Ashdin Publishing
Journal of Drug and Alcohol Research
Vol. 10 (2021), Article ID 236124, 04 pages

Research Article

Area Under Curve Method Development for Etodolac in Bulk and Tablet dosage

V.G.bhamare[*], Renuka R.joshi, R. D. Amrutkar

[1]*Research Scholar, Bhupal Nobles' University, Udaipur- 313001, India*
[2]*Department of Pharmaceutical Quality Assurance, Mahatma Gandhi Vidyamandir's Pharmacy College, Panchavati, Nashik-422003, India.*
[3]*Department of Pharmaceutical Chemistry, MGV's SPH College of Pharmacy, Malegaon-423105, India*

Address Correspondence to: *V.G.bhamare, Research Scholar, Bhupal Nobles' University, Udaipur- 313001, India; E-mail: vaibhav.bhamre@gmail.com*

Received: April 11, 2021; **Accepted:** April 25, 2021; **Published:** May 4, 2021

Abstract

A simple, precise, rapid and economical spectroscopic method has been developed for the determination of Etodolac in bulk and tablet dosage form. In methanol Etodolac shows absorbance maxima at 281nm. Method used was area under curve in which area incorporated in the wavelength range of 275nm-285nm. Etodolac obeys Beer's law in concentration range 0-60µg/ml. Calibration curves were plotted at selected wavelengths and it was found to be linear (r2=0.9997) Linearity for detector response was observed in the concentration range of 5-30µg/ml. The recovery studies established accuracy of the proposed method and results validated according to ICH guideline. Precision and Accuracy studies were carried out and results were satisfactory. Robustness of the given method was studied by using two wavelength, 279nm and 283nm respectively. Results were found satisfactory and reproducible. The developed method was successfully applied to estimate the amount of Etodolac in pharmaceutical formulation.

Keywords: Area under curve;accuracy;precision;spectroscopic method

Introduction

Etodolac is non steroidal anti inflammatory drug which is belongs to pyranocarboxylic acid class developed in the 1970s. It blocks production of certain natural substances that causes inflammation [1]. Etodolac is chemically 1, 8-Diethyl-1, 3, 4, 9-tetrahydropyrone (3, 4-b) indole -1-acetic acid. Molecular formula of Etodolac is C17H21No3 [2]. Cox present in two separate entities, one is Cox-1 and other is Cox-2[3, 4]. It inhibits synthesis of peripheral prostaglandins, by decreasing the activity of the Cox enzyme. Cox -1 protect the integrity of the stomach lining and sustain normal renal function in a kidney .Cox-2 plays a vital role in both control of cell growth and inflammation [5]. Peak serum concentration achieved within 2 hours of oral administration of Etodolac 200mg and 400mg respectively [6] It is rapidly metabolized in the liver, followed by renal elimination as the primary route of excretion [7].

It is used for rheumatoid arthritis and osteoarthritis, postoperative pain and inflammation [8].It is used as anti-inflammatory agent, analgesic antipyretic and cyclooxygenase inhibitor. Etodolac is official in the United States Pharmacopoeia and British Pharmacopoeia [9].

Method development is the process of verifying that an analytical method is good enough for exercise to measure the concentration of an API in a particular compounded dosage form which allow basic measures to be employed to confirm that an analysis procedure, precisely and consistently will deliver a trustworthy measurement of an active ingredient in a compounded preparation [10].Primary purpose of method development to generate date regarding efficiency, safety, impurity, stability (that shows degradation of product), bioavailability and the effect of manufacturing parameter (that shows steadiness of the product) [11].

Materials and Methods

The spectrophotometric analysis was carried out using a Labindia UV-3000 Uv/Vis spectrophotometer with 1 cm matched quartz cell. The spectra were obtained with the instrumental parameters as follows: Wavelength range (nm):200-400nm; Scan speed: Fast; Sampling Interval: 1.00nm; spectral bandwidth: 2.00nm. All weights were taken on electronic balance, Model: Shimadzu AUX220.

