particularly in a mobile service in which flexibility is limited. Furthermore, its use may affect acceptability.

In conclusion, higher compliance is achievable with preallocated appointments, though the method described requires further evaluation especially for use in mobile screening.

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Reversible toxicity in poisoning with colloidal bismuth subcitrate

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Encephalopathy after long term treatment with some bismuth salts has been widely reported, but toxicity from colloidal bismuth has not been recognised. We report the results of an overdose of colloidal bismuth.

Case report

A 27 year old man was admitted four hours after an overdose of 100 De-Nol (colloidal bismuth) tablets (12 g), paracetamol (blood concentration 30 mg/l), and alcohol (blood concentration 162 mg/l). Blood bismuth concentration was not measured. The next day he felt well and was discharged. Ten days later he was admitted to our unit complaining of anorexia, nausea, vomiting, general malaise, weakness of his legs, blurring of vision, thirst, and poor urinary output. He was dehydrated and unwell but had no fever or tachycardia. He had proximal leg muscle weakness with hyperreflexia and ankle clonus. His plantar reflexes, all senses, and both fundi were normal. He was lucid with no signs of encephalopathy.

Biochemical investigations yielded the following results: serum sodium 130 mmol/l, serum potassium 4.3 mmol/l, plasma bicarbonate 30 mmol/l, plasma urea 69.9 mmol/l, and plasma creatinine 2804 µmol/l. Bismuth was detectable in his blood (260 µg/l), urine (120 µg/l), and stools (26.9 mg/g) but not in cerebrospinal fluid. Standard tests of liver function yielded normal results. An abdominal x ray film showed opacification of the colon by ingested bismuth. An electroencephalogram showed non-specific slow wave changes over both hemispheres.

Renal failure and neurotoxicity induced by bismuth were diagnosed. After initial purgation with magnesium sulphate and rehydration with 0.9% saline haemodialysis was started. Five days later renal function had returned to normal and neurological signs resolved. The patient felt well. The table gives the blood urea, creatinine, and bismuth concentrations 96 days after ingestion.

Comment

Toxicity after ingestion of bismuth subgallate, subcitrate, and subsalicylate may result in tremors, confusion, myoclonus,² encephalopathy with characteristic electroencephalographic changes, and fits.³ The mechanisms are not clear. Although colloidal bismuth subcitrate is much less easily absorbed, small quantities of it do enter the blood of animals

Blood urea, creatinine, and bismuth concentrations during 96 days after overdose with colloidal bismuth subcitrate

Days after ingestion	Before or after dialysis	Urea (mmol/l)	Creatinine (µmol/l)	Blood bismuth* (µg/l)
0		<2.5	97	
11		69.9	2804	260
12	{ Before	69.4	2952	185
	{ After	45.7	1693	84
13	{ Before	46.3	1938	165
	{ After	27.8	1165	160
14	{ Before		760	200
	{ After	16.7		160
15	{ Before		460	165
	{ After	9.4		150
16	{ Before	10.3	475	
	{ After	<2.5	140	150
20		7.7	185	200
60		3.8	98	19
96		2.7	88	8

*Measured by atomic absorption spectrometry.¹

and humans, with tissue binding in animal kidneys especially but also in the spleen, liver, brain, heart, and skeletal muscle.^{3,4} Bismuth may cause decreased glomerular filtration, reduced renal blood flow, and defects of proximal tubular reabsorption.⁵ In rats given high doses colloidal bismuth crosses the blood-brain barrier.

The absence of bismuth in cerebrospinal fluid may explain why the patient was not encephalopathic, and his transient neurological signs may have reflected his uraemia, itself a result of bismuth toxicity. The initial fall in blood bismuth concentration occurred after simple rehydration and purging. Reductions in blood bismuth concentration after haemodialysis were transient, the bismuth presumably being re-established from tissue stores but never reaching symptomatic concentrations.

The optimal treatment of overdose with colloidal bismuth is unknown. Within the first few hours absorption should be minimised by early hydration, gastric lavage (refused by this patient), and purging, even if the patient presents late as bismuth may well be absorbed from the colon. Chelating agents, such as penicillamine, may be effective in the early stages before tissue binding has occurred. Haemodialysis may be necessary, but whether this hastens tissue clearance of bismuth is uncertain. Even after large overdoses, as in this patient, the prognosis is good.

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