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Original Article

Formulation and Characterization of fast dissolving tablets of ciprofloxacin

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ABSTRACT

The present study deals with the formulation of fast dissolving tablets by direct compression method using Ciprofloxacin HCL. The influence of superdisintegrants on the croscarmellose sodium and sodium starch glycolate on dissolution time, wetting time etc were studied. The prepared tablets were evaluated for weight variation, content, hardness, friability, thickness, diameter and In vitro disintegrants such as croscarmellose sodium and sodium starch glycolate are used in combinations with the drug, and the combination containing 60 mg of croscarmellose sodium and 60 mg of sodium starch glycolate showed faster dispersion time and maximum drug release in 14 min.

1. Introduction

Over the decades of year there has been tremendous increase in the demand and development of novel drug delivery system. The novel drug system include various route of administration of the dosage form for eg oral disintegrating tablet , implant, nasal drug delivery, ocular drug delivery, transdermal drug delivery, melt in mouth etc. the main reason for increase in the demand of such drug delivery system is the poor patient compliance. Lack of availability of water, frequency of dosage form, difficulty in swallowing the convectional dosage form etc leads to the birth of poor patient compliance.

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Poor patient compliance leads to decrease in therapeutic efficacy that is because of poor bioavailability of the drug in the treatment hence to overcome this novel drug delivery system was develop.

The aim of Fast Dissolving tablets (FDT) drug delivery is to produce good-tasting tablets that disintegrate in a reasonable time without the need for water. Drugs have varying levels of bitterness and dosage. It may be acceptable to have a small amount of drug taste present in the final product. Clearly, patient compliance must be taken into account when developing any new drug products and this is where FDT products have a clear benefit for patients. Ciprofloxacin is broad spectrum antibiotic that is active against both gram-positive and gram-negative bacteria.It functions by inhibiting DNA gyrase, a type II topo isomerase and topo isomerase IV,enzymes necessary to separate bacterial DNA,there by inhibiting cell division.

MATERIALS AND METHOD:

Ciprofloxacin hydrochloride was gift sample from drugs India, Hyderabad, Cross carmilose sodium Sodium starch glycolate, Lactose {SD fine chemicals, boisar}, Magnesium stearate{ microlabs hosur}, Sodium hydroxide IP {SD fine chemicals, boisar}, Potassium di hydrogen phosphate IP {SD fine chemicals, boisar} Hydrochloric acid {SD fine chemicals, boisar}, Ethanol IP{ SD fine chemicals, boisar} and all chemicals and solvents are pharmacopieal standards.

Preparation of Ciprofloxacin HCL fast dissolving tablets

Fast dissolving tablets were prepared using the following carriers:

a) Cross carmillose sodium
b) Sodium starch glycolate
The fast dissolving tablets (FDT) with the above polymer in different proportions.

Direct compression method [39, 40, 41]

Accurate amount of polymer was taken in a dry and clean motar in different proportions separately as shown in table. To this weighed amount of Ciprofloxacin hydrochloride (250mg) was added along with magnesium stearate and lactose mix well. The dry blend was compressed into tablets in a single punch tablets at 30 PCI. The tablets were evaluated for hardness, thickness and diameter, friability, wetting time, weight variation test and drug content uniformity.

EVALUATION:

Weight variation test:

Twenty tablets were selected at random, individually weighed and the average was calculated. The uniformity of weight was determined according to IP specification. As per IP not more than two of individual weight should deviate from average weight by more than 7.5% and deviate more than twice that percentage (15%)

Hardness test:

Tablet requires a certain amount of strength or hardness and resistance to friability to withstand mechanical shocks of handling in manufacture and packing and shipping. The device used for measuring the hardness of the tablets is Monsanto hardness tester. Three tablets were taken from each batch and tested for hardness using Monsanto hardness tester.

Thickness and diameter:

Thickness and diameter of the tablet was carried out using a screw guage.

Friability test:

Twenty tablets were given in the combined effects of abrasion and shock by utilizing a plastic chamber that revolves at 25 rpm, dropping the tablets a distance of 6 inches with each revolution. Twenty tablets were weighed and placed in the friabilator operated for 100 revolutions, dusted and weighed.

