Features of Paraquat Poisoning

	Age and Sex	W.B.C.	Duration of Illness	Blood Urea (mg./100 ml.)	Serum		E.C.G.	Chest X-ray Examination
					Bilirubin	AsT/Alt		
Bullivant (1966)	23 M	26,000	8 days	150 (NPN)*	3	66/160	B.B.B.† Myocarditis	Consolidation
Bullivant (1966)	28 M		15 days	112 (NPN)	13	162/—	B.B.B. Myocarditis	Mottling
Almog and Tal (1967) ..	30 M		18 days	140	4·6	250/—	Normal	Bilateral opacities
Duffy and O'Sullivan (1968)	45 M	10,300	18 days	124	0·8	300/—	Normal	Pneumonia
Campbell (1968)	6 M	11,000	7 days	240	6·0	—	—	Bronchopneumonia
Present case	27 F	13,000	20 days	490	1·1	80/83	Normal	Mottling
Irish (unreported)	Child							
Oreopoulos *et al.* (1968) ..	44 M	19,400	8 days	310				Hypervascularization

*NPN = Non-protein nitrogen. †B.B.B. = Bundle-branch block.

cortisone 100 mg. eight-hourly and fluids intravenously the dyspnoea increased in severity and she was cyanosed at rest.

On the 16th day of illness she was given fluorouracil 15 mg./kg. intravenously daily for three days. There was no deleterious effect in terms of marrow toxicity (W. B. C. 14,000 at end of treatment) or fresh gastrointestinal ulceration, but her condition continued to deteriorate and she died in respiratory failure 20 days after the ingestion of paraquat.

Necropsy.—There was a small ulcer on the tongue (present from time of paraquat ingestion). One hundred ml. of yellowish fluid was present in both pleural cavities. Both lungs were solid and oedematous, and showed numerous subpleural bullae. The alveolar walls were thickened owing to proliferation with spindle-shaped cells and infiltrated with multinucleated giant cells which reduced or obliterated the alveolar lumina. An inflammatory exudate present consisted mainly of lymphocytes. The kidneys showed patchy necrosis of the proximal tubules. There was some fatty infiltration in the centrilobular areas of the liver; bone marrow was within normal limits. Sections of the foetal lungs, kidneys, pancreas, liver, and spleen, and the bone marrow showed no abnormalities.

Comment

This patient passed through a similar sequence to that found in the cases already described (see Table). Though a severe degree of renal failure appears to have developed in most of the reported cases none of the patients seems to have died from this complication. A similar statement holds true for the liver-cell damage, though this does not appear to have been so severe. It is to be expected that some electrocardiographic changes must be noted in patients who are passing through a phase of renal failure, so it is difficult to assess the significance of the E.C.G. changes which have been observed. The multinucleated giant cells noted in the present case had not been observed in previous reports. The lack of changes in foetal tissues is probably a reflection of absent pulmonary function and minimal renal tubular function of the foetus.

Treatment with an antimetabolite was tried for a number of reasons: (*a*) all patients who died have shown a proliferative lesion in the terminal bronchioles that was constricting the lumen; (*b*) Ackerman and Regato (1954) commented on similar lesions to those following administration of carcinogens to animals; and (*c*) Duffy and O'Sullivan (1968) suggested that immunosuppressive treatment be considered. The unique circumstance of this poisoning in a 28-week pregnant woman raised the question of damage to the foetus should the mother survive. Methotrexate and mercaptopurine were precluded because of the maternal hepatic and renal-cell damage already present. Alkylating agents were not considered, because in optimal dosage a prolonged depressive effect on the bone marrow would result. It is important to stress that in this case fluorouracil was given at a stage when the respiratory complications of paraquat poisoning had fully developed. To achieve any possible effect an antimetabolite would have to be given at a much earlier phase of the illness.

We feel there should be little occasion to stress the need for rigorous care in the sale and distribution of this, and, indeed, any other weedkiller. The fact that five of the eight recorded deaths attributed to paraquat have occurred in Ireland—one death a year since 1964—should be adequate cause for grave concern.

Since this report was prepared a further death has been mentioned at a coroner's inquest in Dublin. The Minister for Health has as a result issued restrictions on the sale and labelling of paraquat in Ireland.

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Cholecystogastric Fistulae

Brit. med. J., 1968, **3**, 723–724

Fistulae between the biliary tree and the alimentary tract are not uncommon. Of these the rarest are those between the gall bladder and the stomach. Wakefield *et al.* (1939), in a series of 176 such fistulae, reported 101 to the duodenum, 33 to the colon, 24 direct to the peritoneal cavity, 11 to multiple sites, but only 7 to the stomach. Judd and Burden (1925) reported 153 cases, of which six were to the stomach, and Hicken and Coray (1946) reported 272 cases, with 12 to the stomach. This gives an overall incidence of 4.2% cholecystogastric fistulae.

