



# Renal cortical hypoperfusion caused by glyphosate–surfactant herbicide

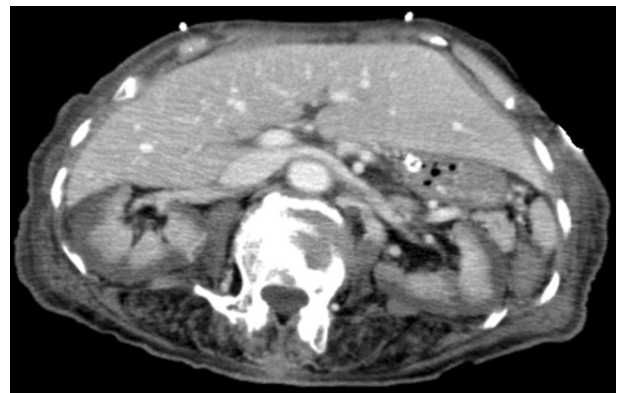
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A 70-year-old woman presented with abdominal pain 2 h after ingesting 500 ml of glyphosate–surfactant herbicide (GPSH). As her abdominal pain worsened, contrast-enhanced computed tomography was performed 12 h after the admission, demonstrating renal blood flow shunting through the medulla which is called “reverse rim sign” (Fig. 1). She had been anuric since hospitalization with sufficient mean artery pressure and negative blood culture. Despite intensive care, she died of multiple organ failure on the 6th day of hospitalization.

Following ingestion of GPSH known for mitochondrial toxicity, our patient developed acute kidney injury (AKI) with diffuse renal cortical hypoperfusion [1]. We assumed that her AKI was attributed to vasoconstriction of small intracortical blood vessels, intravascular thrombosis or mitochondrial toxicity of GPSH resulting in disorders of the mitochondrion-rich renal cortical region [2]. Considering that the lesion was homogeneously localized to the renal cortex, the latter assumption seems to be unignorable.



**Fig. 1** Contrast-enhanced computed tomography in the axial view demonstrating a non-enhancing renal cortex against a background of intact medullary perfusion

## Compliance with ethical standards

**Conflict of interest** The authors have declared that no conflicts of interest exist.

**Ethical approval** This article does not involve research using human participants or animals.

**Informed consent** Written informed consent was obtained from the patient’s family because the patient was incapable.

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## References

1. Bradberry SM, Proudfoot AT, Vale JA. Glyphosate poisoning. *Toxicol Rev.* 2004;23:159–67.
2. Kim HJ, Cho OK. CT scan as an important diagnostic tool in the initial phase of diffuse bilateral renal cortical necrosis. *Clin Nephrol.* 1996;45:125–30.

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