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BAZI LOKAL ANESTEZİKLERİN SPEKTROFOTOMETRIK MIKTAR TAYINLERİ

SPECTROPHOTOMETRIC DETERMINATION OF SOME LOCAL ANESTHETICS

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SUMMARY

In this work the determination of benzocaine, procaine hydrochloride, butacaine sulfate or tetracaine hydrochloride in the injections solutions containing thiamine hydrochloride or pyridoxine hydrochloride was performed at UV by absorbancy ratio method without prior separation of the drugs. Best accuracy was obtained for solutions containing 5-10 mcg/ml of each substances.

ÖZET

Bu çalışmada benzokain, prokain hidroklorür, butakain sulfat ve tetrakain hidroklorür'un tiamin hidroklorür veya piridoksin hidroklorür ihtiva eden injeksiyonluk solüsyonlarındaki miktar tayinleri UV de absorbans oranı metodu ile yapılmıştır. Sonuçlar çok iyi olup, karışımlarda ml de 5 mcg kadar maddenin tayin edilebileceği anlaşılmıştır.

INTRODUCTION

Existing spectrophotometric methods used for the analysis of some local anesthetics were based either on the color intensity determination of Schiff bases (1-6), azo-compounds (7-12), sodium 1,2-naphtoquinone-4-sulfonate derivatives (13-15) and others (16-

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21), or on the measurement of the UV absorbance at a wavelength by comparing with a reference substance (22-25).

In this work the spectrophotometric determination of benzocaine, procaine hydrochloride, butacaine sulfate, orthocaine and tetracaine hydrochloride is described. The procedure used for analysis based on the UV estimation of local anesthetics in their mixtures with thiamine hydrochloride or pyridoxine hydrochloride by the absorbancy ratio method.

EXPERIMENTAL

Chemicals Benzocaine (B), procaine hydrochloride (PH), butacaine sulfate (BS), tetracaine hydrochloride (TH), pyridoxin hydrochloride (PyH) and thiamine hydrochloride (ThH), purified by crystallisation and dried.

Solutions 1) Standart solutions were prepared by dissolving 1.0 mg of each local anesthetic or pyridoxine hydrochloride and 2.0 mg of thiamine hydrochloride in 100 ml water. Extinction coefficients were determined with these solutions at max. and isosbestic points.

2) Binary mixtures were: 1a) B-PyH, 1b) B-ThH, 2a) PH-PyH, 2b) PH-ThH, 3a) BS-PyH, 3b) BS-ThH, 4a) TH-PyH, 4b) TH-ThH.

Spectral characteristics of substances

Absorption maxima: B-285 nm, PH-290 nm, BS-292 nm, TH-310 nm.

Location of the izosbestic points: The izosbestic points were located first approximately by superimposing the spectra of each pair and then by fixing the exact wavelength by comparing the solutions with the interval of 0,01 nm.

The chosen first wavelengths for the mixture 1a, 1b are 285 nm, 2a, 2b are 290 nm, 3a, 3b are 292 nm and 4a, are 310 nm and the located izosbestic points are 317.0 nm, for 1a, 250.85 nm, for 1b, 253.70 nm, for 2a, 257.20 nm, for 2b, 312.0 nm, for 3a, 262.30 nm, for 3b, 337.25 nm, for 4a, and 274.60 nm, for 4b.

