Original article

Unrestricted availability of a plasma paracetamol assay service resulting in an increased number of inappropriate requests

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Summary

Previously, prior approval from the on-call chemical pathologist was required in our hospital for plasma paracetamol measurements. However, since May 1992, there have been no restrictions on ordering this assay. We have assessed the consequences of this policy change by comparing the number and appropriateness of requests for plasma paracetamol measurements in Chinese patients admitted to our hospital with acute poisoning over two six-month periods (July–December) in 1991 and 1993. Requests were considered appropriate if paracetamol ingestion was suspected or unknown drugs were ingested. The number of patients having plasma paracetamol concentrations assayed increased from 51 in 1991 to 141 in 1993 (176%). The corresponding increase in the number of Chinese patients admitted to two of our eight general wards with poisoning was estimated to be 93%. The proportion of 'appropriate' plasma paracetamol measurements dropped from 55% in 1991 to 21% in 1993. Eight patients had plasma paracetamol concentrations above the recommended treatment line; they were all from the group in whom the requests were appropriate. Three of the 135 patients in the group with 'inappropriate' requests were found to have slightly elevated but far from toxic plasma paracetamol concentrations. Unrestricted availability of plasma paracetamol measurements resulted in an increase in the number of inappropriate requests.

Keywords: paracetamol, poisoning, assay

In Hong Kong, paracetamol is commonly used for self-poisoning,¹ and is widely available under many brand names, as well as in combination with other drugs or herbal medicines. Although many clinicians routinely request plasma paracetamol measurements in all patients with acute poisoning, we² and others³ have shown that it is extremely uncommon to miss potentially serious liver damage in patients in whom paracetamol ingestion is not suspected. Routine screening of all patients

with acute poisoning for potentially toxic plasma concentrations of paracetamol is therefore not indicated.

Our laboratory at the Prince of Wales Hospital has been providing a 24-hour service for the measurement of plasma paracetamol concentrations since 1984. Results are available within two hours if requested urgently. In May 1992, it became no longer necessary to obtain prior approval from the on-call chemical pathologists for such requests. The consequences of this policy change on the number of inappropriate requests for plasma paracetamol measurements were determined in the present study.

Subjects and methods

The Prince of Wales Hospital is the sole general teaching hospital in the New Territories East of Hong Kong, serving a population of 1.1 million in 1994. During two six-month periods (July–December 1991 and 1993), all patients presenting to our general medical wards with acute poisoning and having had plasma paracetamol measurements performed, were identified from the registry of requests in the Department of Chemical Pathology.

The hospital records of these patients were reviewed. Demographic data and information regarding diagnosis, reason for poisoning, agents involved, treatment given and outcome were noted. The diagnosis of poisoning and identification of agents responsible were based on the history from the patient or witnesses, labelling of the bottles and/or the clinical features.

Based on the findings from our previous study of the clinical value of screening for paracetamol in 294 Chinese patients presenting to our general medical wards between January 1992 and June 1993,² we defined requests to be appropriate if paracetamol ingestion was suspected. This included patients who ingested unknown drugs for the treatment of pains, fever, common cold and other upper respiratory tract infections. Since it is reasonable to check for possible paracetamol poisoning in patients who have ingested unknown drugs and unconscious patients, the requests in these patients were also classed as appropriate.

In our 24-hour urgent laboratory, plasma paracetamol concentrations are measured by

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the TDX method (Abbott Laboratories, USA). The detection limit of this method is 0.1 mmol/l.

Results

During the study periods, the number of Chinese patients having plasma paracetamol concentration measured increased from 51 in 1991 to 141 in 1993, an increase of 176%. The corresponding increase in the number of Chinese patients admitted to two of our eight general wards with poisoning was estimated to be 93%. However, the proportion of 'appropriate' plasma paracetamol measurements dropped from 55% in 1991 to 21% in 1993 (table 1).

During the study periods, eight patients had plasma paracetamol levels above the recommended treatment line⁴ (table 2); they were all from the groups in whom the requests were deemed appropriate. Three of the 135 patients in the group with inappropriate requests were found to have slightly elevated but far from toxic plasma paracetamol concentrations which were well below the recommended treatment line.

