Int. J. Chem. Sci.: 6(4), 2008, 2055-2061

DEVELOPMENT OF RP-HPLC METHOD FOR ESTIMATION OF DROTAVERINE HYDROCHLORIDE IN PHARMACEUTICAL FORMULATIONS

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ABSTRACT

drotaverine hydrochloride is a novel antispasmodic agent. A simple, selective and precise RP-HPLC method was developed for quantification of Drotaverine hydrochloride in pharmaceutical formulations. The sample was analyzed on reverse phase C18 column (250 mm length, 4.6 mm internal diameter and 5 µm particle size) by using a fixed composition of mobile phase consisting of 25 millimolar sodium acetate buffer (pH was adjusted to 4.50 with acetic acid after addition of 2 mL of triethyl amine) and acetonitrile in the ratio of 55 : 45 v/v. The mobile phase was passed through the system at a flow rate of 1.0 mL/min and the analyte was monitored with UV detector at 354 nm. The proposed method is having a run time of 12 min with analyte retention time around 7.42 min. The developed method shows linearity in the concentration range of 4-12 µg/mL. The method was validated for use in routine quality control of drotaverine hydrochloride in pharmaceutical formulations.

Key words : drotaverine hydrochloride, RP-HPLC, C-18 column

INTRODUCTION

drotaverine hydrochloride[1,2] belongs to the category of antispasmodic agents. Chemically it is 1-[(3, 4-diethoxyphenyl) methylene]-6, 7-diethoxy -1, 2, 3, 4, - tetrahydro isoquinoline hydrochloride. Literature survey revealed the availability of only few analytical methods such as HPLC[3-7], potentiometry[8, 9] and spectrophotometry[10-15] in pharmaceutical formulations and in biological fluids. In the present investigation, a RP-HPLC method has been developed for the quantitative determination of drotaverine hydrochloride in bulk and pharmaceutical formulations.

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EXPERIMENTAL

Instrumentation

Systronics UV/Visible double beam spectrophotometer-2201 was used for scanning the UV spectrum of drotaverine hydrochloride. A gradient high pressure liquid chromatograph (Shimadzu HPLC, class VP series) with two LC-10 AT VP pumps, variable wavelength programmable SPD 10A VP UV detector and Phenomenex Luna C 18 column (250 mm length, 4.6 mm internal diameter and 5 µm particle size) was used. The HPLC system was equipped with "Spincotech" software.

Materials used

drotaverine hydrochloride is a gift sample provided by Aurobindo Pharmaceuticals Limited, Hyderabad. The acetonitrile used was of HPLC grade (Qualigens, Mumbai, India) and triple distilled water used was produced at the laboratory. All other reagents used in the study were of analytical reagent grade quality. A 50 : 50 v/v mixture of water and acetonitrile was used as diluent. All the standard and sample solutions were prepared in diluent.

Chromatographic conditions

pH 4.5 acetate buffer was prepared by dissolving 3.4 g of sodium acetate in 1000 mL of water and to this 2 mL of triethyl amine was added. The final pH was adjusted to 4.50 with acetic acid. The mixture of buffer and acetonitrile in the ratio of 55 : 45 v/v was prepared and filtered before use through 0.22 µm nylon membrane filter. The flow rate of the mobile phase was maintained at 1.0 mL/min. The detection of eluates was carried out with UV detector at 354 nm. The data were acquired, stored and analyzed with "Spincotech" software.

System suitability assessment

About 40 mg of drotaverine hydrochloride was accurately weighed and transferred to 100 mL volumetric flask, dissolved and made up to the mark with the diluent. 2 mL of this solution was further diluted to 100 mL with the same solvent. The solution prepared above was injected five times into the HPLC system at a mobile phase flow rate of 1.0 mL/min.

Construction of calibration curve

About 100 mg of drotaverine hydrochloride was accurately weighed and

transferred to 100 mL volumetric flask and dissolved in diluent to get a concentration of 1 mg/mL. Subsequent dilutions were made with the same solvent to get 4, 6, 8, 10 and 12 µg/mL solutions. Each of the calibrations standard solution was injected thrice into the system. Then the calibration curve was constructed by plotting concentration of drug on X-axis and corresponding area on Y-axis.

