Liver and kidney toxicity caused by wild mushroom poisoning

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In May 2020, a 2-year-old girl was admitted to our hospital with a 2-day history of persistent vomiting, diarrhoea, abdominal pain, and headache. Her family reported that she had eaten half of a large mushroom, about the size of a palm (Fig a) 17 hours before symptom onset.

Physical examination was unremarkable. Laboratory investigations revealed liver disfunction, with elevated aspartate transaminase (AST) 228 U/L and alanine transaminase (ALT) 211 U/L rising to 2591 U/L and 2815 U/L, respectively. The patient was admitted to the paediatric intensive care unit for further treatment. After hospitalisation, AST and ALT further increased to 4005 U/L and 4335 U/L, respectively. Plasma exchange was performed along with treatments including 20% albumin, high-dose penicillin, N-acetylcysteine injection and *Ganoderma lucidum*. Liver function gradually normalised over the following week and the patient was discharged home.

The patient's grandmother and aunt consumed the other half of the same mushroom (Fig a) and other mushrooms (Fig b and c), and both were admitted to hospital with serious vomiting, diarrhoea and mild abdominal pain. Her aunt had normal liver function and kidney function. The grandmother had mild liver and renal impairment with AST 169 U/L, ALT 147 U/L, blood urea nitrogen 12.1 mmol/L and creatinine 168 μmol/L, made a rapid and recovery following rehydration, a bicarbonate infusion, furosemide, and hepatoprotective drugs for 3 days.

Cyclopeptides are the major lethal toxins worldwide, often found in *Amanita* spp, Cyclospora and galea.[1,2] In Guangzhou from 2007 to 2011, the most common species causing mushroom poisoning was *Amanita* spp. In mainland China 95% of fatal cases of mushroom poisoning are caused by amanitin. In Hong Kong, 90% of wild mushrooms are poisonous.

Ultra-performance liquid chromatography-mass spectrometry has high accuracy, and good sensitivity and specificity, and was used to identify the toxin in our patient. However, it was already 2 days after the girl ate the wild mushrooms, and the toxin might have been excreted so that the concentration was too low for detection.

FIG. Photographs of wild mushroom taken by the patient's family and identified by mycologists as (a) possibly *Amanita* spp, which are hepatotoxic; and (b, c) *Macrolepiota* spp, which are edible

Prognosis is often poor for patients with long incubation period of gastrointestinal symptoms (>6 hr), early manifestations of liver and kidney dysfunction, and multiple organ dysfunction.[3,4] Plasma exchange effectively removes hepatotoxins and improves survival, drugs such as silybin, N-acetylcysteine, putatively ceftazidime/penicillin and *Ganoderma lucidum* can also have a significant benefit.[5] *Ganoderma lucidum* contains triterpenoids that can protect the liver and reduce oxidative stress and apoptosis. *Ganoderma lucidum* decoction is effective in the treatment of amanita poisoning at a recommended dosage of 200 g/day decocted with 600 mL water, taking one-third of this decoction (200 mL per dose) 3 times per day, for 7 to 14 days. Liver transplantation is the final option for liver failure caused by mushroom poisoning.

Mushroom poisoning is usually the result of ingestion of wild mushrooms after misidentification of a toxic mushroom as an edible species. Public health education on identification of wild mushrooms and the dangers of wild mushroom consumption is particularly important to prevent mushroom poisoning.

Author contributions

Concept or design: KL Hon, LF Yang.
Acquisition of data: LF Yang, LP Zhu.
Analysis or interpretation of data: YT Li, XB Zhong.
Drafting of the manuscript: LF Yang.
Critical revision of the manuscript for important intellectual content: ZG Chen, KKY Leung, KL Hon.

All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

As an editor of the Journal, KL Hon was not involved in the peer review process. Other authors have disclosed no conflicts of interest.

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Ethics approval

This study was approved by the Ethics Committee of The Third Affiliated Hospital of Sun Yat-sen University (Ref [2022]-02-064-01). Written informed consent was obtained from the patient's guardian for the publication of this case report and all images.

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