The discovery of gall stones in the stomach is also rare. Cases have been reported by Miles (1861), Naunyn (1892), Demole *et al.* (1950), McLaughlin and Raines (1951), and Hoskins (1962). The portal of entry was usually the pylorus, the gall stone having previously entered the duodenum via the common bile duct or a cholecystoduodenal fistula. In these cases the stone must have been small, and many such stones are probably passed per rectum without symptoms. Small stones entering the stomach via a cholecystogastric fistula may also be passed, and several cases of cholecystogastric fistulae

without the presence of a stone in the stomach are recorded (Marchais, 1898; Martin, 1912; Rankin, 1932; Pohlandt, 1934; Borman and Rigler, 1937). For the gall stone to remain in the stomach it must be much larger: these cases are less common (Beaussier, 1770; Reimann and Bloom, 1918; DeFeo and Meigher, 1957; Canter and Gearing, 1960). The following is the report of such a case.

Case Report

A married woman aged 67 was first seen in the outpatient department at the Lambeth Hospital. She gave a history of indigestion for a year, with bouts of vomiting shortly after food and a feeling of epigastric fullness. She complained of some heartburn, but had no intolerance to fatty foods and no epigastric pain. There was no relevant past history.

Physical examination revealed a very obese woman weighing 182 lb. (82.5 kg.); there were no other abnormal physical signs. Barium-meal examination showed a large round filling defect in the stomach, which on altering the position of the patient could be seen to move from the pyloric antrum to the fundus (see Fig.). It was

Barium-meal x-ray film showing gall stone in pyloric antrum.

reported as being due either to a polyp or to a foreign body. Neither air nor barium could be seen to pass into the biliary system. Histamine test meal showed free acid in the stomach. The haemoglobin was 107% (15 g./100 ml.), the erythrocyte sedimentation rate fell by 34 mm. in the first hour (Westergren), and the white cell count was 7,200/cu. mm. The serum bilirubin was 1.8 mg./100 ml. total and 1.0 mg./100 ml. direct. Cholecystography was not performed.

Three weeks after her first visit exploratory laparotomy was carried out through a right upper paramedian incision. There was no free fluid in the peritoneal cavity. Palpation revealed a stony-hard mass in the pyloric antrum. This could be made to move freely within the stomach and was clearly not attached to the gastric mucosa. The gall bladder was small and fibrotic; it contained no stones but was firmly adherent to the anterior surface of the pyloric antrum. In this position it obscured the porta hepatis and the common bile duct, but palpation revealed small stones in the latter. The gall bladder could not be dissected free from the stomach, and was therefore removed with a small piece of gastric wall attached. The incision so made in the pyloric antrum was enlarged in a longitudinal direction and the foreign body in the stomach removed. It proved to be a large, smooth, dark-coloured stone 1 in. (2.5 cm.) in diameter and macroscopically identical with a cholesterol gall stone. The common bile duct was opened, a transduodenal sphincterotomy performed, and the duct washed through. Several small stones were removed and a "T" tube was left in situ.

The postoperative course was complicated on the eighth day by abdominal dehiscence. After resuture there were no further problems. A cholangiogram on the tenth postoperative day was normal. The patient was discharged on the twenty-second day and has remained symptom-free. The gall stone weighed 6 g. and was composed of cholesterol and calcium bilirubinate. Macroscopic examination of the gall bladder showed a small fistula from its lumen to the gastric mucosa.

Discussion

Gall stones entering the stomach via the duodenum and pylorus are usually small and give rise to few or no symptoms. Larger stones are much less common, enter via cholecystogastric fistulae, remain in the stomach, and give rise to symptoms. These are usually mild, as in the recorded case, but more rarely obstruction may occur (Thompson, 1912; Hertz, 1947).

According to Wakefield *et al.* (1939) the mode of formation of such fistulae is by pressure necrosis of the wall of the gall bladder and stomach or duodenum by the gall stone. Perforation of a peptic ulcer (Naunyn, 1892) and invasion by carcinoma are also rare possibilities, though they did not occur in any of Wakefield's cases.

Treatment depends on the individual case, but symptoms alone usually necessitate surgery. The fibrotic gall bladder should usually be excised and the stone may then be removed by gastrotomy as in the recorded case. Less commonly, gastrectomy may be needed for associated gastric disorder.

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