Procedure for estimation of drotaverine hydrochloride in pharmaceutical dosage forms

Twenty tablets were weighed and powdered. The tablet powder equivalent to 40 mg of drotaverine hydrochloride was transferred to a 100 mL volumetric flask containing about 70 mL of diluent. The contents of the flask were sonicated for 30 min to extract the drotaverine hydrochloride from the tablet matrix and filtered through Whatman filter paper (No. 1) into another 100 mL volumetric flask and finally diluted up to the mark with the diluent. This solution was further diluted to get about 8 µg/mL of test solution. 20 µL of this test solution was injected two times into the system. The average value of peak area was calculated and drug content in tablet was found out from calibration curve. The same procedure was followed for estimation of drotaverine hydrochloride in different tablet dosage forms.

RESULTS AND DISCUSSION

The present investigation was carried out to develop a specific, sensitive, precise and accurate HPLC method for analysis of drotaverine hydrochloride in pharmaceutical formulations. The typical blank and test chromatograms were shown in Fig. 1 and 2 respectively. The retention time for drotaverine hydrochloride was found to be 7.42 min.

Table no. 1 : System suitability parameters

Parameter	Required	Obtained
Precision : (%RSD)		
Retention time	1.0	0.08
Peak area	2.0	0.45
Theoretical plates	> 2000	9856
Asymmetry	< 2.0	1.32

