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Survival after paraquat poisoning in a HIV positive patient

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From 1987 to 1994, 31 cases of acute paraquat poisoning were managed in the CHRU of Pointe à Pitre (FWI). Eighteen patients died, 13 survived. Biological indexes accurately predicted patient's outcome in all cases out of one. In the last case biological parameters were misleading: the corresponding patient survived despite consistent clinical and biological prognosis of death. The unexpected survivor was West Indian, male, agricultural worker of 26 years who alleged drunk about 300 ml of gramoxone (20% v/v paraquat) in a suicide attempt. The patient was HIV-infected (Elisa+, Western-Blot+) and presented an AIDS syndrome (CD4 count inferior to 200 cells/mm^3) established since 10 months and treated by AZT. We could not identify any other distinguishing features among the unexpected survivor and the rest of the patients. This observation suggests that the immunological status of the patient could explain this protection from paraquat toxicity

Keywords: paraquat; HIV; immune status; human study

Introduction

Since 1987 31 cases of acute paraquat poisoning were managed in the CHRU of Pointe à Pitre (FWI). According to the delay from the intoxication and its severity, gastro-intestinal lavage followed by oral administrations of activated charcoal and forced diuresis were the basic therapeutic modalities. Hemodialysis and the ADDO treatment[1] were always unsuccessfully attempted.

For each patient, the prognosis was established using the clinical index established by Bismuth,[2] the biological indices developed by Yamaguchi (1990)[3] and Pileire (1991),[4] the curve of blood paraquat concentration/time survival limit (SIPP) developed by Sawada (1988)[5] and the urinary dithionite test.[6]

These indexes and prognosis curves accurately predicted the outcome of 30 out of 31 patients (13 survivors, 18 deceased).

The 31st patient, survived in spite of clinical and biological prognosis of death.

Case report

A 26 year old, male, West Indian, 'creolophone' (French Piggin), agricultural worker, who abstained from alcohol, alleged the ingestion of about 300 ml of a 20% solution of Gramoxone, in a suicide attempt. This ingested volume was superior to the previously published lethal dose for this paraquat formulation. The treatment consisting in gastric lavage, administration of oral adsorbent, diuretics and corticosteroids, was started within 45 min, according to patients's allegation.

At the admission, the patient was alert with no gross oropharyngeal ulceration but complained of a sore throat and a burning sensation of the mouth; hepatic (SGPT), renal (creatinin) pulmonary (blood gases) functions, were normal

Results of biological indices of prognosis were as follows: The alkaline dithionite method (Berry and Grove)[6] confirmed the presence of paraquat in the stomach (4+); Paraquatemia was measured by colorimetry[7] after solid phase extraction, 5 h after ingestion, plasma paraquat level was substantially above the survivals limits of the SIPP curve (1.3 mg/l). The patient was classed by this indice among 'deceased by respiratory failure'; The urinary paraquat concentration was superior to 100 mg/l, 20 h after the ingestion; The rate of creatinine increase (RCI) was equal to 7 mmol/1/h (survival limit inferior to 2 mmol/L/h); The Yamaguchi biological index predict a 30% at the admission then after 72 h a 3% probability of survival.

From the admission a progressive deterioration occured: mouth and tongue ulcerations appeared and the patient complained about intensive abdominal burns. Two days later the patient presented all severity poisoning criteriae described by Bismuth.[2] The patient was febrile, spitting out and tachypnoeic (respiratory rate 40–50 min) but chest X ray remained asymptomatic. The digestive exploration

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showed an inflammatory oesophagitis and a gastritis (level II). A progressive impairment of the renal function occurred with a maximum on the fourth day (anury and serum creatinine equal to 494 umol/l). On the tenth day, the hypoxia was major as assessed by a pO2 equal to 2.9 Kpa associated to a mild acidosis: *ph*=7.32.

Paraquatemia remained above the survival curve of Sawada and paraquaturia positive until the fifth day (last day of measure).

