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B.O. OSOTIMEHIN and A.O. UWAIFO



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the research protocol was approved by the ethical committee of the University of Ilorin Teaching Hospital.

During intravenous urography, blood samples were withdrawn shortly before the injection of contrast medium (T 0), and respectively at five minutes (T 1) and thirty minutes (T 2) after injection of contrast medium. All patients in this study had an intravenous bolus injection of 60ml of Urograffin - 370. Urograffin - 370 contains meglumine and sodium diatrizoate in addition to disodium edetate, which is a chelating agent. The contrast medium was injected in the antecubital vein of one arm, while blood samples were obtained from the antecubital vein of the opposite arm. Observations were made for any adverse reactions from patients during every

examination.

The mean values for serum electrolytes and blood proteins obtained are shown in Table 1. Analysis of variance was done using a single factor repeated — measures design. Comparison among the time means, using Tukey's pairwise T-test, was carried out. A p-value of less than 0.05 was considered statistically significant.

### Results

Four patients (11.4%) complained of nausea while one patient (2.9%) experienced itching following injection of contrast medium; none required drug treatment.

Table 1: Serum electrolyte and protein changes

	Time (Mins)	Mean $\pm$ SD	Change (%)	No. of Patients	F-test p-value
Sodium	0	133 $\pm$ 10.2		35	
	5	130 $\pm$ 13.9	2%	35	N.S.
	30	129 $\pm$ 14.1	3%	35	N.S.
Potassium	0	3.6 $\pm$ 0.6		35	
	5	3.3 $\pm$ 0.7	8%	35	N.S.
	30	3.4 $\pm$ 0.7	6%	35	N.S.
Calcium	0	2.32 $\pm$ 0.25		35	
	5	2.02 $\pm$ 0.33	13%	35	< 0.005
	30	1.95 $\pm$ 0.36	16%	35	< 0.005
Phosphate	0	1.09 $\pm$ 0.40		35	
	5	1.00 $\pm$ 0.41	8%	35	N.S.
	30	1.02 $\pm$ 0.48	6%	35	N.S.
Proteins	0	76.43 $\pm$ 9.50		35	
	5	63.34 $\pm$ 9.31	17%	35	< 0.005
	30	66.77 $\pm$ 10.97	13%	35	< 0.005
Albumin	0	38.29 $\pm$ 6.80		35	
	5	33.26 $\pm$ 6.03	13%	35	< 0.005
	30	34.69 $\pm$ 6.40	9%	35	< 0.005

Sodium, potassium, calcium, phosphate, total proteins and albumin values reflected definite differences in the means of five minutes (T1) and thirty minutes (T 2) when compared with baseline values at T 0 (Table 1). Statistically significant decreases occurred at five minutes (T 1) and thirty

minutes (T 2) in the values of calcium, total proteins and albumin ( $P < 0.005$ ). Sodium values did not recover toward the baseline after thirty minutes but showed a further decrease from the values obtained at five minutes. Potassium showed slight recovery at thirty minutes from the values at five minutes but did

## **Serum electrolyte and protein changes after intravenous injection of sodium and meglumine diatrizoate (urograffin - 370)**

D. A. NZEH, R. T. ERASMUS\* and B. A. AIYEDUN\*

*Departments of Radiology and \*Chemical Pathology/Immunology, University of Ilorin, Ilorin, Nigeria.*

### **Summary**

Serum electrolyte and protein changes in 35 Nigerian patients undergoing intravenous urography were evaluated after injection of 60 mls sodium and meglumine diatrizoate (Urograffin-370). Statistically, significant changes were noted in the values of serum calcium, proteins and albumin at 5 and 30 minutes after the injection ( $P < 0.005$ ). The mean percentage decreases noted were calcium 13%, protein 17% and albumin 13%. At 30 minutes post-injection, the serum protein and albumin levels had incompletely recovered while calcium values continued to decrease. Non-statistically, significant changes were observed in the values of serum sodium, potassium and phosphate at 5 and 30 minutes respectively following contrast medium injection. Alterations in the levels of serum electrolytes especially calcium are most probably responsible for such adverse effects as convulsions and cardiac arrhythmias.