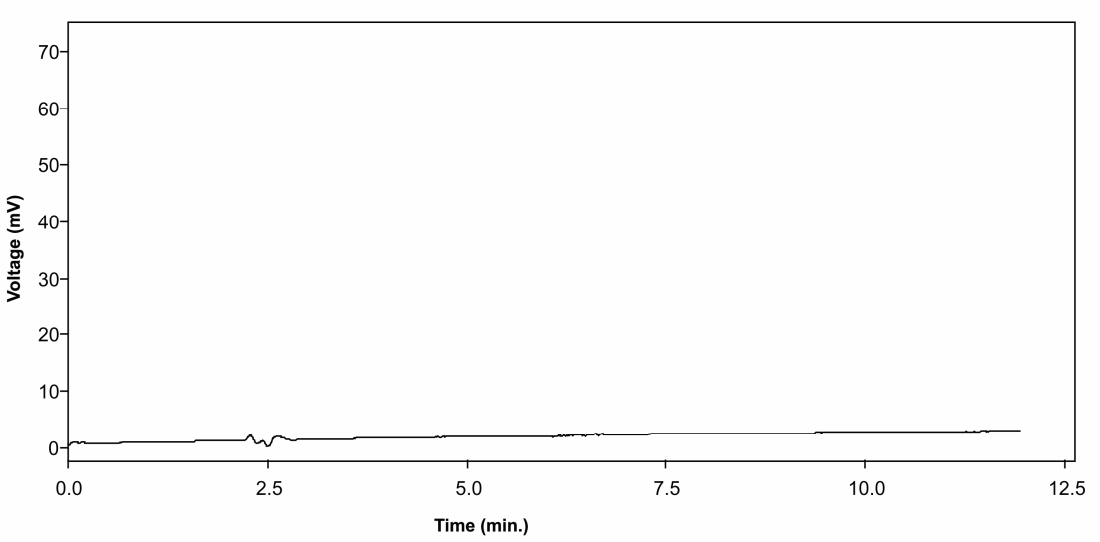

Fig. 1: Blank chromatogram

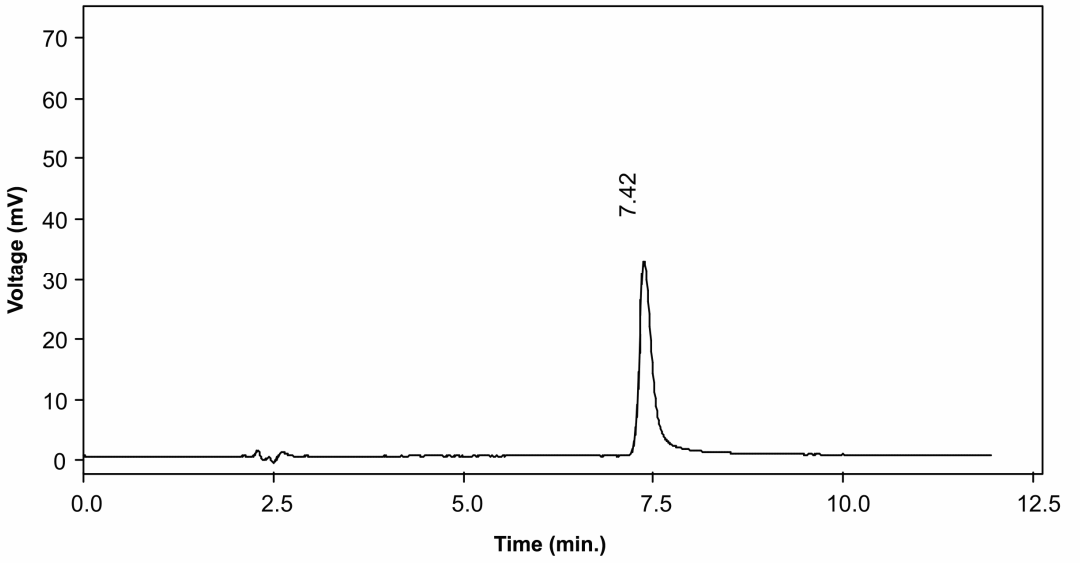

Fig. 2: Typical test chromatogram of drotaverine hydrochloride

20 µL of system suitability solution was injected five times, reproducible retention time and peak area was observed in all cases for drotaverine hydrochloride as indicated by low % RSD values (% RSD values for retention time and peak areas are 0.08 and 0.45

respectively). The system suitability parameters were given in Table 1.

A good linear relationship (r = 0.9995) was observed between the various concentrations of drug (4, 6, 8, 10 and 12 µg/mL) and the corresponding peak areas. The linearity graph is presented in Fig. 3. When drotaverine hydrochloride solutions containing 8 µg/mL and 10 µg/mL were subjected to proposed HPLC to study the intra-day and inter-day variations, a low coefficient of variation was observed (Table 2).

Table 2 : Precision of the method

drotaverine HCl concentration (µg/mL)	Concentration of drotaverine hydrochloride (µg/mL) found			
	Intra-day		Inter-day	
	Mean (n = 5)	% CV	Mean (n = 5)	% CV
8	8.01	1.22	8.02	1.21
10	10.03	1.47	10.01	1.62

The recovery studies were carried out by adding known amount of drotaverine hydrochloride to the pre-analyzed samples and subjecting them to the proposed HPLC method. About 98.65 ± 0.31 to 101.02 ± 0.12 % of drotaverine hydrochloride could be recovered from the pre-analyzed samples indicating the accuracy of the proposed HPLC method. Accuracy of the method in terms of recovery is given in Table 3. The intra-day and inter-day precision and recovery results indicate that the developed method is highly precise and accurate.

Table 3 : Analysis of drotaverine hydrochloride in pharmaceutical formulations

Formulation	Labeled amount	Mean amount found (mg)		Mean % recovery found	
		Proposed method	Reference method	Proposed method	Reference method
Tablet 1	40	40.03 ± 0.08	40.01± 0.05	100.09 ± 0.20	101.02 ± 0.12
Tablet 2	40	39.99 ± 0.09	40.02 ± 0.07	99.98 ± 0.22	98.99 ± 0.17
Tablet 3	80	79.56 ± 0.16	79.99 ± 0.14	100.03 ± 0.16	98.65 ± 0.31
Tablet 4	80	80.11 ± 0.13	81.02 ± 0.23	99.99 ± 0.18	100.11 ± 0.25

The drug content in the tablet dosage form from the local market was estimated by using the proposed method. The amount of drotaverine hydrochloride in four different brands of tablet dosage form is given in Table 3.