Discussion

In this study, we have again shown that routine screening of all patients with acute poisoning for toxic plasma paracetamol concentrations is

not necessary. Approximately one in seven patients in whom plasma paracetamol measurement was appropriate had potentially hepatotoxic concentrations, and one in 35 patients in whom a plasma paracetamol measurement was not indicated had elevated, but far from toxic concentrations. These figures are comparable to those (one in 11 and one in 36, respectively) from our previous study.²

Prior to May 1992, the requests for plasma paracetamol measurements were considered by our chemical pathologists to be in general quite 'reasonable'. Removing the restrictions on ordering such requests was intended to improve the availability of the test and spare the busy duty chemical pathologist from time-consuming telephone calls previously considered a mere formality. However, after the test became freely available in May 1992, the number of requests had almost tripled by 1993 compared to 1991. This magnitude of increase could not be accounted for by the increase in the number of patients admitted with acute poisoning. One contributory factor identified in this study was the absolute as well as relative increase in the number of inappropriate requests (see table 1).

We cannot be certain why there was an increase in the number of inappropriate requests for plasma paracetamol assays between 1991 and 1993. However, after the removal of restrictions in 1992, this 24-hour assay service became freely available and 'paracetamol screening' became part of the 'routine' investigations for patients with acute poisoning. Some clinicians appeared ignorant of the contents of many prescription drugs as well as the over-the-counter drugs which had been taken by their patients. For example, assay requests were frequently made for patients who had taken adult 'Cortal' (acetylsalicylic acid, caffeine). Confusion also arose because of the difference in content between adult and paediatric preparations of the same product. For example, 'Cortal' for children

Table 1 192 Chinese patients with or without a history of paracetamol poisoning admitted to a general teaching hospital over two six-month periods before (1991) and after (1993) the introduction of unrestricted access to the 24-hour plasma paracetamol assay service

	1991 (n=51)	1993 (n=141)
Male (%)	19.6	26.2
Mean $\pm$ SD age (years)	28.6 $\pm$ 12.3	30.3 $\pm$ 12.9
Appropriate requests for plasma paracetamol assay:		
paracetamol ingestion suspected	26	25
unknown drugs ingested	2	4
Inappropriate requests for plasma paracetamol assay:		
paracetamol ingestion not suspected	23	112

Table 2 Plasma paracetamol measurements in two groups of Chinese patients before (1991) and after (1993) the introduction of unrestricted access to the 24-hour plasma paracetamol assay service

	Plasma paracetamol concentration (mmol/l)		
	<0.1	$\geq$ 0.1 (but not toxic)	Toxic*
July–December 1991 (n=51)			
appropriate requests	13	12	3**
inappropriate requests	21	2	0
July–December 1993 (n=141)			
appropriate requests	14	10	5***
inappropriate requests	111	1	0

*Toxic level = plasma paracetamol concentration above the 'treatment line' joining semilog plots of 1.32 mmol/l at 4 h and 0.2 mmol/l at 15 h after ingestion.
One and *three patients developed non-fatal liver damage.

Clinical features of paracetamol poisoning

- no specific early symptoms or signs
- nausea and vomiting may occur
- without treatment, severe liver damage occurs in <10% of unselected patients, about 1% suffer acute renal failure, 1–2% die in hepatic failure
- ethnic difference in susceptibility, eg, renal failure is uncommon in Chinese patients⁶

Who to screen for paracetamol following overdosage

- definite history even if alleged dosage small
- medications for pains, fever, common colds and upper respiratory tract infections
- unconscious patients

Summary/learning points
<ul style="list-style-type: none">• routine screening of all patients with acute poisoning for toxic plasma paracetamol concentrations is unnecessary• unrestricted availability of plasma paracetamol measurements results in an increase in the number of inappropriate requests

does contain paracetamol and not the salicylate found in the adult preparation.

We have now proposed guidelines on the use of the plasma paracetamol assay service in our medical unit and we hope to see a reduction in the number of inappropriate requests. The requirement to discuss the case with the duty

chemical pathologists and, perhaps, a clinical toxicologist is now being reconsidered. Such an arrangement also has the advantage of a team approach, particularly in the management of patients with severe poisoning. A comprehensive list of drugs or herbal (patent) medicines containing paracetamol should be readily available to the admitting physicians. Such information is always available from our 24-hour Drug and Poisons Information Bureau in Hong Kong.⁵

We have not included the smaller number of non-Chinese subjects (eg, Vietnamese) encountered in this study to avoid the possible confounding factor of the language barrier. Future studies should examine the appropriate as well as inappropriate uses of other drug assays in patients with acute poisoning.

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