Reagents: Etodolac was procured as gift sample from IPCA Laboratories, Mumbai. Analytical grade Methanol was used for the experiment. A tablet formulation containing 400mg of Etodolac was purchased from local market.

Standard Solutions: The standard solution was prepared by dissolving 10mg of drug in Methanol and diluted to 100ml with same solvent to obtain a final concentration of 100 ug/ml. Dilutions were done to get concentration of 5-30ug/ml. The solution of Etodolac was analyzed in the wavelength range of 200-400nm. The spectrum was recorded at 281 nm.

Preparation of Sample Solution: The sample solution was prepared by dissolving 10mg of tablet (Etova-400) formulation in methanol and diluted it with of same solvent to attain a final concentration of 100µg/ml.

Area Under Curve: The AUC (area under curve) method is applicable where there is no sharp peak or when broad spectra are obtained. It involves the calculation of integrated value of absorbance with respect to the wavelength such as λ1 and λ2 representing start and end point of curve region [12]. The AUC (area under curve) between λ1and λ2 was calculated using UV probe software. In this study area was integrated between wavelength ranges from 275nm to 285nm. The horizontal axis is selected by entering the wavelength range over which area has to be calculated. This wavelength range is selected on the basis of repeated observations so as to get the linearity between area under curve and concentration.

Validation: The method were validated with respect to linearity, accuracy, precision and robustness.

Linearity: Linearity was performed 3 times for validation. Fresh aliquots were prepared from the stock solution (100 µg/ml) ranging from 5-30 µg/ml. Higher concentration was scanned at 281nm and absorbance of all other dilutions were recorded. The calibration curve was constructed by plotting the response (y) versus the theoretical concentrations of standards(x), by using linear regression analysis.

Precision: The reproducibility of the recommended method was estimated by performing intraday precision (on same day) and inter day precision (on three different days). Precision were performed by preparing nine determinations at specified range (15, 20 and 25µg/ml). Low % RSD indicates that the method has good precision. The results of precision were expressed in% RSD.

Robustness: Robustness of the proposed method was carried out by analyzing aliquots at different wavelength (279nm, 281nm and 283nm). The results are expressed in terms of percent relative standard deviation.

Results

The molecular structure of the Etodolac is represented in fig.1.Methanol was selected as the solvent for Etodolac because it gives excellent solubility and other uniqueness for the AUC measurements. The absorbance and AUC spectrum of Etodolac in methanol for the method is represented in fig.2 and fig.3.

The optical characteristics of Etodolac are given in Table 1. The AUC calibration curve exhibit good linear relationship at concentration range of 5-30 µg/ml for Etodolac (fig4 and fig.5).Linear regression equation was found to be y=0.299x-0.018 (r2=0.999).The results are showed in Table 2. Recovery studies of accuracy for Etodolac showed in Table 3, percent amount found was between 91-97%. Precision was expressed in % relative standard deviation. The %RSD values found to be less than 2, therefore it specify that this method is precise for the drug. The result is given in Table 4.Robustness data is showed in Table 5.

No.	Parameter	Etodolac
1	Beer-Lambert's range	5-30 µg/mL
2	Wavelength	281nm
3	Slope	0.299
4	Intercept	0.018
5	Correlation coefficient	0.999

Table 1: Optical Characteristics Of Etodolac

Concentration	No.	Absorbance (281nm)	AUC
5	1	0.138	1.47
10	2	0.278	2.97
15	3	0.419	4.49
20	4	0.556	5.97
25	5	0.697	7.5
30	6	0.831	8.94

Table 2: Standard Linarity Data For Etodolac

Drug	Accuracy	AUC	Initial Amount (µg/ml)	Added Amount (µg/ml)	% Recovery
Etodolac	80%	4.92	10	8	91.55
	100%	5.6	10	10	93.5
	120%	6.33	10	12	96.31