Wetting time

A piece of tissue paper folded twice was placed in a small petri dish (ID -6.5) containing 6 ml of stimulated saliva pH, a tablet was put on the paper, and time for complete wetting was measured. Three trails for each batch were performed and standard deviation was also determined.

Drug content uniformity:

Ten tablets were laid and taken in the mortar and crushed to powder. A quantity of powder weighing equivalent to 250mg of Ciprofloxacin HCL hydrochloride was taken in 100ml volumetric flask and 0.1N NaOH was added. It was then heated at 60^0 c for 30min. then 10m of the solution was transferred to a 100ml standard flask and made up to 100m with 0.iN NaOH. From this, 1ml of this solution was transferred to a 10m standard flask and made up to 10ml with o.1N NaOH. Then the solution was filtered using membrane filter 0.45µm and then the solutions absorbance was measured at 272nm. Then the amount of the drug was calculated using standard graph.

In vitro **dispersion time:**

In vitro dispersion time was measured by dropping a tablet in a measuring cylinder containing 6ml of pH 6.2[stimulated saliva fluid]. The time for the tablet to completely disintegrate into fine particles was noted. Three tablets from each formulation were randomly selected and In vitro dispersion was performed.

***In vitro* dissolution study**

Dissolution apparatus II USP XXI model was used for carried out in vitro drug release studies on the prepared batches of tablets. 900 ml of sorenson's buffer solution [pH 6.2 was used]. The tablet kept in the bowel and the paddle was rotated at 50rpm. The temperature of the dissolution fluid was maintained at 370c $\pm 0.5^0$ c

Analysis of samples

1ml of the sample was drawn at periodic intervals 2^{th} , 4^{th}, 6^{th}, 8^{th}, 10^{th}, 12^{th}, and 14^{th} minutes and it was made up to 10ml with sorensons buffer solution. 1ml of fresh dissolution medium was replaced after each time. The samples were analyzed spectro photometrically at 272nm for the drug content against the respective buffer blank. The mean % of Ciprofloxacin hydrochloride released at various time intervals was calculated and plotted against time.

RESULTS AND DISSCUSSION

The aim of the present work is to prepare fast dissolving tablets (FDT) of Ciprofloxacin HCL. The fast dissolving tablets was prepared by using various polymers like cross carmilose sodium, sodium starch glycolate . For the preparation of FDT tablets, accurate amount of polymer was taken in clean mortor in different properties separately.To this, weighed amount of ciprofloxaci HCL was added along with the lactose and magnesium stearate was added and mixed well. The dry blend was compressed in to tablets in a single punch tablet machine. The tablets were evaluated for hardness, thickness and diameter, friability, wetting time, weight variation test ,drug content uniformity and dissolution studies.

Hardness:

The prepared tablets in all formulations possess good mechanical strength with sufficient hardness. [ref table-4]

Thickness and diameter:

The thickness and diameter of tablets was found to be in the range of 7.11 to 7.12 mm to 10.39 to 10.42mm respectively[ref table-5]

Friability:

The friability loss of tablet was found to be 0.46 to 0.81% examined by roche friabilator all the batches of tablets passed the test and are with in the limits. It indicated that the tablets were mechanically stable.[ref table -6]

Wetting time :

Wetting time corresponds to the time taken for the tablet to disintegrate when kept motionless on the tissue paper in a petri dish. The values of wetting time were shown in the [Ref.table-7], and the range of wetting time is 150-165 sec.

