

A CASE OF PARAQUAT POISONING

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- 17 Y/F , admitted on **23rd April, 2011**
- H/O consumption of **10ml** of weedicide- Paraquat on **19/04/2011** with a suicidal intent
- H/O Vomiting, abdominal pain after ingestion
- Admitted in hospital in Kanchipuram for 4 days
- Gastric lavage, Inj. Atropine given
- Referred here after 4 days as her renal parameters were deranged

	19/04/11	23/04/11
BUN	33	134 / 72
s. Cr	0.6	9.8 / 11.2

- Antenatal , Natal, Postnatal & Development H/O-
uneventful
- Scholastic performance- below average
- Immunisation H/O- Incomplete

DT at 10 yrs and adolescent vaccination not
given

- Menstrual h/o- Menarche at 13 yrs
regular, **dysmenorrhea** for 3 months
- Family H/O- 4th born of 5 girls to non consanguinous
marriage

EXAMINATION:

Alert, ambulant and oriented

- Head to toe examination- Oral ulcers and ulcers on tongue
- Icterus +
- Vitals stable
- Systemic Examination – unremarkable except for epigastric tenderness

COURSE IN THE HOSPITAL:

- Child admitted with acute renal failure/ liver dysfunction
- 5 cycles of hemodialysis given after Nephrologist opinion.
- Renal parameters, liver enzymes and urine output improved

	24/4	26/4	27/4	28/4	30/4	01/5	02/5
BUN	42	46	29	24	15	18	23
s. Cr	6.8	5.9	2.8	2.2	1.3	1.3	1.2
T. Bili	6.27		5.61	5.31	7.27	7.8	5.56
D. Bili	5.84	4.7		4.87	6.51	6.76	4.78
Albumin	3	2.4	1.7	1.7	1.7	1.6	1.6

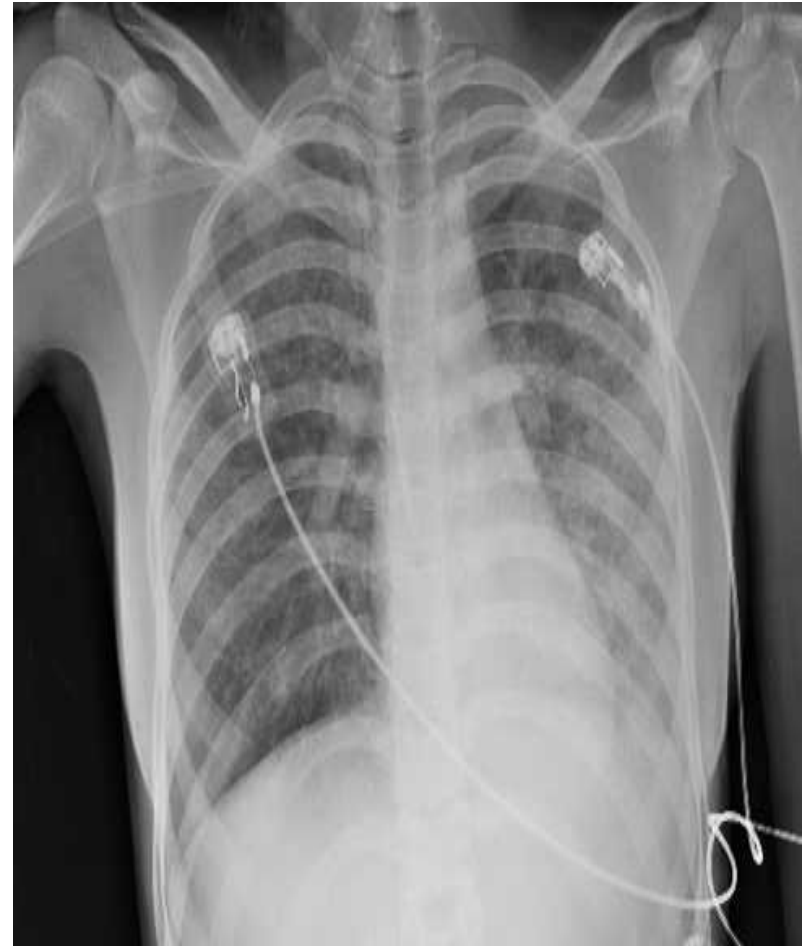
- Had abdominal pain
- Gastro enterology opinion suggested UGI scopy.
- UGI scopy-Corrosive injury esophagus and proximal stomach-Grade 3 A
- Supportive treatment was given and told to encourage oral feeds.

- Child had fever spikes on D4
- Developed difficulty breathing requiring minimal Oxygen support
- CXR-N initially and then worsened with b/l pleural effusion R>L, b/l mid- and lower zone consolidation
- Started on Inj.Piperacillin+Tazobactam , Inj. Amoxicillin+Clavulanic acid .