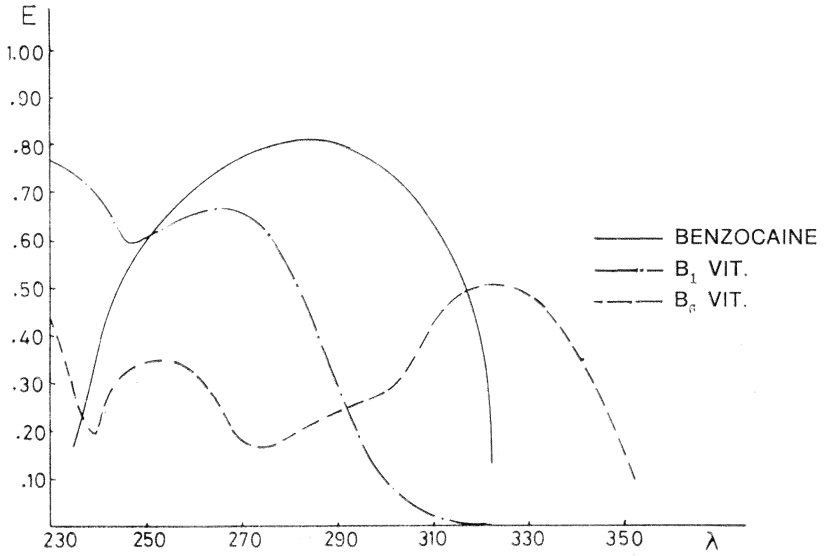

Fig. 1 - Absorption curves a) B, b) ThH, c) PyH

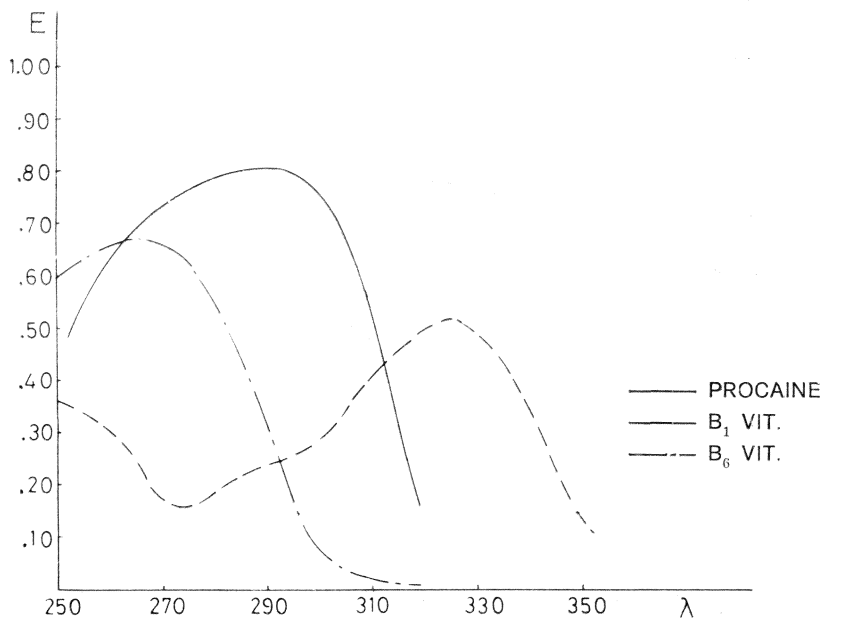

Fig. 2 - Absorption curves a) PH, b) ThH, c) PyH

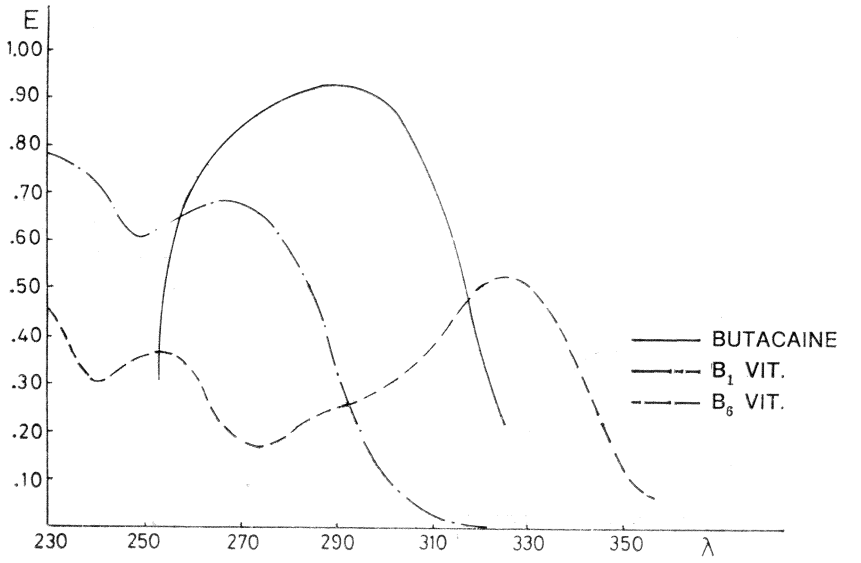

Fig. 3 - Absorption curves a) BS, b) ThH, c) PyH

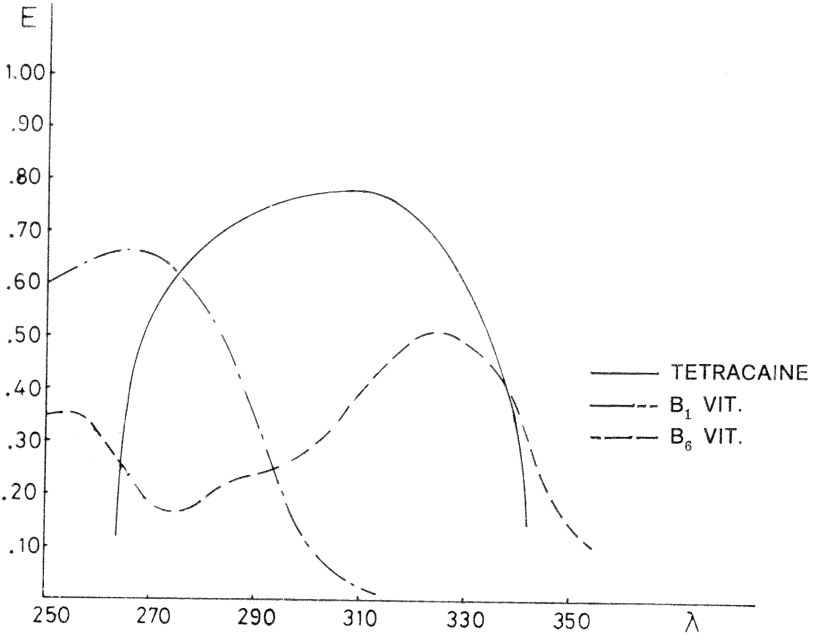

Fig. 4 - Absorption curves a) TH, b) ThH, c) PyH

The absorbances were measured at the absorption maxima and the isosbestic points against a water blank. The relative concentrations of the drugs were calculated by substituting the values into the following equations (26):

$$C_x = \frac{Q_0 - Q_y}{Q_x - Q_y} \cdot \frac{A_3}{a_4} \quad \text{or} \quad C_y = \frac{Q_0 - Q_y}{Q_y - Q_x} \cdot \frac{A_3}{a_4}$$

C_x and C_y are the concentration of the substances x and y in the mixture. Q_x and Q_y are the ratio of the extinction coefficients at λ max. to the isosbestic point for x and y respectively. Q_0 is the absorbancy ratio of the mixtures at λ max. and to the isosbestic point. A_3 is the absorbancy of the mixture at the isosbestic point, a_4 is the extinction coefficient at the isosbestic point.

The results are given in table 1-4.

(Table I)

Compound	Added (mg)	Found (mg)
Benzocaine	1.0	0.998
	0.75	0.998
	0.50	0.495
ThH	2.0	2.002
	1.50	1.508
	1.0	1.005
Benzocaine	1.0	1.00
	0.75	0.765
	0.50	0.50
PyH	1.0	1.00
	0.75	0.765
	0.50	0.50