Weight variation test:

All the batches of tablets were found to pass the weight variation test. The percentage of deviation of individual tablet weight form the average tablet weight was found to be with in the IP limits (Ref. table- 8,9,10,11,12)

Drug content uniformity:

The drug content uniformity was examined as per I.P specifications. All the batches of tablets were found to comply with uniformity of drug content test. None of the individual drug content was out side the limits 90% to 110%(Ref.table-13)

***In vitro* dispersion time**

In vitro dispersion was absorbed in the range of 33-44 seconds for all the formulations. Results indicate that rapid disintegration was seen in F3. (Ref.table no.14)

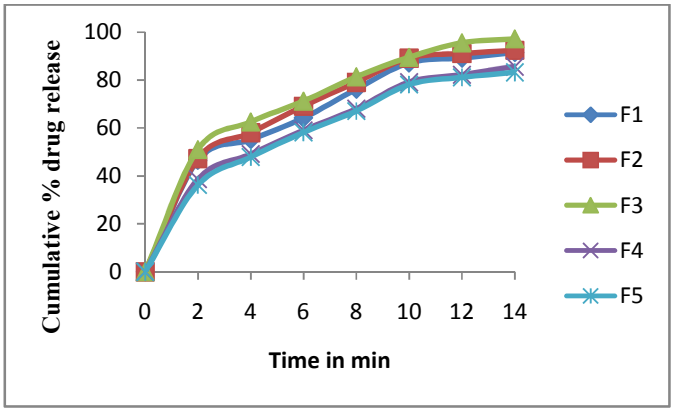
Composition of fast dissolving tablets of Ciprofloxacin HCL

Batch code	Drug in mg	Cross carmi-lose sodium	Sodium starch gly-colate	Micro Crystalline cellulose	lactose	Sodium sac-charine	Mg.stearat e in mg
F 1	250	100	20	40	40	25	25
F 2	250	80	40	40	40	25	25
F 3	250	60	60	40	40	25	25
F 4	250	40	80	40	40	25	25
F 5	250	20	100	40	40	25	25

Physicochemical properties of formulation F1-F8

Formulation code	weight varia-tion (mg)	thickness	hardness	friability	% drug content
F1	348±0.13	3.70±0.03	3.20±0.11	0.76±0.04	98.44±0.36
F2	349 ±0.18	3.64±0.31	3.00±0.07	0.69±0.02	99.74±0.51
F3	348±0.16	3.53±0.23	3.10±0.14	0.87±0.05	99.66±0.46
F4	351±0.21	3.62±0.08	3.10±0.16	0.74±0.01	99.86±0.65
F5	348±0.17	3.43±0.16	3.00±0.04	0.84±0.03	99.57±0.30

Comparison of drug releases of formulation F1-F5



In vitro dissolution studies:

Dissolution apparatus II USP XXI model was used to carry out in vitro drug release studies on the prepared batches of tablets. 900ml of sorensons buffer solution (pH 6.2) was used. The tablet was kept in bowel and the paddle was rotated at 50 rpm. The temperature was maintained at 37^0 c ±0.5^0c.(Ref.table no.15)

Analysis of samples:

1ml of sample was drawn at periodic intervals 1^{st},2^{nd},4^{th},6^{th}, 8^{th}, 10^{th}, 12^{th}, 14^{th} min and it was made up to 10ml with Sorenson's buffer. 1ml of fresh dissolution medium was replaced after each time the sample was drawn. The sample were analyzed at 272nm spectrophotometrically. The mean percentage of Ciprofloxacin HCL released at various time intervals was calculated and plotted against time. Formulations F1, F2, F3, F4 and F5 releases 89.5%, 90.7%, 96.8%, 85.1%, and 80.2% at the end of 14 min. From the results obtained, it was observed that drug –F3 formulation disintegrate quickly, soluble in water and make drug for absorption.

CONCLUSION

In the present work, efforts have been made to prepare and evaluate fast dissolving tablets of Ciprofloxacin HCL using various polymers associated with increased in the overall cumulative drug release. Release profile of F3 having Sodium starch glycolate, cross carmilose prepared by using lactose was found to have maximum release of 242 mg i.e, 96.8% of drug at the end of 14 min. The super disintegrants were also found to be compatible with the other excipients of the formulation as well as with drug, which is evident from the drug content values. Comparison of all formulation of Ciprofloxacin HCL revealed the fact that the developed formulation F3 showed comparable release characteristics, thus it may have fair clinical efficacy. Hence the formulation F3 has met the objectives of the present study which may holds promise for further *in vivo* studies.