24/04/11

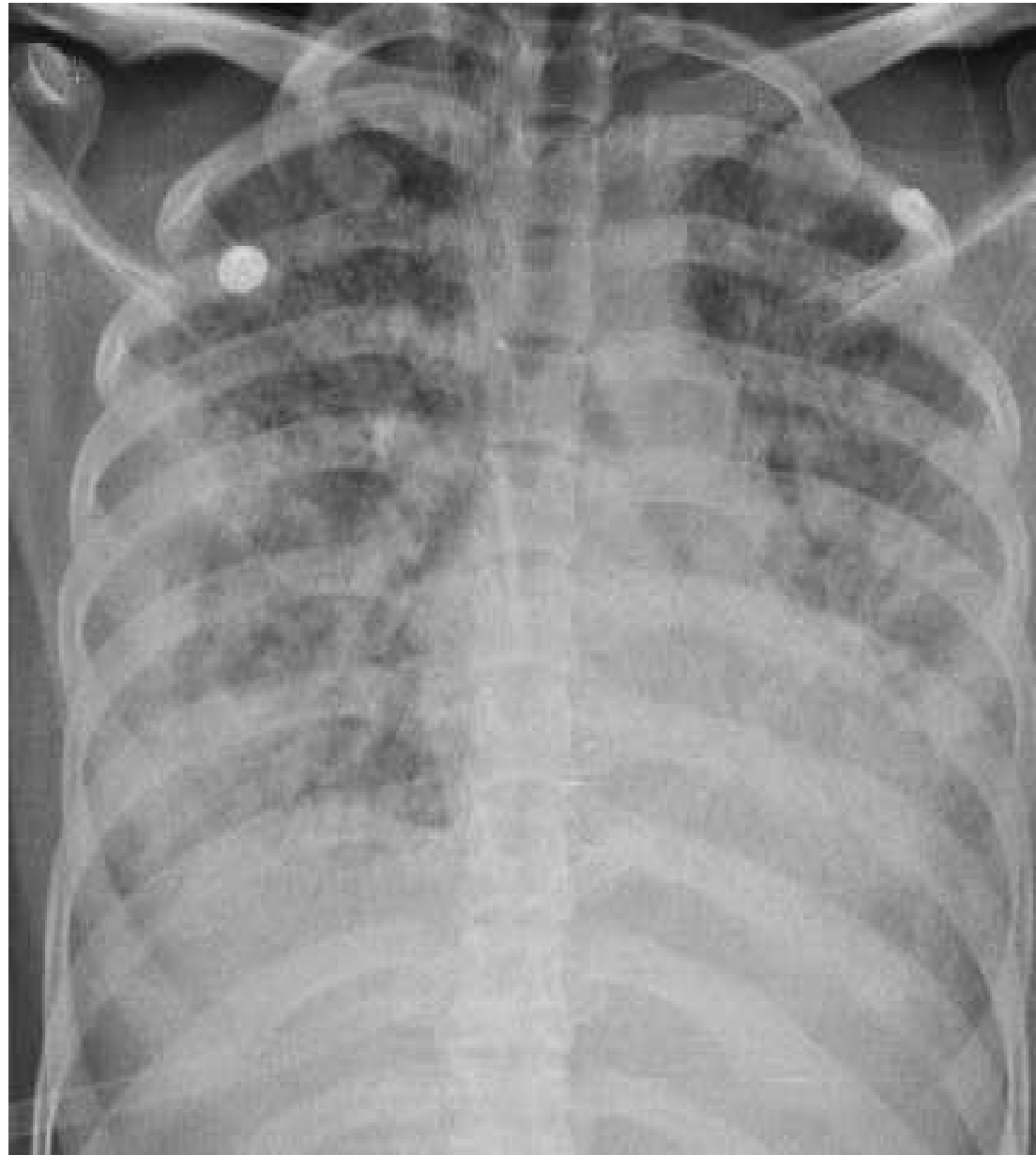


26/04/11



- Fever spikes continued, Oxygen requirement increased progressively and distress worsened.
- Antibiotics- stepped up to renal-adjusted dose of Inj. Vancomycin
- Blood C/S- No growth

30/04/11



- ABG- suggestive of ARDS, child had worsening distress needing intubation
- DAY 8- Ventilation commenced
- Initially, NIV connected

01/05/11



SUMMARY:

- Consumption of Paraquat
- Hepatic, renal dysfunction were the initial presentation
- Dialysis improved the renal function
- Progressive respiratory distress

POSSIBILITIES:

- Rapidly progressive hospital-acquired pneumonia
- Delayed pulmonary toxicity due to Paraquat poisoning

