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Rapid diagnostic test for renal failure accompanying toxic digitalis heart failure patients by estimating Na, K in serum.

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Keywords: Digoxin, Heart failure, Renal function.

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Abstract:

This study was undertaken to compare the electrolytes K, and Na levels serum of (67) toxic digitalis uremic heart failure patients and their levels in the serum of 50 digitalis (not toxic) heart failure patients.

The electrolyte level of K and Na was found to be very low and severe hyponatremia and hypokalemia in the serum of toxic uremic and heart failure patients while their levels were found to be near normal values or slightly higher in digitalis heart failure patients. This study does not support that digoxin might have a protective effect against renal dysfunction in heart failure patients.

Keywords: Digoxin, Heart failure, Renal function.

تشخيص سريع لمرضى عجز الكلية المصاحب لعجز القلب وبحالة تسمم بالديجوكسين باستخدام قياس الصوديوم والبوتاسيوم في مصل الدم

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تم مقارنة مستوى الالكتروليتات الصوديوم والبوتاسيوم في مصول ٦٧ مريض بعجز القلب المصاحب لعجز الكلية وبحالة تسمم بعقار الديجوكسين مع مستواهما في مصول ٥٠ مريضاً بعجز القلب وبدون حالة تسمم بعقار الديجوكسين حيث أن مستوى البوتاسيوم والصوديوم منخفض جداً في حالة التسمم بالديجوكسين المصاحب لعجز الكلية بينما يكون مستوى الصوديوم والبوتاسيوم طبيعياً في حالة عجز القلب والمسيطر عليه بواسطة عقار الديجوكسين بدون حالة تسمم.

الكلمات المفتاحية: عجز الكلية، عجز القلب، الديجوكسين.

1. INTRODUCTION:

Uremic patients are particularly sensitive to digitalin because they excrete less digoxin than patients with normal renal function and often cannot take even the usual therapeutic doses without developing digitalin toxicity. Delay or diminished excretion of digoxin can lead to toxicity [1], and accumulation can occur in severe kidney dysfunction, leading to digoxin toxicity and potentially cardiac arrhythmias [2] Consequently, changes in its metabolism might increase the risk of toxicity and effects. Such changes may occur in elderly patients, patients treated concomitantly with concurrent drugs [3] kidneys regulate sodium and water excretion and thereby play a dominant role in the long—term control of blood pressure natriuresis and diuresis and it secretes several vasoactive hormones [4]. Digoxin has a narrow therapeutic window and therefore needs to be carefully dosed according to age, weight, and renal function, and then subsequently monitored [5].

The guidance also advises frequent monitoring in patients taking thiazide diuretics alongside aldosterone antagonists, as well as advising monitoring of potassium when digoxin is prescribed concurrently, but no frequency is specified. [6] mortality increases with increasing serum digoxin levels. The sodium/potassium ATPase pump normally causes sodium to leave cells and potassium to enter cells, blocking this mechanism using digoxin results in higher serum potassium levels and a decline in renal function [7], the damage to the kidney occurs and this clinical picture is called uremia [8].

A diagnostic test for digitalis toxicity based on the interpreted changes i.e. (electrolyte changes) in saliva was first developed by Watman et al., (1971) [9] and widely investigated

[10] hypokalemia and hypomagnesemia in patients receiving digitalis were under continuous investigation many workers attempted to find a correlation between electrolyte concentration and digitalis toxicity in the serum of digitalized patients [11]. A study by AL-Sammarieyet al., (1998) suggests a method for. identifying patients with digitalis toxicity from the elevation of electrolyte (K, Ca, and Na) concentration in saliva [12].

The present study was undertaken to compare the electrolyte K and Na levels in the serum of digitalis heart failure patients and digitalis uremic heart failure patients.

2. MATERIALS AND METHODS:

Heart failure patients receiving digoxin drugs were studied and all patients with clinical uremia and heart failure digitalis toxicity were diagnosed by the physician. All patients were lying down in Baghdad Medical City Teaching Hospital. All patients were admitted for one week on a hospital diet. The dose of the digoxin drug was 0.25mg /day. They were receiving other drugs such as diuretics and KCl drugs. Serum potassium was maintained at the physiological level by KC1 drug or potassium given in infusion.

The serum was separated and centrifugated and estimated for K and Na levels by using EEL. Flame photometer. In the same way, the Na, and K levels were estimated in the serum of normal persons for comparison.

3. Statistical analysis

One-way analysis of variance followed by Newman-Keuls post hoc test comparison procedures was used to compare between means of different groups. Data are represented as the mean± standard error (M±SE). GraphPad Prism program, version 6.01, a computer program was used for statistical analysis. $P<0.05$ was considered statistically significant.

4. Results:

Table 1: Electrolyte K, Na in digitalis uremic. H.F. patients

	Normal Values	Digitalis Patient	Sever toxic Digitalis H.F. and uremic
K Me Eq/L.	3.3±_0.6 2.7—.9	4.5_±_0.4 4.1 -5	2.3 ±0.35 2.0—2.7
Na Me Eq/L.	141 ± 6 13:5- 146	151±19 132—170	84.5±17 87—102

Table 1 shows the mean values of electrolyte K, Na [12] digitalin heart failure patient, and digitalin H . F. uremic patient as follows: -

The mean values of K in the serum of digitals patient without poisoning was (4.5 ± 0.41) with a range of (4.1 — 5) Me Ed / L. The values obtained here are near normal values or slightly higher.

In toxic digitalis uremic patients, the mean values of K were very low, and hypokalemia was found to be in the range (2.35 ± 0.35) (2 —2.7), respectively the mean values of Na in the serum of digitalin patients were (151 ± 19) and ranged from (132 — 170) which. was within the normal value. A few cases were hypernatremia while in severe- digitalis uremic heart failure the mean value was (84.15 ± 17) with a range of (87 — 102) in which severe hyponatermia was occur.

5. Limitations:

This was a retrospective analysis of patients with heart failure and therefore there may be confound in factors contributing to the changes in renal function. Patients may have other co-morbidities such as hypertension and diabetes which may contribute to impaired renal function.

6. Discussion:

The present study shows a significantly lower value of K in the serum of digitalis uremic heart failure patients in comparison with digitalis heart failure patients in which the K and Na levels in the serum were controlled and about normal values while they were higher in toxic digitalis cases The sodium/potassium ATPase pump normally causes sodium to leave cells and potassium to enter cells, blocking this mechanism using digoxin results in higher serum potassium level [8]. Hypo kalmia may be related to the lowered blood and tissue potassium when the patient is treated with potassium-losing diuretics [13].

Severe heart failure may exhibit a reduced capacity to excrete water load which may result in dilutional hyponatremia [14]. Excessive water or insufficient salt intake leads to hyponatremia while a supply of an inadequate volume of water reduces urine volume ln uremic patients [15]. Also, the long-continued osmotic diuresis interferes with distal tabular function resulting in some increasing loss of sodium and potassium in the urine leading to hyponatremia and hypokalemia [16].

7. Conclusions:

The electrolyte level of K and Na was found to be very low and severe hyponatremia and hypokalemia in the serum of toxic uremic and heart failure patients while their levels were found to be near normal values or slightly higher in digitalis heart failure patients so it can be used as a rapid diagnostic test for renal failure accompanying toxic digitalis heart failure patients by estimating Na, K in serum. This study does not support that digoxin might have a protective effect against renal dysfunction in patients with heart failure.

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