Table 3: Recovery Data Of Etodolac

Conc. (µg/ml)	AUC	Amt. found	% recovery	Mean (%recovery)	SD	% RSD
15	4.49	14.95	99.71			
	4.52	15.05	100.33	100.36	0.03	0.66
	4.55	15.15	101.04			
20	5.97	19.9	99.5			
	5.99	19.97	99.86	99.85	0.02	0.33
	6.01	20.04	100.2			
25	7.5	25.02	100.09			
	7.53	25.12	100.49	100.44	0.026	0.34
	7.55	25.19	100.76			

Table 4: Precision data of Etodolac

Concentration (µg/ml)	AUC	%SD(AUC)	%RSD(AUC)
15	4.41	0.005	0.11
20	5.95	0.0173	0.29
25	7.44	0.0173	0.23

Table 5: Robustness data of Etodolac

It can be concluded that this UV Spectrophotometric method is quite simple, rapid accurate, precise and economical for the determination of Etodolac in the bulk drug as well as tablet formulations. In this method the linearity was observed in the concentration range of 5-30µg/ml with correlation coefficient r2= 0.999 at 281nm.This method is economically alternative to HPLC method. The method was validated as per ICH guidelines.

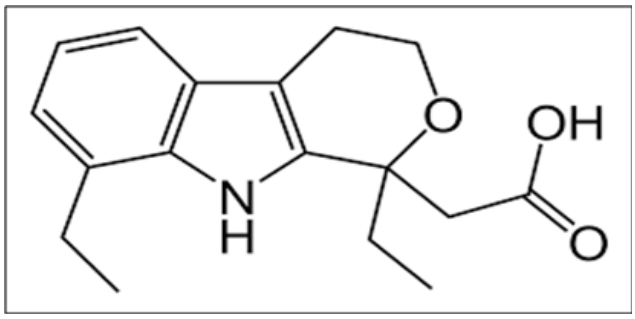

Figure 1: Structure of etodolac.

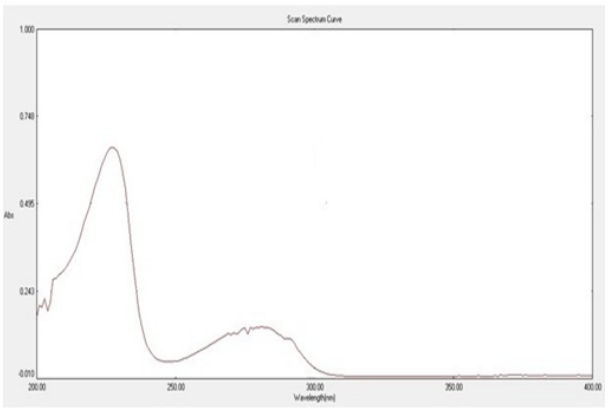

Figure 2: Linearity spectra of etodolac.

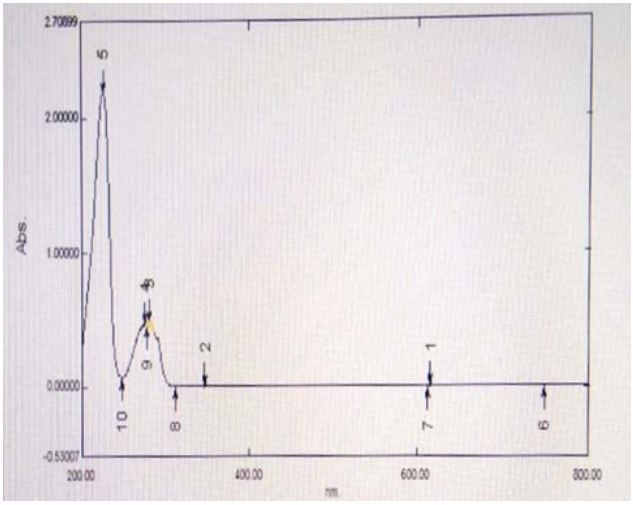

Figure 3: Area under curve spectrum of etodolac in methanol.

