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Research article

CLINICAL SIGNIFICANCE OF URINE MYOGLOBIN IN HIGH VOLTAGE ELECTRICAL BURNS

G.Amar Raghu Narayan[1], SK.Deepthi[2] and Jagdeep Singh[3]

[1]Department of Plastic Surgery, [2]Department of Biochemistry, [3]Department of Plastic Surgery, Narayana Medical College and Hospital, Nellroe, Andhra Pradesh , India.

ABSTRACT: Electrical burns constitute a relatively large proportion of burns . Electrical current causes complex, unprecedented and unpredicted injuries. Serious tissue damage and mortality is caused by high voltage among all types of electrical burns . Myoglobinuria induced acute renal failure is a potentially lethal consequence of electrical injury. The present study was conducted to evaluate the role of urine myoglobin in the early prediction of acute renal failure in electrical burns. Study includes 21 patients of high volatage electrical burns underwent four different Renal parameters i.e blood urea, serum creatinine, serum potassium and urine myoglobin levels. Blood urea , and serum potassium levels were deranged in five patients of high voltage electrical burns who went into acute renal failure. Whereas urine myoglobin levels were deranged in all twenty one patients with high voltage electrical burns.

Keywords: Myoglobin, Acute renal failure, Electrical burns.

INTRODUCTION

Electrial burns causes complex unprecedendented and unpredicted injuries, they account for about 3-4% of burns unit admission. The term high voltage is often used for current involved is more than 1000 volts . High voltage electrical burns are most common in 19-30 yrs of age group. Males suffer most commonly from electric burns due to their profession , outdoor activities Majority of patients had total body surface area between 20-30 % due to high voltage electrical burns(Bagley WH, Yang H et al, 2007) . The most important early complication of high voltage electrical burns are acute renal failure, sepsis and associated skeletal and central nervous system injuries. Myoglobin, a 17- k Da single chain oxygen carrying hemoprotein, appears in the circulation within a few hours of skeletal or cardiac muscle damage and is rapidly filtered by the glomeruli and reabsorbed by the proximal tubules where it is catabolised. (Lamb E, New man J, Tietz text book of clinical chemistry, Bagley et al, Hamilton et al) When the filtered load exceeds the reabsorptive capacity of the tubule, myoglobin spills over into the urine, coloring it red (Lambetal, Bagley wt et al, 2000, Hamilton et al, 1989, Beetham R et al, 2000, Don B.R et al, 2007) The patho physiology of myoglobin induced ARF, three major mechanisms have been proposed .The first mechanism is physical obstruction of the renal tubule by myoglobin precipitation in association with Tomm- Harsfall protein unde acidic conditions. Urate precipitation may also occur, which together, leads to intra luminal casts, increased intra
tubular pressure and subsequently decreased glomerular filtratin rate. (Don RR et al, 2007, Huerta. Alaudin AL et al, 2005) A second mechanism occurs via the haeme group of myoglobin which can enhance renal vaso constriction and ischemia through activation of cytokine cascade . The third proposed mechanism is oxidant
injury through heme induced reactive oxygen such as super oxide anion, hydrogen peroxide or hydroxyl radicals provoking direct oxidative damage to the renal tissue Beetham Ret al, 2000, Huerta –Alardin et al, 2005)

MATERIALS AND METHODS

A Prospective study of case of high voltage electrical burns with raised urine myoglobin levels was done on patients admitted in burns ICU in Narayana Medical College and Hospital, Nellore. Patients with history of high voltage electric burns above 20 % were taken on routine basis for the study except the patients with co-morbid factors (diabetes, hypertension) or with chronic renal failure. Apart from routine investigations blood urea, serum creatinine, serum electrolytes and urine myoglobin was estimated on day 0,1,2,3,4,5,6, and 7th day.

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Urine myoglobin levels were estimated by quantitative immunological method with Roche cardiac reader .Qualitative analysis of urine myglobin can be measured on nephelometer and turbitime (Bebring Diagnostics, West wood, M.A) and Stratus -2 (Baxter, Miami ,FL.) (DC chauhan PS.Chari et al 2004). All are non isotopic immuno assays. E.C.G, (to rule out cardiac arrythmias) Ultra sound abdomen, X-ray of spine (for patients with history of fall), M.R.I of spine and C.T.scan of brain (in patients with history of fall and neurological deficits) were done. Majority of sixteen patients (76.19%) had total body surface area of burns between range of 20-30 %. Mean total body surface area of burns was 29.77% and with a standard deviation of 8.66.