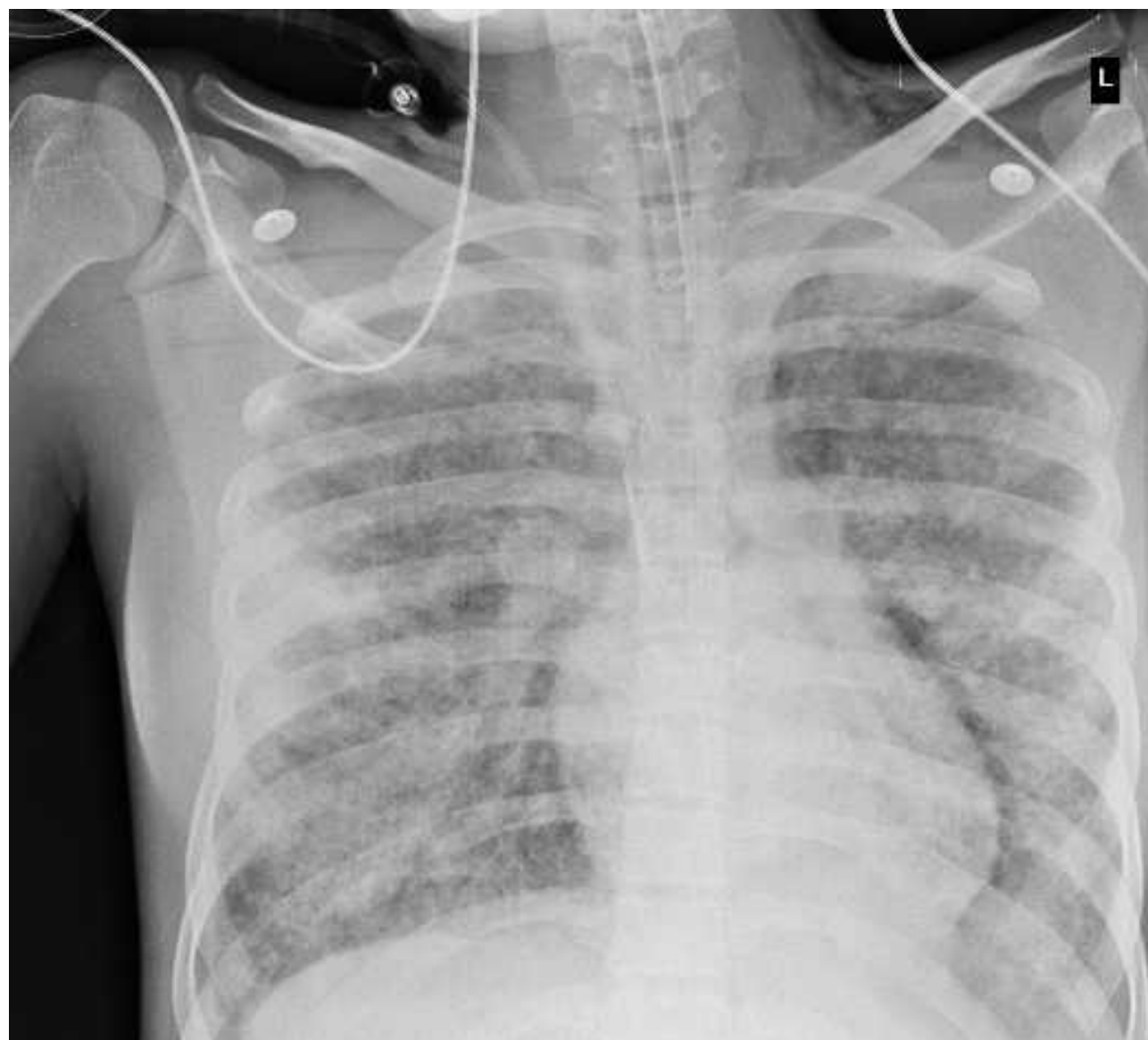
What to do..??

- An uncontrolled trial study showed 18% mortality rate in patients given pulse cyclophosphamide AND pulse methylprednisolone VS 57% mortality in patients given only dexamethasone

Cyclophosphamide treatment of paraquat poisoning, C.G.Newstead, *Thorax*
1996;51:659-660

- Methylprednisolone and N acetyl cysteine started.
- Inj. Cyclophosphamide 800mg/m² given over 4 hours after discussing with Nephrologist
- Progressively worsened requiring high pressures
- Required Inotropic support with Dopamine 10mcg/kg/min.
- Her urine output was normal

02/05/11



- DAY 10
- Ventilation continued with high pressures and FiO₂; O₂ saturation improved to 70% .
- AMA at 5 pm –financial constraints

FINAL DIAGNOSIS:

**PARAQUAT INGESTION WITH
ACUTE KIDNEY INJURY
WITH HEPATITIS WITH ARDS
WITH CORROSIVE INJURY OF
UPPER GIT**

DISCUSSION

- Bipyridyl Compound
- Used as Weedicide since 1962(50 yrs since introduction)
- Preparations:
 - -Liquid concentrate(29%)
 - -Granules(2.5 to 10%)
 - -Aerosol(0.2%)
- Dark blue or green colour
- Strong odour
- Brand name- SWAT, FIRE, PARAZONE
- **Lethal dose** 40mg/kg



Mechanism of action:

- **Caustic damage** - local effects.
- **Oxidative damage**- Systemic effects

Prevents reduction of NADP to NADPH



Free radicals not neutralised



Lipid peroxidation & Tissue damage.