REFERENCES:

1. Narmada GY et al Formulation, Evaluation and Optimization of Fast Dissolving Tablets Containing Amlodipine Besylate by Sublimation Method Ars *Pharm*, 2009, Vol.50; 129-144.
2. Hirani et al Orally Disintegrating Tablets: *A Review Tropical Journal of Pharmaceutical Research*, April 2009; 8 (2): 161-172.
3. Kuldeep Mehta et al. An Emerging Trend In Oral Drug Delivery Technology: RapidDisintegrating Tablets. *Journal of Pharmaceutical Science and Technology* 2010, Vol. 2 (10), 318-329.
4. Saxena Vaibhav, Khinchi Mahaveer Pr ,Gupta M K et al .*International Journal Of Research In Ayurveda & Pharmacy* Nov-Dec 2010 1(2) 399-407.
5. Na Zhao and Larry L. Augsburger. Functionality Comparison of 3 Classes of Superdisintegrants in Promoting Aspirin Tablet Disintegration and Dissolution AAPS *PharmSciTech* 2005; 6 (4) Article 79.
6. Bhupendra G Prajapati and Nayan Ratnakar. A Review on Recent patents on Fast Dissolving DrugDelivery System *International Journal of PharmTech Research* July- Sept 2009 Vol.1, No.3, pp 790-798.
7. Rangasamy Manivannan. Oral Disintegrating Tablets: A Future Compaction. IJPRD,2009, VOV-1,ISSUE-10,DEC/005.
8. Suresh Bandari, Rajendar Kumar Mittapalli, Ramesh Gannu, Yamsani Madhusudan Rao . Orodispersible Tablets: An Overview. *Asian Journal OfPharmaceutics* - Jan 2008.
9. Debjit Bhowmik, Chiranjib.B, Krishnakanth, Pankaj, R.Margret Chandira. Fast Dissolving Tablet: An Overview. *Journal of Chemical and Pharmaceutical Research*, 2009, 1(1): 163-177.
10. A Gupta1, AK Mishra, V Gupta1, P Bansal, R Singh, AK Singh. Recent Trends of Fast Dissolving Tablet - An Overview of Formulation Technology. *International Journal of*

*Pharmaceutical & Biological Archives*2010; 1(1): 1 - 10.

11. Tatsuya Ishikawa, Baku Mukai, Shuji Shiraishi, Naoki utoguchi, Makiko fujii, Mitsuo matsumoto, and Yoshiteru watanabe. Preparation of Rapidly Disintegrating Tablet Using New Types of Microcrystalline Cellulose (PH-M Series) and Low Substituted-Hydroxypropylcellulose or Spherical Sugar Granules by Direct Compression Method1) *Chem. Pharm. Bull*. (2001), 49(2) 134—139.
12. Chaulang,et al effects of physical parameters and superdisintegrant on tablet. *Asian Journal Of Pharmaceutics* oct-dec 2008, 235-240.
13. Indurwade N.H Rajyaguru T.H and Nakhat P.D Indian drugs 39(8) aug,405-409
14. D.Laxman kumar, K.Mohan ravi kumar. formulation and evaluation of fast dissolving tablets of ranitidine hydrochloride by hole technology Asian journal of pharmaceutical and clinical research vol 6, Issue 4, 2013
15. Rishikesh, Mst Rikta Banu improvement of fast disintegrating tablets using ranitidine hcl. Journal of Drug Discovery and Therapeutics 1 (7) 2013, 42-45
16. Metkari VB and , Kulkarni LV Formulation and Evaluation of Fast Dissolving Tablets of Carbamazepine Using Solid Dispersion. Int. J. Pharm. Res. Sci., 2014, 02(1), 47-59.
17. Santhosh R Iyer, R. Sivakumar, formulation and evaluation of fast dissolving tablets of Risperidone solid dispersion. IJPCBS 2013, 3(2), 388-397.
18. R. Sivakumar, P. Siva Formulation and evaluation of fast dissolving tablets of risperidone solid dispersionn, IJPCBS 2013, 3(2), 388-397