RESULTS

The results were expressed in terms of mean and standard deviation (S.D) P value was also calculated $p < 0.001$ showed significance. Table 1 shows patients of high voltage electrical burns with various percentage of burns Figure 1 shows the percentage of burns. Table 2 shows the urine myoglobin levels in all the patients.

Table-1: PERCENTAGE OF BURNS

S. No	Percentage of Burns (%age)	No.of Patients	Percentage of Patients(%age)
1.	20-30	16	76.19
2.	31-40	2	9.5
3.	41-50	2	9.5
4.	≥ 50	1	4.8
	Total	**21**	**100**

Patients of high voltage electrical burns had various percentages of burns.
Majority of sixteen patients (76.19%) with total body surface area of electrical burns ranges between 20-30%.
Mean total body surface area of electrical burns was 29.77% with standard deviation of 8.66.

Table-2 URINE MYOGLOBIN LEVELS IN PATIENTS

Urine Myoglobin Values	DAY 0	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7
≤ 40	3	1	NIL	2	NIL	5	2	7
41-200	NIL	5	5	6	9	5	9	1
201-400	5	8	9	6	6	6	NIL	NIL
401-600	7	3	5	3	2	NIL	1	NIL
≥ 600	6	4	1	3	1	2	1	2

All twenty one patients with high voltage electrical burns had positive urine myoglobin levels on the day of admission (Day 0).
Urine myoglobin levels were negative in most of the eighteen patients at 7th day rest of three patients were urine myoglobin negative by 10th day.

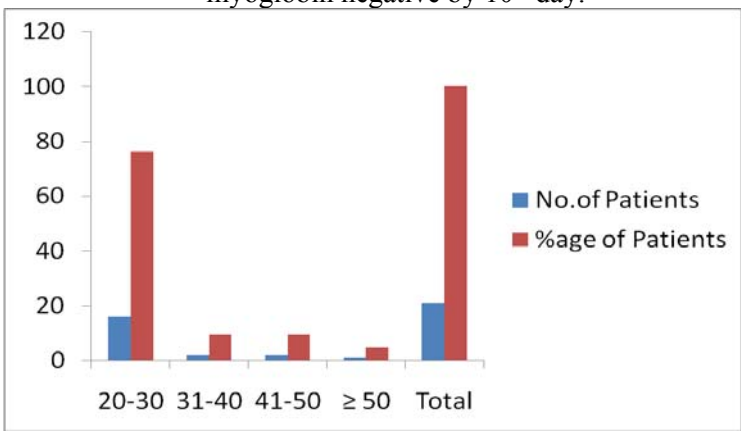

Figure 1 show the percentage of the burns

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DISCUSSION

High voltage electrical burns are most commonly involved in 19- 30 yrs age group Males suffered most commonly from high voltage burns due to their profession, out door activities (Haberal M.A et al, ES cudero –NaFSFJ et al, 1995). Majority of these patients had total burn surface area between 20 -30% due to high voltage burns . Urine myoglobin levels have significance in diagnosing rhabdomyolysis due to high voltage burns with easily available, economical and accurate tests. In our present study majority of sixteen patients (76.19%) with total body surface area of burns ranged between 20-30%. Mean total body surface area of electrical burns was 29.77 % with standard deviation of 8.66. All the 21 patients in this study with electrical burns had positive urine myoglobin levels from the first day of admission. (Chauhan D.C et al, 2004). Urine myoglobin levels in majority of 18 patients were negative by 7 th day of admission. The remaining 3 patients urine myoglobin levels were negative by 10th day. (Haberal M. et al, 1995, Escudero Nafs F.J et al, 1990) (Haerl M, Kalnaloghi.V et al, 1989) Urine myoglobin levels shows an impending renal failure .Urine myoglobin level estimation helps in timely resuscitation with medical and surgical management to avoid complications such as acute renal failure and mortality. Urine myoglobin was found to be one of the most significant and economical and sensitive parameter in the management of high voltage electrical burns.

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