### **Résumé**

Les changements du sérum électrolytique et de la protéine chez 35 patients nigériens subissant l'urographie intraveineuse ont été évalués après la piqûre du sodium de 60mls et de la méglumine de diatrizoate (urograffin-370). Statistiquement, les changements importants ont été signalés dans les valeurs du sérum, calcium, protéine et albumine à 5 et 30 minutes, après la piqûre ( $P < 0.005$ ). La moyenne du pourcentage de décroissement observée était la suivante: calcium 13%, protéine 17% et albumine 13%. A 30 minutes après la piqûre, les niveaux du sérum de protéine et d'albumine s'étaient rétablis mais d'une manière incomplète alors que les valeurs du calcium continuaient de diminuer. Non statistiquement, les changements importants ont été

observés dans les valeurs du sérum de sodium, potasse et phosphate à 3 et 30 minutes respectivement après la piqûre du contraste.

Les altérations dans les niveaux du sérum électrolytique, surtout le calcium, sont probablement responsables de tels effets adverse comme les convulsions et l'arythmie cardiaque.

### **Introduction**

The association of intravascular injection of iodinated contrast medium and adverse reactions such as depressed myocardial contractility, hypotension, tetany and convulsions is a well established phenomenon[2,5]; and these reactions have been attributed to fall in blood calcium levels[1,9]. Chelating agents contained in iodinated contrast media, besides producing hemodilution and hyperosmolarity, are considered responsible for sudden fall in blood calcium level[1,7]. The diatrizoate molecule has been implicated in the binding of small amounts of calcium directly[6,10].

The present study seeks to establish the effects of iodinated intravascular contrast medium on the blood levels of electrolytes and proteins; it is, to the authors' knowledge, the first report in Africans.

### **Materials and methods**

Thirty-five patients referred to the Department of Radiology, University of Ilorin Teaching Hospital, Nigeria, for intravenous urography were included in this study. There were 19 female and 16 male cases with mean age of 43.11 years (range 14- 73 years). The patients were being investigated for possible urinary tract disease; those with co-existing cardiac or renal failure were excluded from the series. Informed consent was obtained from all patients; and

Address for correspondence: Dr. D A Nzeh, Department of Radiology, University of Ilorin, Ilorin, Nigeria.

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not return to the baseline level.

Small changes were noted in the serum calcium levels between T1 and T2 due to a further decrease in value, and indicating poor recovery. Total protein and albumin values decreased by 13% and 9% respectively at T2. Phosphate levels showed a slight recovery at T2 when compared to T1 (Table 1).

## Discussion

Noticeable changes were detected in the levels of serum electrolytes and proteins following injections of ionic contrast medium at intravenous urography; this is in agreement with reports from earlier studies (1,4,7). On the contrary, one study reported no changes in serum sodium and potassium after contrast medium injection[3].

Statistically significant decreases were noted only in calcium, total proteins and albumin. These changes occurred at T1 and T2. A persistent decrease in serum levels of sodium at T2 was observed, which is at variance with reports by other investigators[3,7]. Changes in serum potassium from the present study showed an average decrease of 9% and 6% at T1 and T2 respectively, thus agreeing with findings from an earlier study[7].

Although gradual recovery of serum calcium values to baseline at fifteen minutes and thirty minutes respectively has been recorded in the past[1,7], the present series a persistent decrease in the values of serum calcium level at T1 and T2 respectively was observed. The decrease in the level of serum calcium usually found after contrast medium injection has been considered an effect of chelating agents[1,7], whereas changes in serum proteins and albumin are due to rapid mobilization of extravascular fluid into the vascular compartment[7].

Changes in serum potassium and calcium have been observed to be the likely culprits in cases of cardiac arrhythmias complicating contrast medium injection[8]. Milder reactions such as heat sensation, headache and nausea are largely due to fluid moving from the extravascular to the intravascular compartment.

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