- Concentrated in the lung, due to high O₂ content-
Pulmonary Toxicity
- Excreted mainly by kidneys ,but causes Proximal tubular dysfunction- delayed excretion- toxicity prolonged

Mild poisoning-

- Less than 5 ml of paraquat
- oral mucosal irritation and ulceration
- gastrointestinal discomfort
- Recovery usually occurs with simple supportive measures.

Severe poisoning-

- More than 30ml of paraquat
- Respiratory, hepatic and renal failure and cardiovascular collapse
- despite full intensive care support.
- leads to death within a few days

Less severe poisoning

- Consumption of 5 to 30ml of paraquat
- acute renal failure, hepatitis, and progressively more severe respiratory failure
- frequently results in death as late as six weeks after ingestion.
- It is probably in this group of patients that *active treatment* is most likely to achieve benefit.

PULMONARY TOXICITY

Alveolar epithelial damage – 24 hrs



Loss of alveolar epithelium- 2 to 4 days



Alveolar damage, inflammatory cell infiltration



Severe anoxia



DEATH



Fibroblast prolif in lung



Pulmonary fibrosis

- ***Radiological Findings:***

- Diffuse consolidation
- Pneumomediastinum
- Pneumothorax
- Subcutaneous emphysema
- Cardiomegaly

LABORATORY DETECTION:

- ❑ A qualitative **urine test** for paraquat

Detects concentrations of 1mg/ml or above

2ml of 1% Na dithionite in 1 N NaOH to 10ml of urine- blue colour

- ❑ **Gas/liquid chromatography**

1 to 2 mcg/ml

- ❑ **Radioimmunoassay** <0.1mcg/ml

Plasma levels >0.2mg/ml at 24 hrs after ingestion- Fatal outcomes

TREATMENT:

Main goals:

- *Prevent GI absorption*

NG lavage using Fuller's Earth/bentonite/ activated charcoal/
Kayexalate

- *Decrease blood levels and keep renal parameters normal by
Extracorporeal removal*

Hemodialysis or hemoperfusion – daily 4-5 sessions for 2-3
weeks /till undetectable levels in blood.

Will redistribute from tissues.

Initial Hospital Management:

- Ensure Airway, Breathing and Circulation are intact
 - Administer either:
 - *activated charcoal* - 2 g/kg body weight in children
 - *Fuller's Earth* - 15% solution; 15ml/kg body weight in children
- A purgative should also be used, e.g. *mannitol* or *magnesium sulphate*
- Rehydrate the patient to optimise renal clearance of paraquat

Ancillary treatment:

- Cyclophosphamide 10mg/kg/day for two days
- Methylprednisolone 15mg/kg/day for three days

- Dexamethasone 4mg IV thrice a day

- In a study in Taiwan, mortality in pulse therapy group was lower than control group(4/16(25%) versus 12/17(70.6%), $p=0.01$)
- All fatalities were from progressive respiratory failure
- Conclusion: Pulse therapy may prevent respiratory failure and reduce mortality

Pulse therapy with cyclophosphamide and methylprednisolone in patients with moderate to severe paraquat poisoning, Lin et al, *Thorax* 1996 Jul; 51(7):661-3

- In a study done in PGI Chandigarh, 5 patients out of 84 patients with poisoning had consumed paraquat.
- All five patients were treated with cyclophosphamide and methylprednisolone
- Only two out of five survived.
- Three died because of severe acute respiratory distress syndrome and multiorgan dysfunction syndrome.

Experience with paraquat poisoning in a respiratory intensive care unit in North India, Agarwal R, *Singapore Med J* ;2006 Dec;47(12):1033-7

Other modalities of unproven significance:

- Nitric oxide:
Improves arterial oxygenation
- Lung transplantation- Done in 4 patients without success
- N- acetyl cysteine- ‘free radical scavenger’
- Deferoxamine :
Prevents iron mediated oxidative damage
Not enough studies in humans.
- Immunotherapy with Fab antibody fragment – large amounts needed

TAKE HOME MESSAGE:

- Paraquat is a rare toxin, lethal in small amounts
- Presentation of respiratory symptoms can be delayed
- ✓ Potential role for steroids and Cyclophosphamide
- Prognostic indicators- High blood levels of paraquat
& multi system involvement.
- Paraquat needs to be banned in India also

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THANK YOU