core tablets containing drug were prepared and optimized tablets were compression-coated using mixture of hydrophilic swellable polymer and lactose. To obtain buoyancy, sodium bicarbonate was included in the coating layer. Accordingly, various formulation parameters of the inner immediate release core and the coatings were varied and optimized.

Preparation of Immediate Release Formulation:

The immediate release core tablets were prepared by weighing the drug, diluents along with superdisintegrants and PVP K30 (dry binder), and passing them through sieve #44 to break the lumps and also for proper blending of powder; to this powder blend magnesium stearate and talc were added and mixed. The powder mixtures were punched to 100 mg and 50 mg using flat-faced punches using a 10 station automatic rotary compression machine (Rimek Mini Tablet Press-1, Mumbai, India). The composition of the tablets is given in Table 1.

Sr No	Name of Ingredient	Quantity (mg)					
		F ₁	F ₂	F ₃	F ₄	F ₅	F ₆
1	Solid dispersion of lercanidipine HCl	40	40	40	40	40	40
2	Banana Powder	4	5	6	-	-	-
3	Potato Starch	-	-	-	4	5	6
4	Lactose	20	20	20	20	20	20
5	Microcrystalline Cellulose	50	49	48	50	49	48
6	Talc	5	5	5	5	5	5
7	Mg Stearate	1	1	1	1	1	1
Total wt.		120	120	120	120	120	120

Table No. 1: Composition of Immediate Release Tablet

Evaluation of Lercanidipine Immediate release tablets:

The tablets were subjected to evaluation for the following parameters.

a) Tablet hardness :

Tablet hardness is also known as tablet crushing strength. Monsanto Hardness tester was used. It applies force to the tablet diametrically with the help of an in built spring. The hardness of the tablet is measured by using conventional hardness testers like Monsanto hardness tester. The prepared tablets were subjected to hardness test. It was carried out by using hardness tester and expressed in Kg/cm².

b) Friability test:

Friability test was performed by taking 20 tablets. Pre weight of the individual tablet was taken before subjecting to friability test. Weighed tablet samples are transformed into friabilator and subjected to combined effects of abrasion and shock by revolving at 25rpm for 4min for 100revolutions. Samples are withdrawn after set time completions and loose dust powder was removed from the tablet and final weight is noted and substituted in the formulae.

$$\% \text{ friability} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

c) Thickness:

The thickness of tablets was determined using Digital Vernier Caliper. It is expressed in mm.

d) In - vitro Disintegration time :

The disintegration test was performed using Electrolab disintegrating apparatus. Placed one tablet in each of the six tubes of the basket and operate the apparatus using 0.1N HCl maintained at 37±0.5°C as the immersion fluid. Then noted down the time to complete disintegration of tablets.

e) Content Uniformity:

The lercanidipine HCl content in tablets was determined by powdering 10 tablets in each batch. Powder equivalent to 100 mg of lercanidipine HCl was dissolved in Methanol. 1 ml of filtrate was further diluted to 100 ml with 0.1 N HCl and it was determined by spectroscopy at 250 nm.

f) Weight variation test :

20 tablets were selected at random from the lot, weighed individually and the average weight was determined. The percent deviation of each tablets weight against the average weight was calculated. The test requirements are met, if not more than two of the individual weights deviate from the average weight by more than 5% and none deviates more than 10%.

g) In - vitro release profile of formulated lercanidipine HCl tablet:

Drug release studies were done by using USP type II apparatus (paddle type). For that 900ml of dissolution medium (0.1N HCl) was transferred into round bottomed beaker and the temperature was maintained at 37⁰ c±2⁰ c and Speed of Paddle was 50rpm. At regular time interval (5min.) 5ml sample was withdrawn and replaced with fresh dissolution medium. Removed sampled was diluted and observed in UV spectrophotometer at 250 nm.

II. RESULT AND DISCUSSION:

Pre compression parameters:

Batch Code	Bulk density (gm/cm ³)	Tap density (gm/cm ³)	Carr's index	Hausner's ratio	Angle of repose	Flowability
F ₁	0.512	0.575	10.95	1.12	26.28	Good
F ₂	0.530	0.598	11.37	1.12	26.97	Good
F ₃	0.570	0.616	7.46	1.08	27.33	Good
F ₄	0.578	0.620	6.77	1.07	29.94	Good
F ₅	0.425	0.485	12.37	1.14	22.92	Good
F ₆	0.470	0.502	6.37	1.06	23.21	Good

Table No. 2 Evaluation of precompression parameters

The Precompression parameters were the primary requirements to determine whether the specific material was suitable for the targeted formulation or not. The aim was to formulate the tablet formulation with direct compression method, so it was mandatory to know the bulk density, tapped density, Carr's index, Hausner's ratio and angle of repose as those were the official requirement while choosing any material for its dosage form formulation. Table 2 shows the results evaluated parameters of Bulk Density, Tapped Density, Carr's index, Hausner's ratio, Angle of Repose for various tablet formulation. The result of evaluation parameters clearly indicates its suitability to be the material of choice for formulation.

Post compression parameter:

Formulation code	Weight variation (%)	Hardness (kg/cm)	Friability(%)	Disintegration time	Wetting time(sec)
F1	2.4±0.54	2.5±0.13	0.42±0.16	30 sec	11±0.9
F2	3.6±0.27	2.7±0.12	0.51±0.13	50 sec	20±1.1
F3	4.1±0.21	3.1±0.11	0.73±0.33	40 sec	33±1.7
F4	1.1±0.31	3.1±0.18	0.30±0.19	65 sec	22±1.9
F5	3.5±0.11	3.2±0.22	0.48±0.22	40 sec	39±1.2
F6	2.6±0.43	3.6±0.21	0.68±0.21	50 sec	48±1.7

All the prepared batches were evaluated systematically. The obtained results of the evaluated post compression parameters were represented in the below table i.e. on Table 3. The results of all the trial batches were compared and found satisfactory, as per the reported specification. Finally the comparison parameters were keenly observed to finalize for selection of the optimized batch and formula. Hardness of tablets was found to be in the range of 3.4 to 3.8 kg/cm² given in Table 4. The friability of all tablets was found to be in the range of 0.16 to 0.56 which is less than 1% that showed good mechanical strength. Thus finally formulation F-C i.e. SLS-3 of batch B 3 shows disintegration time 140 seconds and drug release 98.28% which is higher than other tablets formulations.

III. Summary and Conclusion

From the literature survey Lercanidipine dosage form was used in the management of Hypertension. From the above experimental result it can be concluded that, FT-IR studies of Lercanidipine, its solid dispersion, excipients and drug: excipients mixture revealed that, Lercanidipine is compatible with all polymers. Spray dried solid dispersion of lercanidipine as immediate release tablet improves the dissolution rate. From the In vitro drug release study, formulation F6 has been selected as best formulations among all the other formulations. The result of analysis of tablet formulation and recovery studies obtained by UV Visible Spectrophotometric methods were statistically validated.

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