The absorbancy ratio method for analysis was used for the mixtures of B-PyH, B-ThH, PH-PyH, PH-ThH, BS-ByH, BS-ThH and TH-PyH, TH-ThH; the results obtained for orthocaine in the mixtures with PyH or ThH are not favorable for the analysis of this substance.

(Table II)

Compound	Added (mg)	Found (mg)
Procaine HCl	1.0	0.966
	0.75	0.755
	0.50	0.46
Thiamine HCl	2.0	2.034
	1.5	1.525
	1.0	0.98
Procaine HCl	1.0	0.988
	0.75	0.75
	0.50	0.50
Pyridoxine HCl	1.0	0.989
	0.75	0.76
	0.50	0.50

(Table III)

Compound	Added (mg)	Found (mg)
Butacaine sulfate	1.0	0.992
	0.75	0.748
	0.50	0.496
Thiamine HCl	2.0	2.008
	1.50	1.502
	1.0	1.004
Butacaine sulfate	1.0	0.98
	0.75	0.745
	0.50	0.49
Pyridoxine HCl	1.0	1.02
	0.75	0.776
	0.50	0.51

(Table IV)

Compound	Added (mg)	Found (mg)
Tetracaine HCl	1.0	1.03
	0.75	0.78
	0.50	0.52
Thiamine HCl	2.0	1.89
	1.50	1.43
	1.0	0.97
Tetracaine HCl	1.0	1.03
	0.75	0.71
	0.50	0.50
Pyridoxine HCl	1.0	1.08
	0.75	0.74
	0.50	0.50

The spectral characteristics of compounds are illustrated in fig 1-4. This characteristics indicated that binary mixtures of benzocaine, procaine hydrochloride, butacaine sulfate and tetracaine hydrochloride with pyridoxine hydrochloride or thiamine hydrochloride can be analyzed by applying this procedure to the market samples of paranteral solution of this drug. The quantities taken for each assay is the same as market samples. The minimum measurable amounts of the local anesthetic with this method is 5 mcg/ml.

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