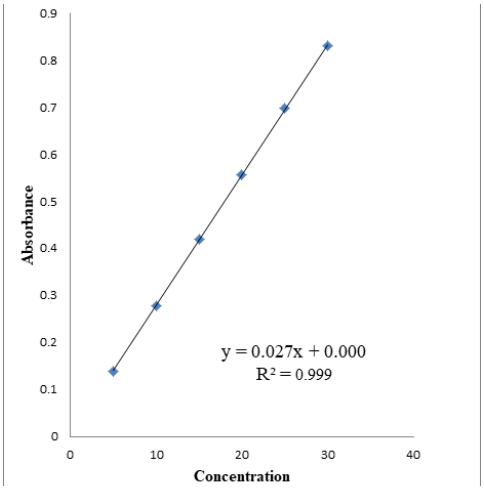

Figure 4: Calibration curve of etodolac.

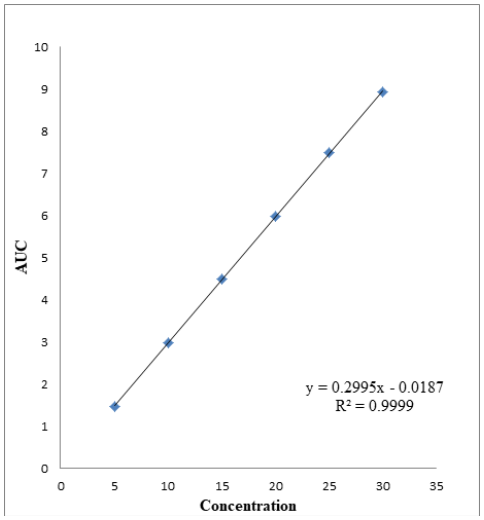

Figure 5: Area under curve calibration plot for etodolac.

Acknowledgment

Authors of the paper are grateful to the IPCA Laboratories, Mumbai for contributing to the research providing gift sample of drug. We are thankful to all the researchers in the field whose findings served as reference during our study.

References

1. Brocks DR, Jamali F. Etodolac Clinical Pharmacokinetics. ClinPharmacokinet 1994; 26:259-274.
2. Jadav AV et al, Gohel BA, Sondagar MM, Patel BA, Parmar SJ. Method Development and Validation for the Simultaneous Estimation of Paracetamol and Etodolac by Derivative UV Spectroscopic Method. International Journal of PharmTech Research 2013; 5:1155-1160.
3. Menke ER et al, Jackson CR, Bagby MD, Tracy TS. The Effectiveness of Prophylactic Etodolac on Postendodontic Pain. J Endod 2000; 26:712-715.
4. Kuehl FA, Egan RW. Prostaglandins, Arachidonic Acid, and Inflammation. Science 1980; 210:978–984.
5. Vane JR, Bakhle YS, Botting RM. Cyclooxygenases 1 and 2. Annual Review of Pharmacology and Toxicology 1998; 38: 97-120.
6. Balfour JA, Buckley MMT. Etodolac A Reappraisal of Its Pharmacology and Therapeutic Use in Rheumatic Diseases and Pain States. Drugs 1991; 42:274-299.
7. Insuyu PD et al, Atila A, Kadioglu Y, Turan A. Quantitative Determination of Etodolac by UV Spectrophotometric Method in Bulk Drug and Commercial Formulations. Int J Pharm Sci Res 2013; 4: 2927-2932.
8. Lynch S, Brogden RN. Etodolac A Preliminary Review of its Pharmacodynamic Activity and Therapeutic Use. Drugs 1986; 31:288·300.
9. Srinivasarao K, Pai KVK. Method Development and Validation of HPLC for Simultaneous Determination of Etodolac. Scholars Research Library 2015; 7: 317-321.
10. Ravisankar P et al, Ch. Naga Navya, Pravallika D, Navya Sri D. A Review on Step-By-Step Analytical Method Validation. IOSR J Pharm 2015; 5:7-19.
11. Sharma S et al, Goyal S, Chauhan K, A Review on Analytical Method Development and Validation. International Journal of Applied Pharmaceutics 2018; 10: 8-15.
12. Jain PS et al, Bhadane PV, Chaudhari HP, Surana SJ. Area Under Curve Method Development and Validation Of Midodrine Hydrocholride International Journal of Pharmaceutical Chemistry And Analysis 2015; 2: 154-160.