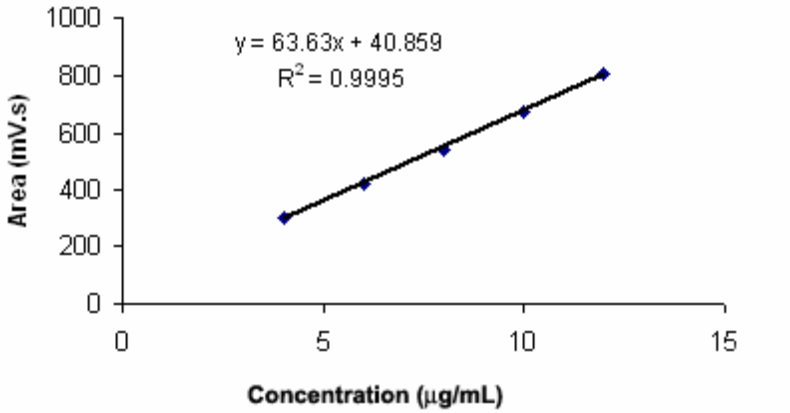

Fig. 3: The linearity graph of the method

The blank chromatogram indicates no interference of the excipients used in the tablet in the retention time corresponding to analyte peak. The low % RSD indicates the reproducibility of the assay procedure for the estimation of drotaverine hydrochloride in the tablet dosage form. The proposed HPLC method was found to be simple, precise, accurate and rapid. Hence, it is a preferred method for the estimation of drotaverine hydrochloride in pharmaceutical formulations.

ACKNOWLEDGEMENTS

The authors are thankful to M/S Aurobindo Pharmaceuticals Limited, Hyderabad, India, for providing the drug as a gift sample and Siddhartha Academy of General and Technical Education, Vijayawada for providing the facilities to carry out the present work.

REFERENCES

1. the Merck Index, 13th Edition, Merck and Co., Inc., Whitehouse Station, (2004) P. 609-610.
2. Martindale, the Extrapharmacopoeia, **33**rd Edn., the Royal Pharmaceutical Society, London, (2002) P. 1606.

3. O. O. Bolaji, C. O. Onyeji, F. O. Ogungbamalia, F. A. Ogunbona and E. O. Ogunlana, J. Chromato. Biomed. Appl. S, **622**, 93 (1993).

4. J. K. Lalla, M. U. Shah, M. B. Jain and A. H. Sharma, J. Pharm. Biomed. Anal., **11**, 385 (1993).

5. J. Sachse,. Coller, S. Hartter and C. Hiemke, J. Chromatogr. B Anal. Technol. Biomed. Life Sci., **830**, 342 (2005).

6. O. O. Bolaji, C. O. Onyeji, A. O. Ogundaini, T. A. Olugbade and F. A. Ogunbona, Eur. J. Drug. Metab. Pharmacokinet., **21(3)**, 217 (1996).

7. S. Dyderski, E. Grzeskowiak, L. Drobnik, E. Szalek, M. Balcekiewicz and V. Dubai, Arzneimittel Forschung, **54**, 298 (2004).

8. Y. S. El-Saharty, F. H. Metwaly, M. Refaat and S. Z. El-Khateeb, J. Pharm. Biomed. Anal., (in press).

9. H. Ibrahim, Y. M. Issa, H. M. Abu and Shawish, Analy. Lett., **38**, 111 (2005).

10. F. A. Metwally, M. Abdelkawy and I. A. Naguib, J. AOAC International, **89**, 78 (2006).

11. H. G. Daabees, Anal. Lett., **4**, 639 (2000).

12. K. V. S. Prasada Rao, P. Nagaraju, G. Srinivasulu, G. Prabhakar and J. Begum, Int. J. Chem. Sci., **2**, 126 (2004).

13. V. K. Mahajan, P. P. Dahivelkar, R. A. Fursule, A. A. Shirkhedar and S. J. Surana, Ind. Drugs, **43**, 656 (2006).

14. P. P. Dahivelkar, V. K. Mahajan, S. B. Bari, A. A Shirkhedar and S. J. Surana, Ind. Drugs, **43**, 896 (2006).

15. A. A. Shirkhedkar, G. H. Upasani and S. J. Surana, The Pharma Rev., **5**, 179 (2007).

Accepted : 25.09.2008