All along, the evolution of the patient's status was matched by the previous biological indices. The destructive stage of the renal impairment went on until the fourth day as shown by the RCI value. The evolution of the Yamaguchi's biological indice after the seventh day reflected the glomerular and tubular regenerative process which led to normal renal function on the 14th day. On the 12th day, the arterial blood gases became normal (pO2 equal to 12.9 Kpa and pCO2 equal to 5.1 Kpa). At this time, patient was normally alimented and alert. The pulmonary function was normal and patient left the hospital on the 18th day after poisoning.

The patient was HIV-infected (Elisa+, Western-Blot+) and presents AIDS symptoms. The number of lymphocytes was 3500 10^3/mm^3, CD4 count was 180 cell/mm^3 and T8 range 1621 cells/mm^3, AG P24 was negative. The infectious status was negative for: HTLV1, HCV, Toxoplasmosis, Tuberculosis. The patient was hypergammaglobulinemic: 48.3 g/l for 108 g/l of total seric proteins (44.6%). AIDS was established 10 months earlier and treated by ZIDOVUDIN*.

Discussion

When compared to previous evolution of paraquat poisoned patients managed in the CHRU of Pointe à Pitre (Table 1), this surival was quite surprising in spite of early treatment.

The prognosis established by previously described standard criteria was very poor: (1) the ingested volume was lethal. This volume was estimated by patient's allegation and should be surestimated. Indeed with such an ingested dose the patient would be expected to die with multiorgan failure within a few hours. However the 'real' ingested volume would be significant: the dithionite test (4+) confirmed the very high amount of stomach contents, the mouth and tongue ulcerations as level II oesophagitis and gastritis reflected the mucuous membrane infraction and the high and extended urinary excretion assessed the tissular distribution significance; (2) the prognosis indices classed this patient among patients who, with a high probability, should die from respiratory failure. Therefore patient's pulmonary impairment was reversible: blood gases returned to normal value on the 12th day and chest X Ray was normal on the 18th day. This reversibility was unexpected: the gas exchange impairment (pO2 2.9 Kpa), reflected the damage of the alveolar epithelium which at this stage is known to evolve toward widespread alveolitis severe enough to cause death from hypoxia.[8]

As indicated by Hart *et al.*[9] the prognosis significance of plasma paraquat concentration curves (Proufoot, Sawada) may be influenced by different factors including patient sensitivity to paraquat, variation in results from different analytical methods and inaccuracies in assessing the time post ingestion. In the described case, as noted for the ingested volume, time post ingestion could be misappraised leading to false Sawada's and Yamaguchi's time related indices. However, independently of subjective appreciations, the CIR index, biological and clinical features point out the severity of the intoxication.

Previous findings[10–12] attempt to show that the 'macrophage lymphocyte alveolitis' response to paraquat poisoning was immunomediated. As a

Table 1 General characteristics of intoxicated patients

n	*Surv.* *13*	*Dcd.* *18*	*Patient* *1*
m. ages (s.d.) year	34.5 (19.0)	37.6 (11.3)	[illegible]
M	4	11	1
Sex			
F	9	7	
Ing. Vol (s.d.) ml	3.7 (1.2)	38.9 (46.1)	300
mini/maxi	3/5	6/100	
Suv. Time(s.d) h	/	151.8 (137.9)	/
mini/maxi	/	18/480	
Rate of creatinine increase m(s.d.) μmol/l/h	0.45 (0.27)	15.8 (12.6)	7
Yamaguchi biological indice m(s.d.) 24th hour	1241 (430)	468 (365)	679
Intoxication*	11D, 2A	16D, 2A	D

*D deliberate, A accidental

consequence, a perturbation of the immunomodulation could be able to impair the development of the lung fibrosis.

From this approach the immunity depletion of the HIV poisoned patient is to be considered as a possible mechanism of protection against paraquat toxicity.

These features could explain that extensive therapeutics based upon superoxyde suppression or hemoepuration were unsuccessful and perhaps explain the relative success of radiotherapy. This clinical observation of protection against free radical, cell mediated toxicity, may provide important clues to a therapeutic approach for this toxic disorder.

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